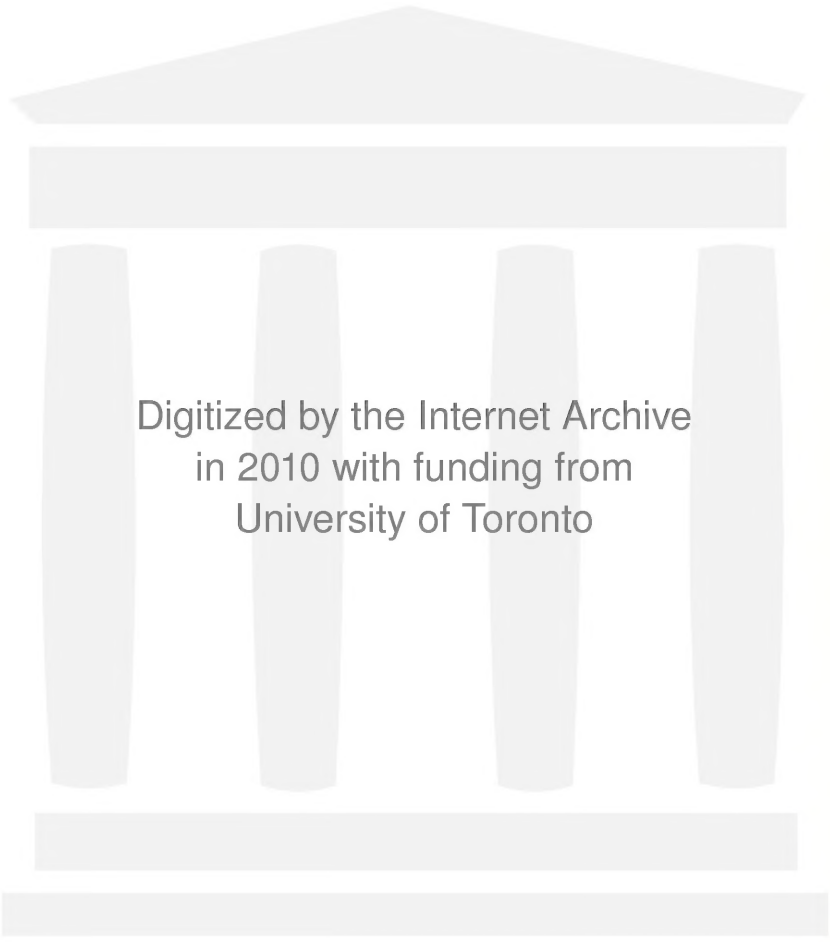
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# The Surveyor

And Municipal and County Engineer.

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## Minutes of Proceedings.

**Road Crust Improvement: The Board's Circular: Important Principles Recognised.**

The Road Board has made an important advance in issuing a circular which relates specifically to road-crust improvements, and explains clearly the administrative principles on which the Board will be prepared to consider applications for grants for the purpose of making such improvements. The circular, which is reproduced on another page of this issue, is, however, of somewhat wider scope than would appear at first glance, and we hasten to pay a tribute to the tact and skill which has made it possible for the Board to retain a firm grasp of the administrative and financial side of the matter, while at the same time affording the surveyors themselves an opportunity of giving effect to their own opinions in the matters of engineering principles and practice, which should be taken into consideration when improvements to the road crust are carried out. The scope of the circular is indicated, in the first place, by the fact that it sets forth the practice which the Board will follow in making grants "in respect of such improvements of existing roads as consist of works designed to strengthen and improve the road crusts." In the second place, it is made quite clear, in sub-sections (1) and (2) of section 3 that the Board will consider works such as strengthening and protecting the edges of the crust, as well as, perhaps, such local widening of the carriageway as may be needed to reduce undue intensity of the wear of traffic. In addition to making specific reference to strengthening or thickening the "strength crust," the Board use the phrase "or carrying out other works designed to permanently strengthening the road." We do not interpret this as involving an allusion to those larger works which, carried out on the road as a whole, would *indirectly* strengthen the crust, though it may be the intention of the Board to lead up to a consideration of such works, especially in those cases in which they ought to be taken in hand first. It is quite clear, on the other hand, that the Board would be prepared to consider such works as a Telford foundation, or the support of the edges of the crust, either in the manner described by Mr. Gladwell or on the principles explained by Mr. Ryves, in both cases described in papers presented to the Irish Road Congress last April.

This would involve putting down material in excess of that required for the part of the crust subjected to wear and the portion immediately beneath it, but the materials so used would not be subjected to direct wear and tear, would not need to be tough or very hard, and would last without renewal for a very long time. The loss of material by "tear" and subsequent rapid wear, accompanying the breaking away or sinking of the edges, is in many places a very serious matter, and it would be an important economy to avoid this loss, and worth doing even where the first cost would be considerable. We suggest, as we have suggested before, that in making applications for road-crust improvement surveyors should include estimates for such strengthening of the edges; and we further suggest that where road margins of the water-table type have been hollowed or worn down by removal of turf and earth, or by the action of water—so that the edge of the crust is not effectively backed by stable earth, and is the more liable to be broken when vehicles run off the carriageway—the cost of putting the margins in proper order should be included in the estimates, so that the road may be maintained according to the best practice for roads of this class. We do not allude, of course, to works of a heavy character, involving the engineering of the road as a whole; but where such works are necessary, permanent works directly affecting the crust should be kept in abeyance. The Board, it is clear, wishes first to direct the attention of surveyors to those stretches of road which do not demand general reorganisation, and where, therefore, the strengthening and improvement of the crust can be carried out effectively and with economy.

* * *

**The Nature of the Crust Itself.**

We are glad to see indications in the Board's circular that the idea that something might quickly be found for use in an up-hill-and-down-dale policy of surface improvement has not prevailed with the Board, and we note with satisfaction the use, in section 5 of the circular, of the phrases, "Roads which have to carry any substantial volume of modern traffic," and a few lines further on, "probably wasteful."

The Board clearly have in mind considerations which we have frequently put forward ourselves as regards the use of materials such as those referred to in that section. By way of a practical recognition of the principle involved we suggest that surveyors who have charge of flint roads should ask for grants for the doubling of the thickness of the crust in those places where are fairly steep inclines. These roads wear true and without puddles or ruts until they are too thin to support the traffic. An effective foundation not disturbing the *régime* of such stretches of road, and preferably of the same mate-

rials as the crust, would be a permanent improvement, making it possible to get the last half-inch of wear out of the renewable crust.

As regards the intention of the Board "to take into consideration the effect of the improvement in reducing the cost of future periodical renewals," this seems a fair arrangement. When, however, materials forming a crust durable in itself are used, the "life" of the crust as a material must not be confused with the life of the crust as a thing of proper shape. Generally, perhaps, the difficulties which lie in the way of the use of bituminous binders are not fully realised. A statistically-minded reformer, when aiming to produce a surface which does not wear much, is apt to overlook the fact that a reasonable rate of wear is essential to the success of a road-crust. The idea that the rocks of which main roads are made would be quite suitable if we could find a cheap binder which would hold them rigidly is a fallacy: necessarily as regards wear and foot-hold, practically, too, as regards settlement and compactness. The more rigidly we hold the stones, the more will the road crust approximate to a solid sheet of granite—a road crust which even mules on mountain paths avoid whenever possible. The difference in an individual stone between a "give" of 1-100 of an inch and a "give" of 1-1,000 of an inch may be the difference between standing up and falling down, between going round a corner forwards and going into a hedge sideways. One of the chief reasons, then, for making the best possible use of water-bound crusts and of local materials is that it will give us time to develop the use of tar in the best possible ways.

We regard the Board's circular as marking an important advance in highway engineering in this country, and we counsel surveyors to rise to the occasion, making proposals for thorough and substantial improvements rather than aiming at improving a large mileage in a short time. We note with satisfaction the decision of the Board to consider separately the case of Ireland, where the relation between mileage and population as well as climatic conditions demand that road improvement should be pursued in a manner different from that which suits the conditions in the sister Isle.

* * *

**Compensation for Accidents.**

Our contemporary the *Contract Record* of Toronto calls attention to an interesting case which was recently decided by Mr. Justice Charbonneau. An action was brought by one Bernier, an employé of the council of the City of Montreal, against the city for damages in respect of an accident. It appears that Bernier, while working for the city on sewer excavation work, was buried beneath a pile of earth and drain pipes and was severely injured. He brought an action to recover from the city the sum of 2,000 dollars on the ground that the authorities, as employers of labour, fell within the scope of the Workmen's Compensation Act. In granting the petitioner permission to enter suit for the amount claimed, the Judge reviewed at some length the history and meaning of the Act. One of the primary considerations under the Act is whether the object in view, or construction, is undertaken for monetary gain. The Judge contended that such works as water supplies, sewerage, and so on were undoubtedly undertaken by municipal corporations directly or indirectly under this heading. "As far as constructional operations are concerned," he added, "it seems to me necessary to submit civic corporations to the same obligations as would be imposed upon a private contractor." Maintenance works come under a different category, according to Judge Charbonneau, for the reason that they are not undertaken for profit, and that it is a duty which the municipality has no choice but to assume. In the Workmen's Compensation Act no exception is made in favour of municipal corporations, and the town or city assuming the responsibility of carrying out construction work by day labour is transformed, in the eyes of the law, into a chief of works answerable to the law equally with the contractor.

It is interesting to compare the Canadian law on the subject with that which is in force in England. The restriction that the work in respect of which an accident happens must be undertaken for monetary gain in order that the provisions of the Workmen's Compensation Acts shall apply is not known to the English law. A municipal corporation in England is in the same position as any other employer of labour, and is subject to the full provisions of the Workmen's Compensation Acts in the case of an accident to a workman which arises out of and in the course of his employment, and there is no distinction in this respect between works of construction or maintenance.

* * *

**Manchester and Sheffield Schemes.**

The *Manchester Guardian* in its retrospect of the year 1911 makes allusion to the great drainage scheme for Manchester, the plans for which were prepared by the city surveyor, Mr. T. de Courcy Meade. With respect to these plans Sir Alexander Binnie, reporting to the Rivers Committee, wrote: "Speaking generally, the new scheme of main drainage will make Manchester one of the best-drained and in every respect the most sanitary city in the kingdom. . . . In preparing the above report an immense amount of time and labour has been involved in going through the mass of information collected by your city surveyor in recent years with the object of thoroughly maturing a complete scheme. Every figure which he has placed before me has been independently checked by my own staff, and in considering every alternative which appeared to me to raise a *prima-facie* case for investigation, I have no hesitation in fully endorsing his proposals, which I consider are the best which can be devised for putting the main-drainage system of Manchester on a footing to meet the demands which may be made upon it in the future." Parliament has sanctioned £1,000,000 for this scheme—which is designed to effect an improvement in the drainage of Hulme, Moss Side, and the central parts of the city—and it is understood that the works will be let by contract, and that special precautions will be observed with a view to the detection of unsatisfactory work. The Manchester procedure for the detection of scamped work gives while it also exacts something. The work is cut into at places selected by the city surveyor, and if found to be satisfactory the corporation bear the cost of the examination, but if the result is otherwise the cost falls upon the contractor, who is at the same time called upon to make good the defects. The expansion of the large provincial cities, such as Manchester, Liverpool, Birmingham, Leeds, Glasgow, and Sheffield, has its necessary corollary in schemes of sewerage, water supply, and road-making, and it is to be noted that while Manchester has received authority for the expenditure of a round million, Sheffield is seeking powers next session to spend £1,500,000 for street improvements, town extensions, and the provision of new water reservoirs. All of which goes to prove that there is no finality to an enlightened municipalism, and that the municipal engineer will be called upon more and more in the future to grapple with problems that will test to the utmost all his most skilful professional qualities.

* * *

**Dumping Sludge at Sea: The Self-Emptying Barge.**

It must often have occurred to municipal engineers who are responsible for the sewage disposal of inland cities that the local authorities of towns situated near the sea and on large estuaries take a somewhat unfair advantage of their special facilities for disposing of sewage into salt water. If, however, seaside municipalities cannot see their way to making arrangements for complete disposal of sewage as under-

stood inland, they can, it may be suggested, keep in view the advantages of such methods of treatment as will result in the discharge of a fairly harmless effluent into the tidal waters, and the dumping of a relatively small quantity of sludge in the open sea. The nearer the seaside place can approach to inland practice, the less noxious will be the effluent from the outfall, and the smaller will be the quantity of sludge which has to be towed out to sea. Whatever proportion of the sewage cannot, or is not, broken up into liquids and gases is clearly less likely to cause a nuisance if dumped far out at sea in the form of sludge than it is if discharged as more or less crude sewage into an estuary or off the coast.

These reflections are suggested by a description of a self-emptying barge which will be found on another page of this issue. Subject to criticisms from the seaman's point of view, this type of vessel may be said to offer important advantages in the matter of sludge disposal by dumping at sea. As regards seaworthiness, it may be suggested that no serious harm would be done if the vessel were overturned by the waves without the intervention of the operator, who, in rough weather, would be prepared to scuttle round his treadwheel like a squirrel in a revolving cage, instead of walking round slowly as in the ordinary case of turning the vessel over in calm water.

* * *

**Public Lighting.** In another column will be found a paper on Public Lighting which was read a short time ago before the Yorkshire Junior Gas Association, by Mr. E. Garsed. The author advocates the application of modern improvements to street lighting, and his paper contains many points of interest. His statement as to the very large number of old-fashioned flat-flame burners which is still in use in various districts will be a revelation to many who are interested in the lighting question. There can now be no doubt as to the superiority of the incandescent burner, both as regards efficiency and economy. The reasons for its non-adoption are no doubt various, but in many cases the difficulty is that the public lighting is controlled by a department separate and distinct from the gas undertaking of the district.

Mr. Garsed quotes some very interesting statistics in regard to the comparison of upright and inverted mantles, which tell very strongly in favour of the latter, particularly as regards durability, the renewals being less than one-third of those required for upright mantles. Among the other improvements suggested by Mr. Garsed is that of the inauguration of a system of district control for lighting and extinguishing lamps. The modern devices which have been introduced for this purpose will supersede the old-fashioned if picturesque lamplighter. The cost of the necessary pilot lights is counterbalanced by economy in wages, and the district system is certainly more convenient. We are in full agreement with the general tenour of Mr. Garsed's paper that gas-lighting for our streets has a future before it if it be conducted only on thoroughly up-to-date lines.

* * *

**Road Signs and Local Authorities.** In our issue of December 22nd we expressed the opinion that warning signs on the roads should be under the control of the authorities, with central regulation. In this matter the county council is not, we think, so much concerned as is a district or borough council, and these latter should decide where the signs are wanted. In order, however, that these signals may be readily recognised, each for what it really is, by road users all over the country, the form of each sign should be devised by a central body, such as a small committee selected by the Local Government Board. If a district council failed to do its duty in this respect the county council would, under an arrangement such as we propose, be empowered to apply to the Local Government Board for permission to act instead of the smaller authority. At a recent meeting of the Dorking Rural District Council the chairman said that certain speed-limit signs at Abinger had been erected in accordance with measurements supplied by the county council, and it was absurd, he remarked, that local authorities were not consulted, while the motor associations were. In regard to signs of another kind it is significant that a leading organ of the motor Press has expressed the opinion that sign-posting is being overdone, and with a view to advertising the rival organisations.

* * *

**A Good Example.** We have never hesitated to criticise the action of local authorities in regard to their treatment of candidates for appointments in any cases where we deemed that such criticism was merited. It is a pleasure now to commend an authority—the Southampton County Council—for the very courteous manner in which they have treated the applicants for the appointment of divisional road surveyor. Among the complaints which have to be made only too frequently we often see that communications are sent to candidates with half-penny stamps; that applications are not acknowledged; and that no notification, or, what is worse, a postcard which can be read by everyone, from the office boy upwards, is sent to unsuccessful candidates. As a contrast to this procedure we observe with satisfaction that the Southampton County Council forwarded in duplicate to every candidate a copy of the list of duties and so forth enclosed in a sealed envelope; every application was acknowledged; and, finally, a courteous letter was sent (also in a sealed envelope) to the unsuccessful candidates thanking them for their applications. We hope that other authorities will note this good example and will go and do likewise.

* * *

**Nearing the Majority.** At the beginning of last year we were jubilant on reaching our thousandth weekly issue. This issue makes another red-letter day in our calendar, inasmuch as with it we approach to within a year of our "coming of age." May we take advantage of the occasion to make an appeal to our readers? We base it on the assumption that during our period of existence we have been of some use in relation to municipal engineering and municipal engineers. If this be appreciated—and every week brings us evidence that it is—we ask our readers to reciprocate to the extent of keeping us (and through us their confrères) well posted in all that happens in their field of interest. Results of tenders is a case in point. We should be glad to think that our record of these, useful alike to engineers as to contractors, is as comprehensive as it could be made. Early intimation of works projected, occasional notes of the stages of their progress, copies of special and annual reports—all suggest the assistance we invite. A contemporary claimed to be "written by gentlemen for gentlemen:" we should like such value as THE SURVEYOR has sustained and extended by the co-operation of municipal engineers for municipal engineers.

* * *

**"The Surveyor" Special Issue.** We recently made a request in this column that returns of municipal works projected should, in order to ensure their appearance in our forthcoming Special Issue, be despatched to us without delay. While the response to this appeal has been in every way satisfactory, we would urge upon those of our readers who have not yet submitted their forecasts to arrange that these shall reach us in the course of the next few days.

# Waterworks Management.*

By EASTON DEVONSHIRE, Assoc.M.Inst.C.E., and WILLIAM MATTHEWS, M.Inst.C.E.

**(Conclusion.)**

One of the foremost duties of the waterworks manager is to keep an up-to-date and correct record of the underground system of pipes, valves, and fittings, showing, upon suitable maps, their location, size, and, in exceptional cases, their depth.

Where possible the date at which they were laid should be marked upon the maps, or, alternatively, be registered in a book. This work brooks no delay, and should be done as soon as the work is completed, while, in the case of old and unrecorded work, no occasion should be missed, when pipes are laid bare for any purposes, of obtaining and recording all the particulars mentioned and of noting the structural condition of the materials

In the authors' experience it is the exception rather than the rule to find this done properly, or even at all, and it frequently happens that all the information available as to the location and size of pipes, valves, and complicated connections is centred in some elderly turncock who, for selfish reasons, is too often indisposed to impart his knowledge to another.

The preparation of engineering drawings is outside the scope of this paper, but it is the duty of the manager to obtain and keep for reference copies of the corrected drawings of all works as finished, and not, as is often the case, the originals, upon which alterations made during progress are either absent or very imperfectly portrayed.

*Keeping of Drawings.*—In order to economise space and avoid confusion, any such original drawing should, after a safe interval, be destroyed and give place to the corrected copy, and it is strongly recommended that the bulk of the drawings should be on tracing linen, as they then take up so much less room than if on paper, and sunprints can be taken off them at any time. Drawings or tracings of any sort should never be rolled up, but tracings on linen, to which need for reference is only probable in remote circumstances, may be folded and kept in files or packets.

*Filing of Specifications, &c.*—Specifications, reports, and sheets of statistics (other than those entered in books) should be filed and, more conveniently still, be from time to time bound up in suitable volumes, it being hardly realised what concentration of matter, order and economy of space can thus be effected at a trifling cost for binding.

All statistical matter to which frequent reference has to be made should be in books, even where the system of keeping records in the diagram form is also in vogue.

*Diagrams.*—These diagrams, to which reference has already been made and their special use pointed out, should be kept well up to date, and plotted to scales large enough to bring into clear relief all characteristic variations of any importance, but not so large as to extend the diagrams to unwieldy size, it being desirable that each should record the data for at least twelve months back. These diagrams may be conveniently traced on to linen, as copies then printed off will always be up to date.

### Applications and Contracts for Supplies.

*Application Form.*—Applications to supply any premises with water for domestic purposes should be on proper forms, and the authors recommend the adoption of the model form agreed upon by the Incorporated Joint Committee on Water Regulations.

Upon every occasion when there is such change of ownership or occupancy that liability to pay the water charges is removed from one person to another, the signing of a fresh application form should be insisted upon.

Each application form should state the character and position of the fittings from which water is to be used, and upon the receipt of each an inspector should be sent to verify the information and make a thorough inspection to see whether the pipes and fittings are all in accordance with the regulations, and only after the receipt of his satisfactory report should the water be turned on.

The application forms constitute contracts, and should bear numbers assigned to them consecutively as soon as all formalities have been complied with and the water turned on.

The applications accepted during the past month should be laid upon the table at each committee or board meeting, and after that filed in numerical order. Any contracts annulled or replaced by fresh contracts relating to the same premises should either be destroyed or withdrawn from the general file and assembled apart.

Similarly, application forms or contracts for the supply of water for building purposes, gardens, or trade uses should be numbered and filed in numerical order and assembled separately for reference.

### Index Cards and Rent Rolls.

The preparation of rent rolls involves the expenditure of much time and labour, so that any device by which these can be reduced and the collections advanced should be welcomed.

*Index Cards.*—There has been devised and put into successful operation a system which by the use of "index cards" at once furnishes the means of reducing labour and the establishment of a record in the most convenient form for reference; and it is therefore proposed to describe in considerable detail the principles, use and application of the cards as being well worthy of close consideration by waterworks managers.

As far as the authors are aware the system they are about to describe was first elaborated by Mr. Kemna, manager of the Antwerp Waterworks Company. It has since been adopted by other companies with which the authors are either separately or jointly connected.

The cards recommended for use are about 4¾ in. by 3 in., with a single perforation for wiring them in file boxes; those referring to ordinary domestic supplies are of white colour, while those for trade meter, garden, building, or other special purposes are of distinctive colours.

The boxes may be of any convenient depth, each to receive the cards for one or more streets or districts, arranged in permanent topographical order, and irrespective of colour.

At the outset each card stands for a house or premises having a definite address, supplied with water under an application form with a consecutive number, liable to the charges named in that contract, and furnished with the fittings enumerated therein.

As soon as brought into use, and year by year thereafter, each card assumes a number and stands for the same in the rent roll to which it relates, and on the demand notes and receipts for the whole year.

Directly after water has been turned on to any premises a card should be prepared by writing at its head the address with a line ruled under it; and close below this, on the left-hand side, the number assigned to the application form or other contract, followed by the name of the contracting party liable for the charges, and the total charges collectable per quarter, or the conditions of the meter, or other contract, all these particulars being copied direct from the application form or contract. On the back of the card should be noted the date when the water was turned on, and following this the particulars of the fittings, which also appear on the application form or on the report of the initial inspection of the premises.

Each card thereupon becomes a register of all the particulars of a distinct supply, and only in case of dispute is reference to the application form or contract necessary.

Assuming an undertaking to be started at the commencement of any year, and that, say, 1,000 supplies for domestic purposes were then and there turned on, that number of cards would have been prepared and must then be placed in file boxes in their proper topographical order. The next operation would be to assign to them their rent roll numbers, which would be from 1 to 1,000, following the topographical order throughout and whether in one or a dozen boxes. These numbers must be put on the front of the cards on the right-hand side, on the same line as the name already there written.

Cards relating to meter supplies, &c., of distinctive colour, are dealt with in a similar manner and placed topographically among the white cards.

Everything will then be ready for simultaneously

* Paper submitted at the recent winter meeting of the Institution of Water Engineers in London.

writing up the rent rolls, the demand notes, and the corresponding receipts.

*Rent Rolls.*—The rent roll will have at its left-hand margin a column into which already have been written or stamped consecutive numbers beginning at 1 and ending at 1,000, and neither address nor name need be written in the roll.

Following the marginal numbers from left to right the double pages of the rent roll are ruled in four groups of columns headed First, Second, Third and Fourth Quarters, and containing, as sub-headings, arrears (brought forward), water rate, payments, allowances, and voids for each quarter, with a space at the right-hand edge of the book in which to write a reference number to next year's rent roll for arrears carried forward.

In this manner each rent roll deals with one year, and may conveniently contain 5,000 marginal numbers and be of such size as may be kept in a small safe. Each double page of a rent roll is ruled horizontally, with a space at the foot of each column for totals.

*Rent Roll Summary.*—A similarly ruled book may be used as a rent roll summary, with marginal numbers indicating the successive pages of a rent roll, the columns of which are added up quarterly and their totals on each page entered in the summary, where they are again totalled so as to show quarterly the credit and debit accounts between the water authority and its consumers.

*Meter Supply Rent Rolls.*—In the meter supply rent rolls the entries under the heading "gallons consumed" are obtained from the meter reading books and the charges for the previous quarter entered in the appropriate column. Reference to meter reading books is made below.

*Method of Using Cards.*—Commencing now with the white card now bearing the number 1, a clerk calls the necessary particulars, another enters opposite No. 1 on the rent roll the charges, while yet another enters on the demand note and receipts already correspondingly numbered the same charges, and, in addition, the name and address: card No. 2 is then read off, and so on throughout the series.

It will thus be seen that, owing to the cards being arranged in both topographical and numerical sequence, a reference to the rent roll number alone suffices to trace the location of the property, all particulars connected therewith, and the application form, and that by the simple process of adopting a quickly stamped or written number it becomes unnecessary to reproduce, and year after year repeat, on the rent roll matter permanently inscribed on the cards; while, incidentally, attention may be called to the saving in space and consequent reduction in the size of the rent rolls themselves.

The coloured cards with their corresponding rent rolls, demand notes, and receipts are then dealt with in the same manner.

*Temporary Rent Rolls.*—Between the commencement and end of each year (or rent roll period) new supplies will come into operation and furnish the basis for charges which cannot be put into the current rent rolls without causing confusion, and to provide for these a supplementary or temporary rent roll for each class of supply should be kept, and this should have space reserved for the address.

Assuming that there are 500 such new supplies for domestic purposes during the year, the first of these should, following the last number in the general current roll, receive the number 1,001 and the last 1,500.

Returning now to the index card procedure, in each such case the card must be prepared as before, but the rent roll number be prefixed by the letters "T. R.," indicating the temporary rent roll, into which the particulars must then be entered, as well as on to the demand note and receipt, after which the card should be filed in its proper box according to its topographical position.

If no properties have in the interval ceased to be supplied there will at the end of the year be 1,500 cards in the boxes, and the new rent roll numbers range from 1 to 1,500; and as each is in its proper place the cards have only to be taken out in rotation and be numbered in regular sequence from first to last, each number being placed under that for the last year, after which the rent roll and demand notes and receipts can be made up as before.

Where a property ceases to be supplied altogether, the card should be permanently withdrawn or replaced by a card of distinctive colour bearing only the address of the void premises, but in cases where one contract ceases and a new application form applies, the original card remains as the index to that particular properly or supply, and must be revised by inserting on the first clear line below the last rent roll number the application form number, the name, and the charges payable under the new contract, followed by the temporary rent roll number, while on the back must be noted the date when the supply was turned on, and any necessary correction in the description of the fittings; after which the card is returned to its place.

Cards which become filled with details should be replaced by new ones, into which the permanent particulars and the data for the current year must be transferred, the old card being either destroyed or filed apart, but there is really little use in keeping them for, at any rate, longer than a year.

In order to avoid the use of numbers exceeding four figures, on either cards, rent rolls, or demand notes, it is well to distinguish the collecting districts by letters A, B, C, and so on, and using these in combination with the rent roll numbers.

These letters need not be repeated in every case, but appear as headings to the columns on the cards and rent rolls and on the front covers of the demand note and receipt books.

### DEMAND NOTES, RECEIPT BOOKS, AND COLLECTION.

*Demand Notes and Receipts.*—The demand notes should be prepared at the earliest possible time, in the manner previously indicated, and the receipts be filled up either simultaneously or directly afterwards. These should all bear the consecutive numbers corresponding with those on the rent rolls and cards, and thus render it impossible for the issue of more than one demand note and receipt in each case.

All receipts should have the name of the manager or other authorised officer written or stamped on them, and the authors strongly deprecate the use of blank receipt books to be filled in by the collector.

*Collectors.*—The remuneration of collectors is either by way of commission upon the amount collected or by salary, the authors being of opinion that the latter method is preferable, as in that case the hours of work can be controlled, and at times when there is but little collection possible, as at the commencement of each quarter, the collectors may be usefully employed upon other work.

The number of collectors must be properly proportioned to the size and character of the districts, in order that the same rate of collection may be maintained throughout.

The collectors should, so far as possible, and occasionally at least, be changed from one district to another; take no part in the making out of receipt forms; bank the money received at least every two days; and be held responsible to account for cash or the production intact of a receipt form for every counterfoil in the receipt book.

Under no circumstances should any collector be allowed to alter a receipt form, or accept any less sum than is shown upon the receipt, either as payment on account or otherwise, without the express authority of the manager given by means of a notice in some prescribed form.

*Allowances and Deductions.*—All questions of allowances and deductions must be referred to the manager, who alone should be empowered to make them, and give any consequent receipts.

All such special receipts should be of distinctive form or colour, and drawn from a numbered book provided with a counterfoil, a reference to the number of the special receipt being entered on the counterfoil of the original unused and cancelled receipt, which has been returned to the office where it is retained for reference by the administrative council or board, and by the auditors. The revised charges may then be applied for by the manager or the collectors in return for the new receipt.

In this connection the authors desire to point out the desirability of a periodical inspection of the rent roll by one or two members of the administrative committee or board. This inspection should be made in the presence of the manager and of the collector employed in the district covered by the rent roll under examination, and affords the opportunity of enquiry as to arrears, allowances or voids, and of receiving explanations as to any case where the full original charges have not been collected.

### WASTE INSPECTION.

Expenditure upon waste inspection is next to useless unless the work be done systematically, regularly, and then followed up by action such as will at once stop the waste and check it in the future.

*District Control.*—In the authors' experience the

systems of district control which have been adopted too often lead to the acceptance as satisfactory of results which, while giving good averages for a district on some particular day, by no means prove the non-existence of extensive waste at some points such as can profitably be sought for.

The details of such systems cannot be here discussed, it being sufficient to say that none of them accomplish the desired end unless combined with a rigid house-to-house inspection at least once every three months.

*Underground Leakage.*—The search for underground leakage can be carried on by an inspector or turncock with two or three assistants, who, working at night and examining a district street by street, are able, by sounding the valves and stop-cocks, to detect the passage of water which, after midnight, will in the majority of cases prove to be due to leakage. This leakage must, upon their report, be further traced by opening up the ground at the suspected points unless traceable to leaky internal fittings or some unusual consumption of water during the night hours.

*House Inspection.*—After making allowance for a reasonable number of second or checking inspections, it has been found that a district containing from 2,500 to 3,000 houses can be properly dealt with by one inspector in three months.

The inspectors should be changed from district to district, and as house inspection is only legal between 9 a.m. and 4 p.m., they may in the early morning be usefully employed upon such duties as the inspection of drinking fountains, public conveniences, and the like.

Ceasing inspection at 4 p.m., they may in the majority of cases be required to at once proceed to the office, hand in their reports, and take instructions for the next day's work; or, if working in outlying districts, they should send their reports to the office by post, and next morning by the same means receive their instructions.

*Inspectors' Books.*—Books for the use of the inspectors should be prepared in the office; these must be in pairs, the first, a sort of directory, being entered up from the index cards before mentioned, and containing the addresses and particulars of the fittings in each house. These books, subject to some corrections for alterations of fittings and the insertion of newly-supplied properties, will constitute a permanent record and last for a good while, possibly several years. Any insertions in these books should be made in the office from notes furnished by the inspectors.

The second set of books required are inspection or report books, having written therein first the addresses corresponding with those in the first set, followed by a column headed "alterations," in which any changes made in the fittings are to be noted, after which there should be as many blank columns as can conveniently be arranged (probably six) on both sides of the open page, and into which the inspector enters the particulars of the defects discovered, each column being for a single inspection. At whatever point he starts, the date must appear in the column after which, as each house is visited, a tick mark is placed in cases where all is in good order, while to describe defects shortly the adoption of letters as "B.P." for burst pipe, "C.L." for cistern leaking, and such like, is quite sufficient.

By the adoption of this form of book, with the results in columns, persistent or oft recurring waste from any particular fitting, or at any particular house, becomes obvious, and may furnish good evidence where drastic action has to be taken.

Each pair of books must refer to a number of streets, or a district, containing at least such a number of houses as will constitute a day's work, and, for the purpose of exchanging them and avoiding delay either of inspection or office work, the number of sets of books must be at least double that of the number of working inspectors.

The books themselves need not be larger than octavo size, and, while complying with the above requirements, will not together cost above a penny for postage.

Each inspector receives his instructions by being given the books for the district to be inspected and it is his duty to visit every house in succession, unless for special reasons, such as after a night inspection, particular premises which are to be examined, they being indicated by the office staff putting a red cross mark against each of these in the inspecting column for that day.

*Notice to Make Repair.*—The quick abatement of waste is so important that it is well worth making arrangements for at least one clerk in the office remaining, if necessary, after the usual closing time for the purpose of issuing and posting such notices to abate waste as may arise out of the inspectors' reports for that day.

From the inspectors' reports there should be prepared note books or sheets describing the location and character of the defects discovered, with two or more columns headed "second inspection" and "third inspection." Two days having elapsed since the issue of the notices, an inspector should visit each premises named on the sheet and note in the column headed "second inspection" whether the defect has been remedied or still exists. If necessary, a second and peremptory notice must be issued, and later on a third inspection made and reported as before.

There should be a defined limit to the expense and trouble incurred by reason of these repeated inspections, and the ignoring of notices by consumers. Such limits should be settled by the committee or board, and the manager have authority to thereafter take action, or, alternatively, he should at every meeting submit a list of defaulting cases and thereupon take such instructions as the committee or board may see fit to give under the circumstances.

### BY-LAWS AND CONDITIONS OF SUPPLY.

In this connection the authors desire to draw the attention of the members of the institute to the "Model By-laws and Conditions of Supply," recently issued as a publication by the Joint Committee on Water Regulations. It contains:—

(*a*) The new series of Model By-laws prepared by the Local Government Board.

(*b*) Conditions in regard to the supply of water which the undertakers are by statute empowered to enforce, and which it is desirable should be brought to the knowledge of consumers.

(*c*) Certain schedules and appendices, in which are set forth model forms of application, contracts for supply by meter and for special purposes, scales of charges, and such extracts from the general Water Acts as are referred to in the regulations.

Among the new Model By-laws will be found one by which authority is given to the undertakers to fix, for the purposes of detecting waste, an outside stop-cock on every service pipe, and in addition to any stop-cock which is under the control of the consumer, that of the new one being reserved exclusively to the authority. This power will greatly aid in the detection of waste by affording means for its discovery, at any time of the day or night, without entering upon the premises or disturbing the consumer, and will also furnish effective means of shutting off the supply to empty houses and defaulting consumers without having to break open the roads; while any interference with the stop-cock by the consumer, either by damaging it or turning it on without authority, makes the offender liable under sec. 60 of the Waterworks Clauses Act, 1847, to a penalty of £5.

*Powers to Make By-Laws.*—This and many other desirable powers are nowadays almost automatically inserted in private Water Acts in the form prescribed in the House of Lords Model Bill; but it is an unfortunate fact that many undertakings are still operated under the Public Health Act and without other special powers, in which cases they neither have the benefit of these clauses nor can they make by-laws; and the subject is here introduced as being one to which the manager should call the attention of the administrative body with a view to the necessary powers being acquired at the earliest possible opportunity.

The subject has been dealt with in the report of the Water Areas and Statistics Committee of the institution, and a recommendation put forward that steps should be taken to incorporate these powers in a short Public Act in such a form that every authority would automatically and at once come under its operation.

In any case, such conditions of supply as are in the Model form of the Joint Committee on Water Regulations should be printed and made available for the use of any applicant or consumer, even if a small charge be made for the same, these, in the case of authorities having the necessary powers, being accompanied by their by-laws as approved by the Local Government Board.

### COMPLAINTS.

*Complaint Book.*—The manager should keep a "complaint book," recording the nature of each complaint received, its origin, how it was dealt with, and making references to any correspondence involved or reports made thereon to the committee or board.

*Automatic Pressure Recorders.*—Where, as in some cases, detached houses at high levels give rise to complaints arising from insufficient supply at certain times, it is a good plan to establish a check upon the accuracy of such allegations by having fixed in some convenient place in the district affected a Bristol or other automatic recorder giving a weekly chart; indeed, the general use of these in all districts where pressures fluctuate greatly, and are affected by supplies coming from perhaps two or more directions, is greatly to be recommended.

METER SUPPLIES.

*Date of Meter Readings.*—Meters should be read at as nearly as possible the end of each quarter, even if this necessitates the temporary employment of some inspectors usually performing other duties. Those connected to very large supplies should have the indications taken more often—say monthly—as the failure of any such meter may give rise to dispute and involve claims of considerable importance.

Meter reading books should, as in the case of fittings inspection books, be grouped topographically, and be of such number and size as will permit of part of them being left daily in the office for entry in the rent rolls. The books should be ruled in columns, showing, quarterly, the index of the meter and the consumption since the last reading, with a column for remarks by the inspector as to any defect discovered or suspected in the working of the meter. Every consumer supplied by meter should be provided with a card, to be kept by him in a place accessible to the inspector, who should write on the card the index of the meter as read at each visit and entered in his report book.

*Register of Meters.*—Every meter should be registered in a proper book, and have a number assigned to it quite apart from that of the maker, such number being stamped or engraved upon a zinc or brass label to be attached to the meter.

Incidentally it may be observed that in lieu of keeping a book the index card system may be here most conveniently employed; but, in any case, this register should show the meter number, its size, type, and the maker's name and number, these all being permanent. Following this there should from time to time be records made of its location, the consumer's name, and the number of the contract for the supply, as well as the dates when fixed, moved, tested, repaired, and finally removed. When tested or repaired there should be a reference made to the page in the book where the details of these operations can be found.

*Test and Repair Book.*—The test and repair book should show the number of the meter, and give particulars of all tests and repairs, including the cost thereof; and, where the undertakers do not themselves do this work, the entries should be made from the reports on forms provided by the manager, furnished by the persons carrying out the repairs and making the test, the latter being insisted upon as necessarily following any repair.

*Life of Meters.*—The length of time during which any meter will continue to work satisfactorily without serious error depends upon a number of circumstances which cannot be now discussed, but it may be laid down as a general rule that every meter should be tested at least once in three years.

OUTDOOR STAFF, UPKEEP OF MAINS, ETC.

*Number of Men.*—The adjustment of the number of men who can be economically employed to the amount of work required to be done requires careful consideration. A certain class of men, such as pipe jointers, are indispensable for both ordinary and breakdown work, but should be so selected that they can in slack times be put to other than their regular trade work, such, for instance, as waste inspection and service tapping, this department being one in which it is particularly desirable to employ the all-round, handy man.

*Permanent Gangs.*—Many authorities now do a good deal of new main laying without the aid of contractors, a plan which in some cases has possible advantages, but, unless the undertaking be very large and increasing rapidly, this work will be of such a fluctuating character that a permanent gang of men cannot be kept fully employed, and there is a commonly-found tendency to avoid breaking it up by shifting it about from the laying of new mains under capital account to work chargeable to maintenance and repair, the latter being either neglected for certain periods, or at other times burdened with the cost of an unnecessarily large gang.

Foremen, quite naturally, strive to keep intact a well-schooled and experienced set of men, and to such the question of economy does not appeal, as it must to the manager, who should carefully analyse the cost, insist upon any reasonable reduction of numbers, and properly weigh the relative advantages of either carrying out all such work by the employment of direct labour, or of letting out to contract some or all of the new main-laying work.

*Service Tapping and Laying.*—The tapping for, and in some cases the laying of, services employs men in localities at greatly varying distances from the central depot, and the means by which they, together with tools and material, can be quickly transported from point to point deserves much consideration, it being believed that in extended districts such work and the repair of the smaller-sized mains would be facilitated and rendered less costly by the employment of a light motor lorry.

*Inspection of Valves.*—A duty, somewhat neglected, is that of making periodical inspections along the lines of mains to prove that valves are in working order and the paving round the surface boxes is in an unburied state. These inspections are, in outlying districts not much visited by the staff, best made in fine weather, when any leakages on the pipe line may very likely be detected from wet places appearing on the surface.

In town districts the valves, especially where waste detection is practised, will come into more frequent use and be under more constant observation; but they still require attention, and it has been found that elderly men, past working with pick and shovel, and therefore cheaper paid, can be usefully and economically employed upon such work, and the clearing out of stop-cock boxes and freeing their covers, by going in advance of the better-paid waste inspectors, whose work is thereby unimpeded.

*Breakdowns.*—In anticipation of inevitable breakdowns, there should, at convenient centres, always be kept a stock of pipes, materials, tools, and suitable tackle for quickly executing repairs of the ordinary character, and without having to hunt round for what is required; this is the obvious duty of the foreman, but it is necessary that the manager should at times test the readiness of a breakdown gang to get away promptly and properly equipped.

*Supervision.*—The subject of the effective supervision of the outdoor staff calls for more than passing mention, and is, in widely extended districts, one of serious importance, affording, as it does if neglected, an almost unlimited scope for demoralisation, laxity and consequent waste. Some foreman or inspector is usually put in charge of a district, and, where not far away, his operations can frequently come under the notice of the office staff, but beyond certain limits it is imperative, either that there shall be an outside superintendent, constantly moving about from district to district, or that the manager shall be so relieved from office work that he can himself make frequent and surprise visits to all points of operation. In either case proper means of locomotion must be provided, and the controlling body be brought to see that without this effective supervision is impossible, and, further, that it is false economy, by understaffing in the office, to load the manager with such a mass of detail work that it is impossible for him to exercise any real supervision or control at the very points where the bulk of the expenditure is incurred.

The management will invariably be found defective, and the financial result unsatisfactory, when the head of the department is discovered doing work which can be done equally well by clerks at a much lower cost, and who is invariably to be found in the office. The admiration expressed by a certain class of local legislators in particular for men who are "always to be found," arises from complete ignorance, and is in some cases calculated to encourage and accentuate the evil, and thereby do a great deal of mischief.

STAFF AT PUMPING AND OTHER STATIONS, RECORDS, ETC.

A great deal depends upon the placing of reliable and efficient persons in charge wherever the operations of pumping, filtration, treatment, or the regulation of water have to be performed, and no one is fit for such a post unless competent to take correct observations and keep their records.

The use of automatic recorders is becoming common, the charts being changed periodically and then sent to the office for computation and entry in books

or upon diagrams; but where recorders are not in use proper books or sheets must be provided for the daily entry thereon of all necessary data, and these should be sent to the office weekly, unaccompanied by any totalling up or attempt at the computation of results. In addition to this, each superintendent should be required to furnish all particulars of goods received, sent away, or likely to be required, to keep the labour time sheets, and also a general diary, which should at intervals be examined and initialled by the manager or his deputy.

*Data and Measuring Output.*—The data proper to each station will vary according to the operations there performed, and cannot be here discussed in detail, but the measurement of the output of the station will be common to all, and is worthy of consideration.

*Measuring Water in Bulk.*—It is satisfactory to note the practice of measuring in bulk, by means of meters, weirs, gauges, and other more or less absolute methods, is becoming increasingly common, as these, used in combination with self-recorders, furnish the most reliable data upon which to base any important deductions. Estimates based upon the numbers of hours, at assumed regular speeds, and the use of similarly assumed constants, may be at once described as valueless, while those based upon the ascertained number of engine strokes and assumed constant-pump displacements, can only be approximate, the pump slip varying from various causes, and affecting the result in a manner which can neither be measured nor rated with any certainty.

The only possible check upon this method is to occasionally pump into a closed reservoir for a given length of time, and in that way measure the quantity, but it is neither always a possible or at all convenient operation to perform as a frequent and periodical check such as is alone of real value.

A correct knowledge of the quantity of water obtained and sent on for distribution is essential; neither time nor money should be spared to obtain this by the most reliable means obtainable, and where such means do not already exist the manager should endeavour to impress upon the governing body the importance of the subject, it being the authors' experience that the inaccurate and misleading figures obtained by imperfect methods of computation have in many cases been responsible for the expenditure upon new works of quite unnecessary sums, and in others have largely contributed to such shortages of supply as have led to water famines.

EXPENDITURE ON CAPITAL ACCOUNT.

*Proper Allocations to Capital Account.*—The question as to what should, or should not, be charged to capital account is a debatable subject of much importance, and cannot be lightly overlooked, as it may have a distinct effect upon the financial result of the working of any undertaking, and there is an unfortunate tendency on the part of local authorities in these days to begin rates to seize upon any pretext for charging to capital account the cost of quite trivial works which the current revenue account ought to bear.

The matters to be which should be freely discussed between managers, accountants, and auditors, and a proper balance be struck between the theoretical and practical aspects of a subject full of difficulty, as will presently appear.

*Renewal of Mains.*—This question frequently arises as to the renewal of mains originally laid years ago. If the main had broken down bit by bit the renewal of each part would have been paid for out of revenue; but if for the sake of convenience, and while portions are yet good and sufficient, it is decided to renew the whole at a single operation, then it is pleaded that the charge should be against capital account. This is largely complicated in cases where, for convenience or future, and also a provision for increased carrying capacity, the renewal is made by means of pipes of larger size, and it would appear only reasonable that capital account should bear some part of the charge, and it seems to meet the case to charge to capital account the difference between the cost of the new pipes and the cost of pipes of the same size as those removed, plus the cost of the latter to the point of removal.

This and the kindred subject of depreciation are matters of both great interest and importance to gas engineers, a separate paper which it is to be hoped will be forthcoming from some member of the Institution.

CONCLUSION.

The authors are conscious of having left many interesting matters unreferred to, and of having passed by with but scanty reference others deserving of more attention than could be devoted to them in a paper dealing with a wide field. On the other hand, some members in reading this paper may be inclined to think that the keeping of the forms and details suggested as essential to good management involves the use of such an unnecessary number of them as would involve waste of time; such, however, is not the authors' experience, it, on the contrary, leading them to the conclusion that the methods they advocate are, in the long run, both time and labour-saving to the manager and profitable to the authority by whom he is employed.

It may appear that, by inference, lax management is imputed to many managers, but the authors desire to say that although there are undoubtedly many cases where, from lack of initiative, the best possible is not being done, there are also many cases where the manager is so hampered by the insufficiency of office accommodation, staff, and reasonable facilities for doing work properly, that the blame must be put on other than his shoulders, and it is one of the objects in view and the hope of the authors that the reading, discussion, and dissemination of this paper may have an influence in bringing about improvements, not only in management, but also in the lot of the manager.

## ROYAL SANITARY INSTITUTE.

### THE YORK CONGRESS AND EXHIBITION.

A public meeting to inaugurate arrangements for this year's Congress and Exhibition of the Royal Sanitary Institute will be held at the Mansion House, York, on the 10th inst., at 3 p.m.

Among the officers of sections and conferences are the following:—

Engineering and Architecture.—President: Mr. J. Walker Smith, M.Inst.C.E., chief engineering inspector, Local Government Board for Scotland; recording secretary: Mr. A. Saxon Snell, F.R.I.B.A.

Engineers and Surveyors to County and other Sanitary Authorities.—President: Mr. A. F. Greatorex, M.Inst.C.E., borough engineer and surveyor, West Bromwich; recording secretary: Mr. J. S. Brodie, M.Inst.C.E., borough engineer, Blackpool.

Sanitary Inspectors.—President: Mr. T. G. Dee, sanitary inspector, Westminster; recording secretary: Mr. A. E. Drummond, chief sanitary inspector, York.

The congress will be opened on July 29th.

SOUTH AFRICAN BRANCH.

The first sanitary congress arranged in the Colonies by a branch of the Royal Sanitary Institute was held in Cape Town on November 9th, 10th and 11th, and proved very successful. This initial Colonial congress marks a distinct epoch in the history of the institute, and it is hoped that it will result in furthering the objects of the institute, and of the South African branch in the union of South Africa.

Delegates were officially appointed to the congress by twenty-three municipal authorities and other bodies, and a number of members and associates from various parts of the Union of South Africa attended the meeting. The Mayor of Capetown (Sir Frederick Smith) welcomed the delegates and members to the city. Sir Frederick de Waal, Administrator of the Province of the Cape of Good Hope, was the president of the congress, and he delivered an address dealing with the work of the institute, and the need for activity in sanitary matters in South Africa.

Papers on a variety of subjects connected with public health administration were read, and it is hoped that the institute may be able to publish the papers read, or, at all events, the more important of them, in some form.

At a meeting of the Royal Sanitary Institute, to be held at Manchester, on Friday, March 8th discussions will be opened on "The Application of the Housing and Town Planning, &c., Act to the Development of Suburban Areas now in Process of Transition," by Mr. F. W. Platt, building surveyor, Salford; and on "The Quantity of Water available from Upland Drainage Areas," by Prof. J. Radcliffe, M.Sc. On the following day visits will be made to places of local interest.

**The Preservation of Iron in Concrete.** This has again been demonstrated in the demolition of an old gasometer in Hamburg Germany. The structure was built about 1852, and when taken down forty-eight years later the iron anchor bolts which had been completely encased in a cement concrete were found to be as fresh and bright as new iron with no trace whatever of rust.—*Canada Record*, Toronto.

# The Strengthening and Improvement of Road Crusts.

## ROAD BOARD'S CIRCULAR TO ENGLISH AND WELSH COUNTY COUNCILS.

The Road Board have circularised the county councils of England and Wales with reference to applications for advances towards works to be carried out during the next financial year, and have communicated to them the following minute of the board with reference to road crust improvements:—

1. The purpose of the following minute is to set forth generally the practice which the board propose to follow in making grants to county councils and other highway authorities in respect of such improvements of existing roads as consist of works designed to strengthen and improve the road crusts.

2. The only powers which the board possess to make grants are those contained in the Development and Road Improvement Funds Act, 1909, and that Act expressly excludes from the category of improvements all works which fall within the description of "ordinary repairs essential to placing a road in a proper state of repair."

3. The maintenance or repair of any road must necessarily involve the recoating or renewal from time to time as required of the wearing surface or surface crust which is worn away by the effect either of traffic or of weather and natural deterioration or decay. It is necessary therefore to draw a distinction between works which consist of—

(1) Strengthening or thickening the sub-crust or foundations, both of which may be included in the term "strength crust," or carrying out other works designed to permanently strengthen the road.

(2) Substituting better and more durable material for inferior material previously used in renewals of the strength crust or the surface crust.

(3) Laying down and steam rolling a wearing surface or surface crust in renewal of a damaged or worn-out surface crust.

4. The board consider that an obligation rests on the authority responsible for the maintenance of a road to maintain the strength crust, as well as to recoat the surface or renew the surface crust with an adequate thickness of material when it is necessary to do so, in order to keep the road in a proper state of repair, and that the cost of periodical renewals of surface crust is a charge which properly falls on the maintenance account. In making contributions to road crust improvement work it is necessary therefore to confine grants to some proportion (75 per cent is the proportion usually given) of the extra cost of improvement after provision out of maintenance account of the cost of renewal, with proper materials, of the surface crust which requires renewal.

5. In the case of roads which have to carry any substantial volume of modern traffic the practice of carrying out periodical renewals with inferior material, such as gravel, flints or soft limestone, although such material may be comparatively cheap in first cost, and binding with mud, is probably wasteful, and results in the total cost of periodical renewals of surface crusts, spread over a term of years, being greater than it would be if, in effecting renewals, superior stone or other good surfacing material, treated with some kind of bituminous material for binding or for surface protection, were used. The board are therefore desirous of assisting, so far as the funds at their disposal may permit, not only the strengthening of sub-crusts and foundations, but also the improvement of surface crusts by the use of superior surfacing material and by the substitution of bituminous-bound for water-bound material. They are assured by their technical advisers that this will not only provide better roads from the point of view of road users, but will also prolong the life of surface crusts, protect these crusts from rapid wear, and diminish the frequency of necessary and expensive renewals or recoatings. But the question whether the whole of the extra cost of improved surface coatings can be treated as improvement cost without regard to the greater durability of these coatings, and the consequent diminution of the annual equivalent of the cost of renewals properly chargeable to maintenance account, must be considered.

6. Hitherto the board, before making grants to road crust improvement work, have obtained from highway authorities estimates of the extra cost involved in renewing surface crusts either with improved materials or by improved methods, and have contributed a proportion of such extra cost without taking into account the estimated extra life of the improved surface crust.

7. It has now been so fully established that bituminous binding will substantially increase the life of wearing surfaces, that in future, in dealing with surface crust improvement, and in cases where the circumstances render the consideration relevant and material, the board intend to take into consideration the effect of the improvement in reducing the cost of future periodical renewals, which are properly chargeable to maintenance account. The effect of this will be in some cases to reduce the proportion of the extra cost for which grants can be made, or to render it necessary to introduce into some grants a condition that, in the event of the extra cost of the improved surface crust being in fact wholly or partially recouped by the extra life of the surface crust, the highway authority will spend upon other permanent road improvements in the district under their jurisdiction an amount equivalent to the grant made by the board, or so much thereof as may in fact be recouped by extra life of the new surface crust to which the board may have contributed.

8. If, instead of applying for grants for a proportion of the extra cost of improvements in surface crusts on the terms suggested in this minute, any highway authority would prefer to apply for a short-term loan at a low rate of interest, or in some cases without interest, of the whole amount of such extra cost, the board propose to give favourable consideration to applications for such loans.

9. In the event of any highway authority hereafter desiring to make an application for a grant or loan towards the cost of road crust improvement work, they will be required to supply, either with the application or prior thereto, the information indicated in Form No. 19 appended to this minute, so that the board may be informed as to the quantity and prices of material laid down on the roads maintainable by such authority, and as to the expenditure on repairs and renewals in the last complete year for which such information is available, prior to the date of the application for a grant.

10. The authority will also be required to supply with or prior to any application for a grant towards road crust improvement work a statement as to the lengths proposed to be recoated and the expenditure proposed to be incurred on maintenance account in the year following that for which particulars may be given on Form 19 above mentioned, and the board will, as far as practicable, select from the works of recoating or renewal which the authority are proposing to carry out in the ordinary course of maintenance those lengths which, having regard to the importance or the condition of the selected road, should be executed by improved methods or with improved materials.

11. Subject to the terms of this minute, the board will continue to make grants and loans to road crust improvements on applications for such grants or loans being made by county councils and other highway authorities. They will also continue to make contributions to the cost of surface tarring in cases where such treatment is suitable, but such contributions, except in cases where the grant is in continuation of a grant already made for a first application of surface tarring, will not, except under special circumstances, exceed from 50 to 75 per cent of the cost.

12. This minute is intended to apply to applications from England and Wales and Scotland (with some exceptions necessary to provide for those cases in which the circumstances require special consideration). The case of Ireland will be separately considered.

W. REES JEFFREYS,
*Secretary.*

Queen Anne's Chambers,
Broadway, Westminster,
London, S.W.

General directions for surfacing an existing road with steam-rolled, water-bound macadam have been prepared by the Advisory Engineering Committee.

and have been issued under the authority of the board by Messrs. Waterlow & Sons, Limited, London Wall, London, E.C., from whom they may be obtained, price 6d. post free.

## GRANTS TO HIGHWAY AUTHORITIES.

### FIFTH LIST.

During the months of October, November and December, 1911, the Road Board, with the approval of the Treasury, have made advances amounting to £33,787 from the Road Improvement Fund to county councils and other highway authorities as follows:—

| | |
|---|---|
| For the improvement of road crusts (including grants towards tar-macadam, &c., and surface tarring) ... ... | £29,045 |
| For road widenings and improvement of curves and corners ... ... | 4,223 |
| For road diversions ... ... ... | 519 |

The total grants up to December 31st are as follows:—

| | |
|---|---|
| For the improvement of road crusts ... | £347,407 |
| For road widenings and improvement of curves and corners ... ... | 50,436 |
| For road diversions ... ... | 17,094 |
| For construction and improvement of bridges ... ... ... ... | 13,897 |

Advances by way of loan have also been made to the sum of £8,173.

In addition, grants amounting in the aggregate to £490,413 have been indicated to highway authorities towards works of improvement, of which the details are still under consideration and discussion.

The following is a detailed list of the grants.

| Authority. | Amount of grant for | | Total. |
|---|---|---|---|
| | Improvement of road crusts. | Widenings, corners and diversions | |
| ENGLAND. | £ | £ | £ |
| Berkshire County Council .. | — | 392* | 392 |
| Dorset County Council ... .. | — | 89* | 89 |
| Essex County Council ... | — | 1,000* | 1,000 |
| Hereford County Council... ... | 879 | — | 879 |
| Hertford County Council... | 10,000 | — | 10,000 |
| Isle of Wight County Council .. | 200 | — | 200 |
| Kent County Council ... ... | 346* | — | 346 |
| Northumberland County Council | 475* | — | 475 |
| Somerset County Council... .. | 2,146* | — | 2,146 |
| Stafford County Council .. | — | 50* | 50 |
| Surrey County Council ... .. | — | 250* | 250 |
| Warwick County Council ... ... | — | 400* | 400 |
| Westmorland County Council ... | — | 826* | 826 |
| Fulham, Metropolitan Borough Council | 12* | | 12 |
| WALES. | | | |
| Brecon County Council ... .. | — | 450* | 450 |
| Denbigh County Council ... .. | — | 698* | 698 |
| Radnor County Council ... .. | — | 315 | 315 |
| SCOTLAND. | | | |
| Aberdeen County Council | 6,050* | — | 6,050 |
| Caithness County Council | 1,890 | 240 | 2,130 |
| Lanark County Council ... .. | 400* | — | 400 |
| Peebles County Council ... .. | 1,200 | — | 1,200 |
| Stonehaven Burgh of) ... .. | 200 | | 200 |
| IRELAND. | | | |
| Antrim County Council ... .. | 199* | — | 199 |
| Fermanagh County Council | 1,298 | 72 | 1,370 |
| Monaghan County Council | 100 | — | 100 |
| Queen's County Council | 1,050 | — | 1,050 |
| Tyrone County Council ... .. | 2,600* | — | 2,600 |

* In addition to grants previously made.

**Trinidad Asphalt Macadam.**—The firm of H. V. Smith & Co., Limited, 20 Victoria-street, Westminster, S.W. (managing director, Mr. H. B. Marten, M.Inst.C.E.) are putting up works at Hale Wharf, Tottenham Lock, London, N., for the manufacture of the above well-known road material. The works will have a large output and will be available for the whole of the Eastern half of London.

**Abertillery Water Supply.**—The Abertillery and District Water Board have accepted the tender of Messrs. Underwood & Beattie, of Dukinfield, Cheshire, at £261,715 to construct a dam and reservoir in the Gray Rare Valley, Brecknockshire, a new road to make, long water mains 33 miles long, a tunnel through the Cefn Mountain, Blaenavon, and service reservoirs at Abertillery and Aberavon. The scheme will supply the greater part of Industrial Monmouthshire. The engineer is Mr. Robert Latham, of Westminster.

## A SELF-EMPTYING BARGE.

### TIME SAVING IN SLUDGE DUMPING.

References to the recently invented self-emptying barge, or scow, which can be emptied by making it "turn turtle," have recently appeared in several engineering journals, and a very clear description, from which the following particulars are taken, has been published in *The Scientific American*. The barge is nearly rectangular in section, with rounded ends, and is divided, in the middle plane, by two decks, each of which plays in turn the part of a real bottom or a false bottom, since the vessel is symmetrical about this plane and can be loaded either side up. At one end of the axis of the barge there is a wheel which actuates the spindle controlling the valves, and around this wheel is a drum, the inner surface of which provides a platform for the operator in any position of the vessel. As the barge heels over the man walks round in a manner suggestive of the old treadmill. It takes about fifteen seconds for the barge to turn on to her beams, and in about two or three seconds more she "turns turtle" and dumps her load. While the direction in which the turning takes place could, of course, be controlled by providing the necessary compartments and valves between the two bottoms, this is not found to be necessary, as the water when first admitted gives her a list one way or the other, and sooner or later this list is maintained until the vessel heels over. It is clear that this scow may be used as an ordinary deck-loading barge where there is sufficient depth of water, and can be unloaded from the deck, but its chief claim to attention is with respect to the time saved in discharging sludge or spoil into the sea; whether we compare it with a deck-laden barge or with a hopper barge. As regards the last-named, the difference in speed is greatest when the load is such that it jams in the hopper. On this point our contemporary states:—

"The reluctance of the bottom dumper to deliver all of its material through the bottom has given rise to the practice of the towing captains called "bumping," which means, after the gates have been opened and the material refuses to leave, the tug is used as a battering ram, repeatedly butting into or bumping against the scow to dislodge the reluctant material. As the unloading usually occurs at night, and far out at sea, often in heavy weather, and as the captain dislikes very much to return to port with half a cargo, the practice often results in discharging some of it through the hole made by the tug."

The scow is framed longitudinally with heavy trusses on four-foot centers, braced diagonally and covered vertically with uprights. The framing is of exceptionally heavy scantling throughout, braced and offered with knees and breast hooks at bow and stern. The interior is divided by four longitudinal watertight bulkheads, one near each bow, extending from the bottom to the top of the scow, and two intermediate bulkheads extending between two false bottoms which are located from 6 in. to 9 in. above the light-draught water line.

There are valves or openings near the top and bottom of each compartment. All these valves are opened at the same time, the upper valves, when the scow is loaded, allowing the air to escape as the water enters at the lower openings. When the scow has reversed itself, the water which has entered will run out through the lower openings, due to the fact that the reserve buoyancy below the false bottom is sufficient to raise the bottom or deck 6 in. or 8 in. above the light water line, after which the valves may be left open and closed at any time before the vessel is reloaded.

**Back-to-Back Houses.**—Dr. E. P. Manby, a Local Government Board inspector, after a visit to the town of Llanelly, says that while the dwelling-houses appear to be in a fair order structurally, many of them have the floors paved with rough stones. He was informed that ninety-eight were built back-to-back. In many instances where windows existed they were not made to open, and in order to get ventilation the tenants had to remove the glass. Twelve out of fifty-three cases of diphtheria which occurred were secondary to others in the same house, and probably some of the secondary cases might have been prevented if immediate cases had been removed to the hospital. Dr. Manby suggested the appointment of a fully-qualified and trained sanitary inspector and surveyor. The town council is taking certain steps to comply with the Local Government Board's requirements.

# River Waters of the United States.

## SOLIDS IN SOLUTION AND SUSPENSION.

**[The following notes have been made and the diagrams specially prepared for THE SURVEYOR from a publication of the United States Geological Survey.]**

Among the many interesting reports of the United States Geological Survey there are some which, from their wide scope and the manner in which the subject is treated, are almost as useful to engineers generally as to those of the United States in particular. Among these we may reckon Water-Supply Paper, No. 236, Part I. of which contains a mass of figures giving the analyses of the waters of a large number of the more important rivers east of the 100° Meridian—that is to say, roughly, the eastern half of the United States.

In most cases samples were taken more than thirty times in the course of the year, and the tables show the variation, through the different seasons, in the quantities of the various constituents. As it would be impossible to deal within a reasonable space with all these figures, we have selected, as of the greatest general interest to water engineers, those relating to total solids in solution and to suspended matter.

From the quantities given in the tables we have prepared the accompanying diagrams, in which the various stations are placed in order of the mean quantities of the total solids in solution. This gives a curve, with which are plotted the corresponding figures for maximum and minimum total dissolved solids at each station, and above these curves are placed the figures giving the values for suspended matter, maximum, mean, and minimum.

On account of the great range of values it has been necessary to plot the curve to four different scales, and the four diagrams refer to what may be regarded as four classes of waters, grouped according to the mean value of the "total solids in solution."

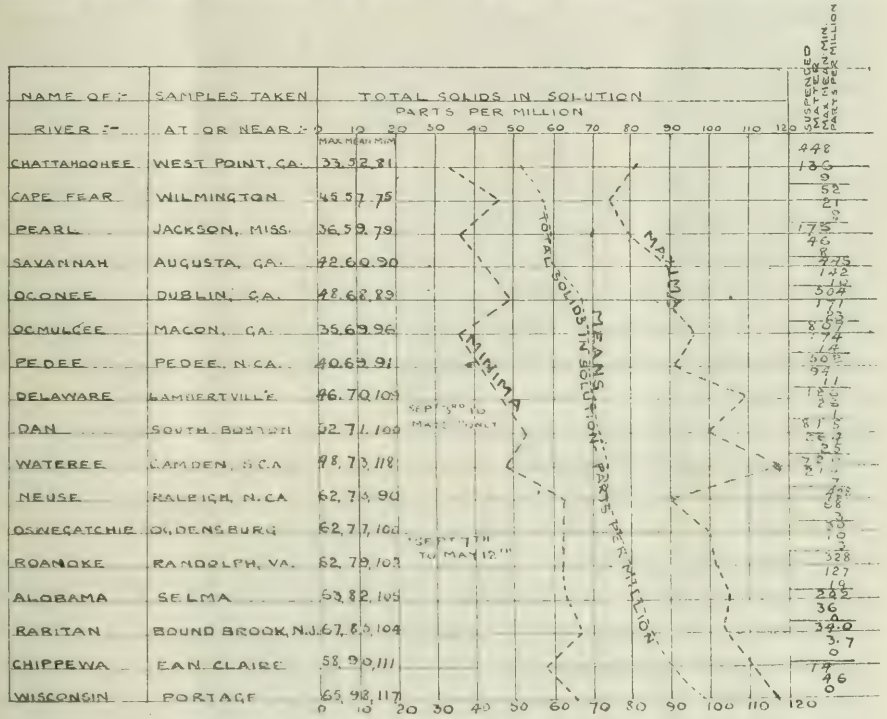

NAME OF RIVER
SAMPLES TAKEN AT OR NEAR
TOTAL SOLIDS IN SOLUTION PARTS PER MILLION
MAX MEAN MIN
CHATTAHOOCHEE WEST POINT, GA. 33,92,81
CAPE FEAR WILMINGTON 45,57,75
PEARL JACKSON, MISS. 36,59,79
SAVANNAH AUGUSTA, GA. 42,60,90
OCONEE DUBLIN, GA. 48,68,89
OCMULGEE MACON, GA. 35,69,96
PEDEE PEDEE, N.CA. 40,69,91
DELAWARE LAMBERTVILLE 46,70,103
DAN SOUTH BOSTON 52,71,100
WATEREE CAMDEN, S.CA 48,73,118
NEUSE RALEIGH, N.CA 62,76,90
OSWEGATCHIE OGDENSBURG 62,77,102
ROANOKE RANDOLPH, VA. 62,79,103
ALABAMA SELMA 63,82,105
RARITAN BOUND BROOK, N.J. 67,85,104
CHIPPEWA EAU CLAIRE 58,90,111
WISCONSIN PORTAGE 65,98,117
MAXIMA
MEANS
MINIMA
TOTAL SOLIDS IN SOLUTION PARTS PER MILLION
SEPT 30TH TO MAY 1ST
SEPT 7TH TO MAY 12TH
SUSPENDED MAT MEAN MIN PARTS PER MILLION
0 10 20 30 40 50 60 70 80 90 100 110 120

FIG. 1.

### METHODS OF ANALYSIS.

It is not necessary to describe in detail the methods of analysis employed, since it may be assumed that the results obtained are nearly the same as those obtained by methods in use elsewhere, and fairly state the physical facts. At the same time, the following points may be noted as of general interest. The usual interval between analyses was ten days, but each analysis was made with the mixture of samples taken one on each of the preceding ten days. The maxima and minima are not therefore those of a few hours, but in each case the figure given is the mean of the conditions prevailing for ten days. This is an important point to be borne in mind. The composite sample, about 1,100 cubic centimetres, was usually divided as follows: 50 c.c. for the determination of nitrates; 100 c.c. for that of chlorine; 50 for carbonates and bicarbonates; 500 c.c. for suspended solids and for filtration; the rest being in reserve. *Turbidity* was measured by the Jackson candle turbidimeter directly when between 100 and 1,000 parts per 1,000,000. More turbid waters were diluted. The instrument consists of a glass tube surrounded by a cylindrical brass holder supported by a stand, in the centre of which is a standard English candle, the flame of which is 3 in. below the bottom of the glass tube. The depth of the water in this tube necessary to obliterate the view of the candle below it measures the turbidity. *Total Suspended Solids.*—A good crucible was used to measure the total suspended matter. Difficulty was encountered in getting the muddy waters of rivers in the Mississippi basin to pass through the asbestos mat, but results were not seriously affected. *Total Solids in Solution.*—The measurement of total solids in solution was, as a rule, on 500 cubic centimetres of the water, though half the quantity was taken for some waters high in solids in solution, and a large quantity in the case of very soft waters. The other tests made were for silica, iron, calcium, magnesium, sulphate radicle, sodium and potassium, carbonate and bicarbonate radicles, chlorine, nitrates, total acidity, and total iron (including that in suspended matter).

The various checks on accuracy, which were very

carefully carried out, show that the figures obtained are thoroughly reliable for any of the ordinary purposes for which such data are required.

half the scale of Fig. 1, showing that the variations are greater in the group with the greater mean solid contents in solution. Bringing Fig. 3 into the com-

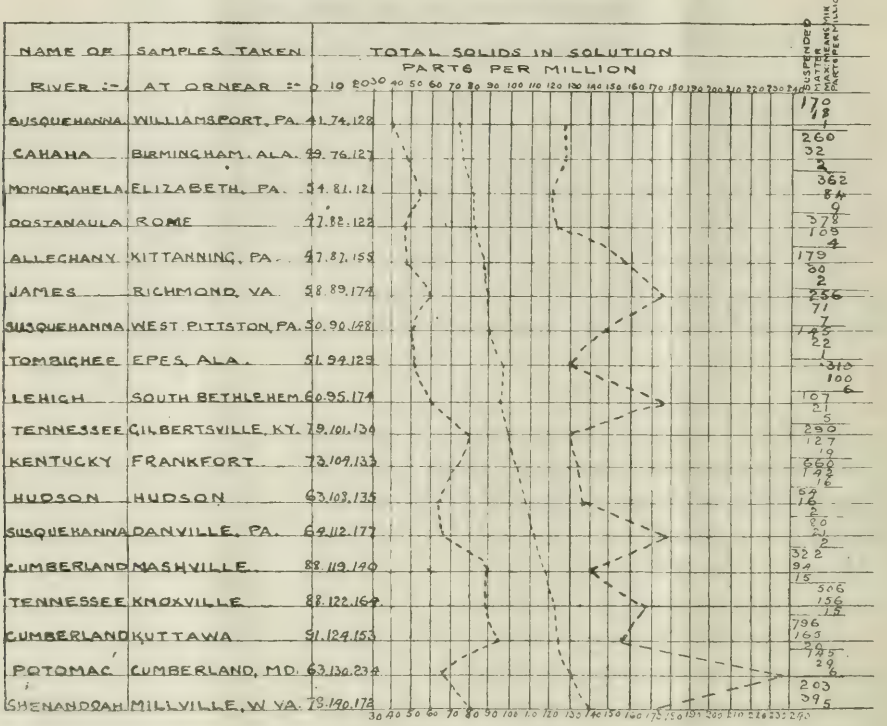

NAME OF RIVER :-
SAMPLES TAKEN AT OR NEAR :-
TOTAL SOLIDS IN SOLUTION PARTS PER MILLION
SUSPENDED MATTER PARTS PER MILLION
SUSQUEHANNA WILLIAMSPORT, PA. 41.74.128
CAHABA BIRMINGHAM, ALA. 49.76.127
MONONGAHELA ELIZABETH, PA. 31.81.121
COOSTANAULA ROME 47.88.122
ALLEGHANY KITTANNING, PA. 47.87.158
JAMES RICHMOND, VA. 58.89.174
SUSQUEHANNA WEST PITTSTON, PA. 50.90.148
TOMBIGBEE EPES, ALA. 51.94.125
LEHIGH SOUTH BETHLEHEM 60.95.174
TENNESSEE GILBERTSVILLE, KY. 79.101.134
KENTUCKY FRANKFORT 73.109.133
HUDSON HUDSON 63.103.135
SUSQUEHANNA DANVILLE, PA. 69.112.177
CUMBERLAND NASHVILLE 88.119.140
TENNESSEE KNOXVILLE 88.122.164
CUMBERLAND KUTTAWA 91.124.153
POTOMAC CUMBERLAND, MD. 63.136.234
SHENANDOAH MILLVILLE, W VA. 79.190.172

FIG. 2.

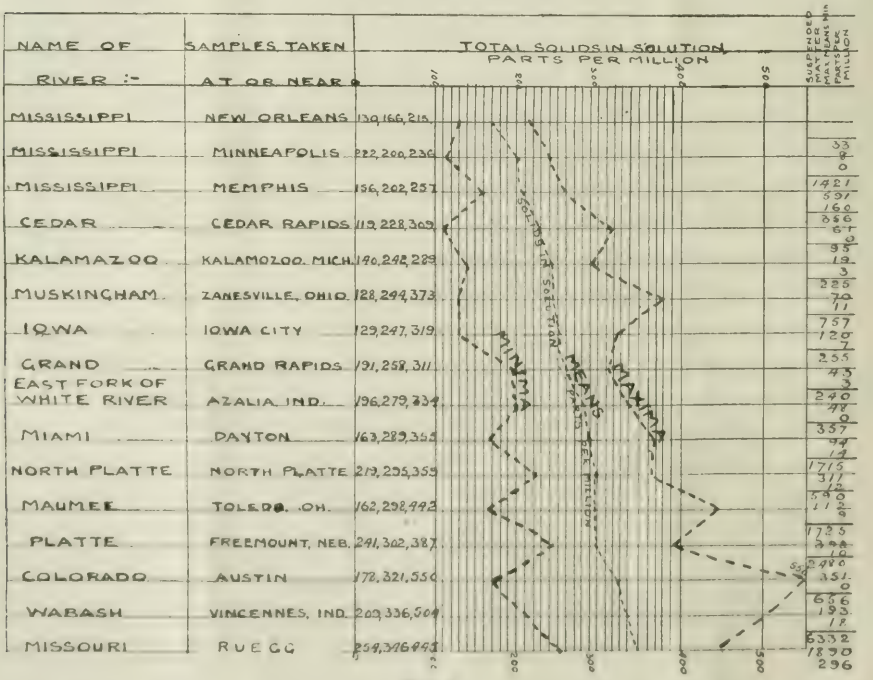



FIG. 3.

POINTS FROM THE DIAGRAMS

If we compare Fig. 1 and Fig. 2, the similarity between them, coupled with the fact that Fig. 2 is

parison—one-tenth the scale of Fig. 1—the difference in the extent of the variation is all the more marked. The small group shown in Fig. 4 is not so easily

comparable. In Fig. 1 the curve of means divides the area between the lines of minima and maxima into portions, the upper one of which is somewhat, but not much, larger than the other. The same is true of Fig. 2, and the fact conveys an interesting piece of information. With the higher values of Fig. 3 the tendency is for the means to be somewhat nearer the maxima than they are to the minima, but not much, so that a general rule is established for these waters. Fig. 4 shows that the waters with the highest means have also very high maxima.

An inspection of the values for solids in suspension does not suggest that there is any connection between these figures and the position of the mean value for solids in solution between the maximum and minimum. Nor is there, in Figs. 1 and 2, any obvious connection between the quantities of solids in suspension and those in solution. In Fig. 3, however, waters with solids in solution above 300 parts per 1,000,000 (mean) have none of them less than 100 parts per 1,000,000 (mean) of solids in suspension. This is maintained to the ends of Fig. 4, but the number of stations is, perhaps, not sufficient to provide on this particular point any sure indication of a connection of the kind suggested.

In company with some of the lowest values for solids in solution we find such values as 136, 142, and 171 for solids in suspension, and for solids in solution above 200 parts per 1,000,000 we have several cases of the mean for solids in suspension being less than 50 parts per 1,000,000. With solids in solution below 600 parts we have, at Shroveport, in Red River, 870 parts River, includes only 14 of silica, 117 of calcium and magnesium, 142 of sodium and potassium, 234 of bicarbonate radicle, 79 of sulphate radicle. The highest mean total of solids in solution, that at Waco, Brayos River, 1,136 parts, included no more than 22 parts of silica and 140 of calcium and magnesium. As might be expected from the huge total, sodium and potassium account for as much as 234 parts, and chlorine for 338 parts. Bicarbonate radicle accounted for 158 only, sulphate radicle for 279.

The Missouri River, at Florence, is notable as having a mean total solids in suspension of 2,059 parts per 1,000,000, the maximum, 5,900, being a less remarkable figure than the relatively higher mean. The Mississippi, at Minneapolis, has a mean total solids in suspension only 8 parts, the Wisconsin, at Portage, only 4·6 parts per 1,000,000. The waters of some other rivers are even more remarkable, for the maximum total suspended solids (mean of ten days) is, as will be seen from the diagrams, in several cases less than 60 parts per 1,000,000, and at Portage is only 14 parts per 1,000,000. Other points are as obvious in the diagrams as they could be made by setting them down in type.

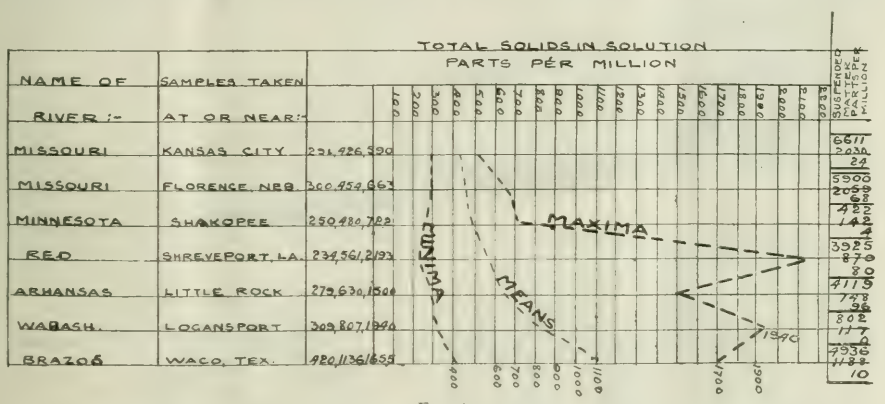



FIG. 4.

of solids in suspension, but with solids in solution above 800 parts at Logansport, Wabash River, the solids in suspension are only 117 parts per 1,000,000.

TYPICAL PROPORTIONS OF DIFFERENT CONSTITUENTS.

Among the rivers with the smallest proportion of solids in solution are the Chattahoochee, at West Point, Ga., the Cape Fear, at Wilmington, the Pearl, at Jackson, Miss., and the Savannah, at Augusta, Ga. The contents include: Silica, 10 to 23 parts calcium and magnesium, 5 to 8 parts; soda and potash, 7 to 12 parts; bicarbonate radicle, 23 to 32 parts; sulphate radicle, 3 to 6 parts; chlorine, 2 to 6 parts. If we compare these with the group having from 77 to 85 parts per 1,000,000 of mean total solids, we find that the increase is mainly in bicarbonate radicle to about 50 parts, with some increase in calcium also.

The three waters with mean solids in solution from 100 to 110 parts similarly show the increase in bicarbonate radicle to over 70 parts, some increase in calcium and magnesium to about 25 parts, and a slight increase in sulphates. From Fig. 3, taking the three with nearly 300 parts mean total solids in solution, the increase at Ayalia and at Dayton is in each case mainly in bicarbonate radicle, but calcium and magnesium now provide nearly 84 parts, while sulphate radicle has increased to 30 and 40. At North Platte there are nearly 100 parts less of bicarbonate radicle, but sulphate radicle is 76, calcium and magnesium only 46, but silica 40 against the 15 and 17 of the two former. The high total of 480 parts per 1,000,000 at Shakapee, on the Minnesota, includes 23 parts of silica, 117 of calcium and magnesium, 23 of sodium and potassium, 296 of bicarbonate radicle, 144 of sulphate radicle. The mean 807 parts at Logan-port, Wabash physical, physiological, æsthetic and economic—and what they demand. Principles deducible. General v. local lighting. Shading and misuse of shades. Direct v. indirect lighting. Contrast lamps and polar curves. Photometry and illuminometry. The effect of decoration. The lighting of architectural features. Practical application to churches, schools, hospitals, libraries, and factories.

**Business Announcements.**—The business of Messrs. Bradshaw & Co., we are informed, has been registered as a private limited company, under the title, Bradshaw's Asphalte Company, Limited. The company's registered offices will remain, as now, at 52 Queen Victoria-street, London, E.C., with branch offices at 61 Lothian-road, Edinburgh, 50 Wellington-street, Glasgow, and 61 Rusholme-road, Manchester. Mr. Charles William Bradshaw, hitherto sole proprietor of Bradshaw & Co., will continue in the business as managing director, together with Mr. Paul Kathmann. In a circular which they have issued the firm state that their asphalte comes from the freehold Limmer mines belonging to the Deutsche Asphalte Actien Gesellschaft. All the asphalte imported to Great Britain from this celebrated mine passes through their hands, and they are the sole concessionnaires for the United Kingdom. The firm carry out all kinds of asphalte work—compressed and mastic—for municipal authorities, architects, and for the building trade.—The engineering business of Messrs. Barford & Perkins, of Queen-street Iron Works, Peterborough, has, for family reasons, been formed into a private limited company. The present partners, Messrs. J. G. Barford and J. E. S. Perkins, will continue actively to control the business, and Mr. Robert True will join the board as a director.

**Illumination as a Study for Architects.**—A paper on this subject will be read at a meeting of the Society of Architects on the 11th inst. by Mr. John Darch, F.S.I. The following is a synopsis of the paper, which will be illustrated by means of lantern slides and diagrams: The position of the architect in illumination. The need for reform. The governing factors—

# Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

## THE MONTHLY PREMIUM.

The premium for December is awarded to

Mr. W. E. BLIZARD.
Lansdowne House,
Castle-lane,
Southampton.

whose contributions have, in the opinion of the adjudicators, been the best received during the month.

## QUESTIONS.

This week answers are invited to the following questions:—

**218. Aqueduct.** What are the maximum centres at which the supports may be placed to carry a steel tube 2 ft. in diameter, full of running water, for a distance of 180 ft. at a height of 60 ft. above ground? (E. M. D., *Wood Green.*)

**219. Tram Rails.**—Describe an accurate, practical method of measuring the wear of a steel-girder tram rail. (T. R.)

**221. A Problem in Mechanics.** A trap door is 4 ft. square and weighs 75 lb. It is hinged by one of its edges, and is supported with its plane horizontal by a chain which passes from the middle point of the outer edge of the door to a point vertically over the middle point of the edge in which the hinges are fixed, and 7 ft. above it. Determine graphically the pull in the chain and the thrust of the hinges. (A.M.I.C.E.)

**222. Building Materials.**—What is the chemical composition of the following: marble and its substitutes, [illegible]. Describe, with sketches, a good method for [illegible]. (A. W. S., *Bournemouth.*)

**223. Reinforced Concrete Bridge.** [illegible]

## REPLIES TO QUESTIONS.

**212. Outfall Sewer Extension.** [illegible] stone. Explain the method you would adopt for the construction of such an extension and give a detail estimate of the cost. The difference in level between high and low tide may be assumed at 18 ft. ("Theodolite.")

The method to be adopted in the construction of the sewer will largely depend upon the slope of the foreshore and the range and force of the tides.

If the foreshore has only a gentle slope, say some 3 ft. or 4 ft. fall in the 300 yds., as shown in dotted lines in Fig. 1, and the range of the tides is great, it may be possible to lay the greater part of the sewer during the equinoctial or other high tides, with the shore exposed between the outfall and the low-water mark of ordinary spring tides. If flanged pipes are used it may only be necessary to cut holes for the flanges, and float up the inequalities of the foreshore with concrete, and cover the pipes with, say, 12 in. of concrete, as shown in Fig. 2, roughing up the surface of the limestone, if required, so as to form a key for the concrete.

If the current is strong, as it will be if in an estuary with a big range of tides, it may be necessary to secure the pipes with W.I. straps and rag bolts let into the limestone, as shown in Fig. 3; and the concrete can then be dispensed with. Two methods of using the rag bolts are shown.

Should the shore slope quickly, say some 12 ft., between L.W.M.O.S.T. and the proposed outfall, as shown in firm lines in Fig. 1, it will be necessary to employ divers to fix the pipes. The pipes should be anchored down if the current is strong by the method shown in Fig. 3, or if the surface of the foreshore is unequal the pipe may be secured by fixing on a bed of concrete laid in bags, as shown in Fig. 4.

The method of fixing the rag bolts may be left to the contractor, who will probably use a jumper for making the holes for the bolts, and the pipes will be lowered and placed in position from a raft, on which the air pump for the diver will also be operated.

Flanged C.I. pipes are shown to be used as being preferable [illegible] socketed pipes.

Steel pipes may be used [illegible]

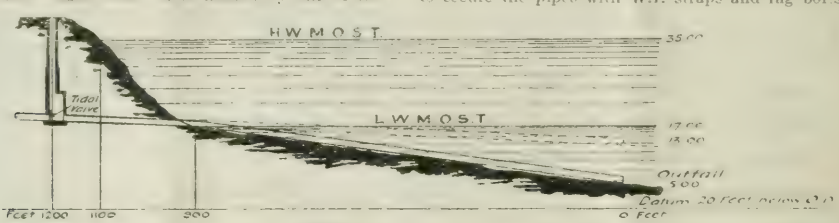
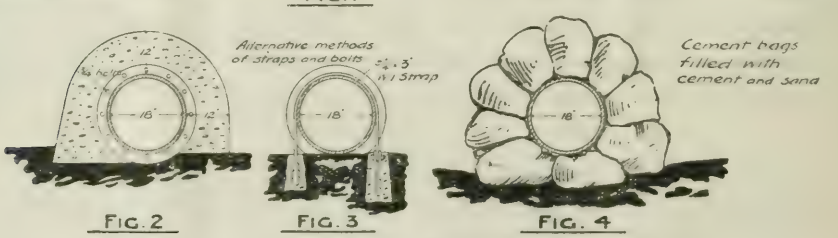



FIG. 1




OUTFALL SEWER EXTENSION.

With regard to the cost, it is impossible to give anything like an accurate estimate without knowing the coast or the range of the tides. The element of risk is so great that practical contractors will probably vary in their estimates from 50 to 100 per cent.

The cost may run from £4 to £8 per yard, according to the distance for carriage and the difficulties of the position. (W. H. P.)

**220. Purification by Cellular Upward Filters.**—What degree of purification can be obtained by means of a cellular upward filter as described in the answer by G. W. H. to Question 214? (J. G. N., *Doncaster.*)

These cellular upward filters are of recent introduction, and as sewerage is of such a varying nature, depending on the district and the trade effluents it is subject to. It is not until several such filters have been installed in various districts for a considerable period that any definite figures can be obtained as regards the degree of purification obtainable. If the percentage purification per hour over a square yard of effective filtering surface is obtained for better known types of filters or slate beds, then it is reasonable to suppose that this standard can be applied in estimating the amount of purification that would take place in a cellular upward filter when working under similar conditions of quantity passed per square yard of surface per hour.

There are 60 sq. yds. of filtering area per cube yard of 2-in. diameter pipes, as previously described, and the velocity of the dry-weather flow should not exceed 0·03 ft. per minute, or take at least three hours to rise up through the filter, which is usually 6 ft. deep.

The main object of the cellular upward filter is for the separation and retention of suspended and colloidal matter.

The slow upward flow through the pipes, with a total absence of eddy currents and free passage for gas to escape, gives the best possible conditions for the settlement of suspended solids; also the large extent of surface with which the sewage is held in contact favours the deposition of the colloidal matter. If this filter is used as a preliminary treatment of sewage before it is passed on to a clinker filter it will to a great extent prevent the latter from becoming clogged and the spray holes of the distributing pipes from being stopped up. (G. W. H.)

## CORRESPONDENCE.

*"All truth is precious, if not all divine."*—COWPER.

### DAILY WEATHER FORECASTS.

*To the Editor of* THE SURVEYOR.

SIR,—I thank you for your courtesy in giving a place to my letter on the above subject in your issue of the 22nd ultimo, and that kindness prompts me to transgress again on your space. During Christmas week I kept my weather eye on the forecasts of what was to be and how it actually turned out in this district with the following result:—

| | Forecast. | Actual weather. |
|---|---|---|
| Dec. 20. | Alternately fine and cloudy, occasional rain, humid southerly wind. | Light rain early morn, warmer later, heavy rain, high wind, very cold wind shifting to N.W. |
| ,, 21. | Wind backing to south and increasing, fine to cloudy, occasional rain, cool at first, milder later. | Rain all day up to late afternoon, then misty and raw cold. |
| .. 22. | Continuing squally, unsettled generally, misty to dull, heavy rain in most districts, rather high temperature. | Dull morning, heavy rain afterwards, little wind, cold. |
| .. 24. | Easterly winds backing northerly, strong to a gale at times, squally, rainy, some snow or sleet, fairer later, much colder. | Brilliant sunny day, no wind, normal temperature. |
| ,, 24. | South wind, unsettled, rainy, fair intervals. | No rain, a typical summer day. |
| .. 25. | Squally, rather colder, frequent showers, with hail in places, some bright intervals. | Beautiful sunny day, mild. |
| .. 26 | Generally unsettled and mild, rain at times, strong, squally, south-westerly winds. | Dull early morning soaking rain after, no wind. |
| .. 27. | Squally and changeable, temporarily fine and cooler, mild, with rain again by afternoon or evening. | Grand cloudless day. |

I would also like to refer to an interesting article in a London daily paper of December 27th on "Facts and Forecasts," referring to that of the previous day: "But yesterday rain, which set at nought the Meteorological Office prediction that it would develop nothing more than a few showers, was peculiarly malignant, An enthralling, but learned, correspondence which is being conducted in the chief scientific papers reveals the fact that the clerk of the weather was over and over again led astray during the summer by conditions which ought to have produced rain, but did not."

Viewing on a brilliant day the Coronation Procession of King Edward VII. in company with an eminent county surveyor, he turned to me with a pensive face and remarked, "What a day for tarring," and looking at the weather results for December 23, 24, 25 and 27, I repeat, "What days for tarring these would have been," but, acting on the forecasts, the instructions to the men would have been to get out the scrapers or else find a job under cover.—Yours, &c.,

FRANK HARRIS,
Engineer and Surveyor.

Broadway, Southborough,
Tunbridge Wells.
January 1, 1912.

[We do not suppose that anyone will have the hardihood to affirm that the Weather Office forecasts for the period from December 20th to December 27th were successful. The conditions were very difficult, as failure to hit off the time when one of the small disturbances would pass resulted in the forecast for a disturbance being allotted to what happened to be a bright interval, and so on. Over and over again the pelting showers from west and north-west marked the end of a wet spell, and a fine interval would follow. It was a period in which weather lore was, we freely admit, more useful than forecasts. As regards conditions "which ought to have produced rain, but did not" during last summer, Mr. Harris has dropped on examples of failure to appreciate the influence of "persistence of type." This used to be a weakness of the forecasting department, but of recent years the principle has been better understood.—ED. THE SURVEYOR.]

### THE EXPANSION OF BRICK PAVEMENTS.

*To the Editor of* THE SURVEYOR.

SIR,—As a keen and appreciative student of American practice in street paving, I must admit to being very much surprised to see your notes upon the paper read last September by Mr. W. P. Blair before the National Paving Brick Manufacturers' Association (U.S.A.).

Why should the municipal engineer prefer to deal with either contraction cracks or expansion upheavals when it has been conclusively proved that both are avoidable even in a country like America, which experiences extreme changes of temperature?

My observations in the States have satisfied me that the monolithic theory is absolutely unsound. Bricks naturally expand in hot weather and contract in cold, while the rigid cement bed upon which they are laid resists this process, and expansion joints when resorted to are inefficient.

A brick pavement ought not to be a monolith at all. It should have power to expand and contract, and the only way to obtain such a pavement is by the use of a suitably fluxed bitumen with a high melting point as a filler for all the joints, thus making every joint an expansion joint.

Under these circumstances the pavement is quiet and the protection against water is perfect.—Yours, &c.,

CECIL NATHAN, A.I.E.E.

1 London Wall Buildings,
London, E.C.
January 1, 1912.

[We have carefully read through our article, but cannot find anything wrong with it, nor do we see in Mr. Nathan's letter any specific criticism of what we wrote. There may be better jointing materials than cement mortar, but if that material satisfies American municipal engineers, and if the cost of providing asphalte joints would be greater than that of taking measures to prevent cracks or upheavals from occurring with cement-jointed brick pavements, American engineers may prefer to go on using cement. We were, in fact, not treating of brickwork joints, but of temperature effects, and especially of the important principle of the selection of temperatures for building or closing up masses of masonry.—ED. THE SURVEYOR.]

# Law Notes.

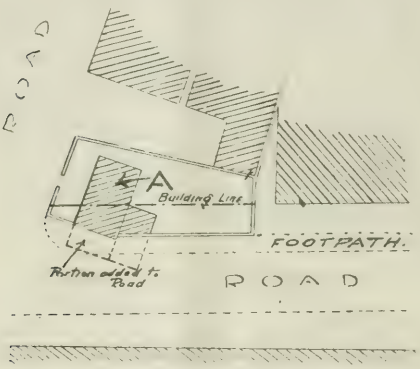
EDITED BY J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

*The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, one side only) should be addressed to "The Law Editor," at the office of* THE SURVEYOR, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction**—*i.e.*, **without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

## QUERIES AND REPLIES.

*In order to avoid confusion querists are requested to use distinctive words as* **noms de plume.** *The letter* **X,** *combinations such as* **X.Y.Z.,** *and words such as* "engineer" *and* "surveyor," *should never be used.*

BUILDING LINE.—"Iconoclast" writes: A cottage marked A on the corner of two roads was partly demolished in order to widen a long stretch of road to a uniform width on the lines laid out by the building estate. The estate has since fixed and established a building line which has been observed for the whole length of the road. The corner property having been sold, the present owner claims a right to build on the foundation of the old building, which building projects, as will be seen on the sketch, to the limit of the land. Whether there is a covenant with the present owner to set aside the frontage so as to conform with the estate building line is not




known. Opinion is desired on the following points: (*a*) Does the taking down of the old building and the erection of a new house on the old foundations constitute a "new building"? (*b*) Cannot the council insist upon the new building being built in line with the other property in the street shown by dotted line, as provided by the Public Health (Building in Streets) Act, 1888? (See case (page 490) of the Justice of the Peace, October 14, 1911.) (*c*) If sec. 155 of the Public Health Act, 1875, has to be relied upon, would the council have to pay compensation for the whole area in front of such building—*i.e.*, the space between the front wall and the footpath?

(*a*) Under sec. 19(2) of the Public Health Act, 1888, the re-erecting of any building pulled down to the ground floor is to be considered the erection of a new building for the purposes of the Act. (*b*) Yes, assuming that this is an urban district. (*c*) Under this section compensation would be payable for any loss or damage the owner might sustain, the amount thereof to be settled by arbitration in case of dispute. But as already stated the urban council can require the building to be set back, without making compensation, under the Act of 1888.

CONTRACT WITH COUNCIL: COUNCILLOR A PARTY AS SURETY: PAYMENT OF CONTRACTOR, NOTWITHSTANDING SURVEYOR'S REFUSAL TO CERTIFY. "An Interested Ratepayer" writes: I shall be glad of your opinion through the valuable columns of THE SURVEYOR on the enclosed matter. The surety to the contract is a member of the town council, and is on the committee that deals with this particular business of the council, and when the surveyor reports the work is not to be carried out satisfactorily, and refuses to certify that the work has been satisfactorily done, the council by a casual majority, chose to pay the contractor the full amount of ten monthly instalments without even retaining the 20 per cent. provided for in the contract, and the result is a question raised for the payment. I should like to know if the member in question and the council generally were within their legal rights in so doing.

[COPY CONTRACT.]

THIS INDENTURE made the Twenty-sixth day of September One thousand nine hundred and eleven Between The Mayor, Aldermen and Burgesses of the Borough of X (hereinafter called the Council) of the first part, A. B. (hereinafter called the Contractor) of the second part, and C. D. the third part.

Witnesseth, that the Contractor hereby covenants and agrees with the Council that he will for the space of one year from the thirtieth day of September One thousand nine hundred and eleven to the twenty-ninth day of September One thousand nine hundred and twelve (both days inclusive) execute and do all the work matters and things set out in the paper hereto annexed headed "Collection and Removal of House Refuse Contract No. 1," for the sum of ONE HUNDRED POUNDS in accordance with the specifications and conditions set out in such paper. And the Council hereby covenant and agree with the Contractor to pay him in the manner provided in the said paper in respect of such work matters and things therein provided for according to the price in such paper set out. And it is hereby agreed between the parties hereto that the said paper shall be deemed to be incorporated with and form part and parcel of these presents. And the said C. D. hereby covenants and agrees with the Council that the Contractor shall duly and properly execute the work matters and things set out in the paper hereto annexed headed "Collection and Removal of House Refuse Contract No. 1," and that he will indemnify the Council against any loss costs or expenses which the Council may in any way incur through any non-performance or non-observance by the Contractor of this Contract. And the Contractor and the Surety hereby further agree that it shall be lawful for the council if the Contractor shall not perform the work matter and things hereby contracted for to the satisfaction of the Surveyor at any time to call upon the Surety by notice in writing to perform the said work matters and things, or in such event as above mentioned the Council may engage other persons to perform such work matters and things by their own men and all expenses thereby incurred by the Council shall be repaid to them by the Contractor and the Surety or may be retained out of any monies payable to the Contractor or the Surety under this Contract.

In Witness whereof the Common Seal of the Council has been hereto affixed and the said parties have hereunto set their hands and seals the day and year first above written.

The Common Seal of the said Council was this day hereto affixed in the presence of
(Signed) E. F.,
Town Clerk.

SEAL.

Signed, Sealed and delivered by the said A. B. and C. D. in the presence of
(Signed) A. B.
" C. D.

(Signed) G. H.,
Clerk to Mr. E. F.,
Town Clerk,
X.

[COPY PAPER ANNEXED.]

BOROUGH OF X.

Collection and Removal of House Refuse.

CONTRACT No. 1.

SPECIFICATIONS AND CONDITIONS.

The Contractor to collect and remove daily (except Sundays, Christmas Day, Good Friday, and Bank Holidays) all house refuse placed in utensils outside the dwelling-houses in all the streets within the Borough, except Y Bridge.

The Contractor to deposit every week five loads of screened refuse at the Slaughter House, and the remainder of the refuse at Scarrowscaut, or elsewhere, to the direction of the Borough Surveyor. The whole of the refuse to be collected between the hours of 7

The Surveyor
And Municipal and County Engineer.

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and 11 in the forenoon, according to Schedule of times with the Borough Surveyor, to collect and remove with suitably covered carts (covers to be in four parts, of wood or galvanised iron) to be approved by the Surveyor, to affix a bell to each cart used, and to remove all refuse accidentally spilt from the utensils, and to provide each cart with a brush and shovel for that purpose.

The Carts, Horses, and Men to be subject to the approval of the Sanitary Committee. Payment will be made after the 4th Tuesday in each month up to the second Tuesday in the month on a written certificate of the Borough Surveyor that the work for which payment is sought has been satisfactorily done. The Council have power to terminate this Contract on seven days' written notice if the Contractor shall in any respect fail to observe and carry out these conditions. Security to the amount of £20 (to be considered as liquidated damages for the due performance of the contract) will be required, and the name, description and place of abode of the surety in his own handwriting to be furnished with each tender. The lowest or any tender not necessarily accepted. The Council to be at liberty to retain a sum of 20 per cent of the sum certified until the end of the year.

TENDER.

I hereby undertake with the X Town Council to do the work mentioned in the above specifications, subject to the above conditions, for one year from the 29th September, 1911, for the sum of £100.

Dated this 1st September, 1911.

I hereby guarantee to the Town Council the due and proper execution by the Contractor of all the work above specified subject to the above conditions.

(Signed) A. B.

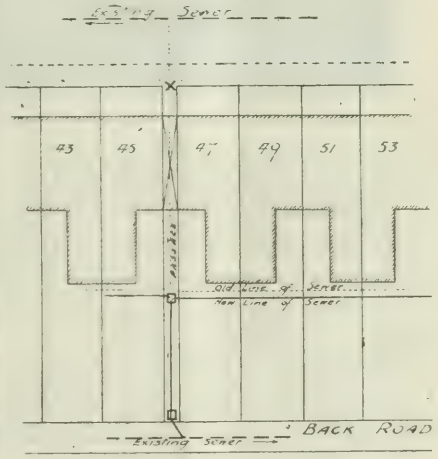
(Signed) C. D., CONTRACTOR.
SURETY.

The surety councillor is disqualified under sec. 12 of the Municipal Corporations Act, 1882, and under sec. 41 he is liable every time he acts as a councillor to a fine not exceeding £50. I think the council were within their legal rights in paying the contractor, notwithstanding the surveyor's refusal to certify. The contractor might not have been able to compel payment in the absence of the certificate, but this being a condition for the benefit of the council it was open to them to waive it.

PRIVY ACCOMMODATION : DRAIN VENTILATION. — "Desideratum" writes: (1) Under sec. 36 of the Public Health Act, 1875, can a privy or pail-closet which is in a defective state through the floor being uneven and broken, the roof bad, and the whole in such a state as to be a nuisance, be reported by the inspector of nuisances to the local authority as insufficient, and a water-closet ordered to be substituted, although only one house uses the existing accommodation? (2) In this district it has been the custom when laying new drainage systems to carry a 4-in. pipe from the inspection pit nearest the sewer (where the interceptor is fixed) to the surface of the ground, and place an iron grid in the socket of the last stoneware pipe to act as a fresh-air inlet to the drains. It has been proved that in a very short time these soon get full of dirt which is thrown or pushed in by pedestrians, and I shall be obliged if you can inform me, when serving a notice to abate a nuisance under sec. 94 of the Public Health Act, 1875, whether the inspector can stipulate and subsequently enforce the fixing of an iron pipe against the nearest wall to a height of about 6 ft., and a mica flap to be fitted on the top, to act as an efficient air inlet to the new system of drains, or can the owner fix anything he likes, as long as it is an air inlet, to the drains?

(1) It is for the local authority to decide, upon the report of their surveyor or inspector of nuisances, whether the existing accommodation is sufficient, subject only to the right of appeal (under sec. 268 of the Act) to the Local Government Board. If the local authority decide that the accommodation is insufficient, and take proceedings to recover the cost of the work, the magistrates are bound to make an order for payment, and cannot go into the question of sufficiency (*Boy* v. *Sherborne Local Board*, 46 J.P., 675). (2) If the condition of the pipes constitutes a nuisance, and a notice to execute works is served and not complied with, the magistrates would have power under sec. 96 to make an order directing the execution of "any works necessary to prevent the recurrence of the nuisance." The authority would have to satisfy the magistrates that the particular works they required were necessary for this purpose.

SEWER CONSTRUCTION.—"Subscriber" writes: The accompanying plan shows a number of houses drained into a sewer at the rear of the premises. As the sewer was not perfect, the council relaid it, but instead of continuing along the existing line in the passage to the sewer in the roadway, they diverted




in an opposite direction to the sewer in a back road. The property has been built for over seventeen years, and the passage is open at one end only. (*a*) Can the owner of Nos. 43 and 45 (who claims the freehold of the passage) place a gate at the point marked X? (*b*) Has he any right of action against the council for altering the line of the sewer?

(*a*) Yes, unless the passage is a public highway, which it may possibly be, notwithstanding that it is closed at one end (see *Bateman* v. *Black*, 18 Q.B., 870.) (*b*) No, in the absence of negligence. But any person who has sustained damage by the laying of the new sewer would have a claim to compensation under sec. 308 of the Public Health Act, 1875.

HIGHWAY : GRASS MARGIN : DEDICATION. — "Marcher" writes: I should be obliged if you would give me your opinion on the following case: A public road, repairable by the district council, passes through a tillage field, from which it is unfenced on the one side; for most of the way the metalled road is separated from the field by a narrow strip of grass and the ordinary road ditch. The owner erects a wire fence and plants quick, at distances varying from 12 ft. 6 in. to a bare 15 ft. from the centre of metalled portion. When called upon to

remove the fence, as erected within 15 ft. of the centre of the road (sec. 51 of the Highway Act, 1864), he refuses, and says he is within his rights, as the portion enclosed was never dedicated, the only evidence he has to support his contention being that it has been ploughed, planted, &c. The strip enclosed is higher than the road by nearly 2 ft. in the highest place, but is useable, although awkward, and was constantly used by cattle, which tramped down the grain much further out than where the fence is put. I contend this fence is illegal, because it is within the 15 ft., and that the use by cattle is sufficient to prove dedication; also, that the planting, &c., does not disprove dedication.

In order to constitute an encroachment within this section the fence must be erected on the highway in the sense of the space of ground actually dedicated to the public (Pratt and Mackenzie's "Law of Highways," 15th Edition, p. 438). If the owner of the adjoining land and his predecessors in title have for many years ploughed and planted and exercised acts of ownership over the strip, to such an extent as its nature permits, I think this would in all probability be held to rebut any presumption of dedication—especially having regard to the fact that the strip is considerably higher than the road. See *Countess of Belmore* v. *Kent County Council* (1901, 1 Ch., 873.)

House Drainage.—Mr. G. B. Hartfree, p.a.s.i., surveyor to the Alton Urban District Council, writes: In respect to the answer to the query upon house drainage in your issue of December 1st (p. 652), I beg to point out, firstly, the fact that the drain is rubble is an index to its condition, and a smoke test properly applied would be a proof, as there is no doubt whatever that smoke would escape, showing that sewer gases also would escape. This appears to be a simple case, as a drain, unless true in invert, joints, gradients, &c., upon examination would be found "to be in bad condition, or to require alteration or amendments" (sec. 41 of the Public Health Act, 1875), and the powers conferred by the Public Health Acts, including secs. 34 and 45 of the Act of 1907, are all-sufficient for a council to enforce the necessary remedies. If your correspondent will write me direct I shall be pleased to advise him further.

I am obliged to Mr. Hartfree for his letter. His technical acquaintance with the practical side of the subject will doubtless be an assistance to "J. L. P." It is to be remembered, however, that secs. 34 and 45 of the Act of 1907 are only in force where applied by the Local Government Board.

Cart Traffic on Footpath.—"J. W." writes: Will you kindly inform me if a parish council can prevent horses in charge of their respective hauliers travelling to their daily work over any public footpath belonging to, and repairable by, the council? The reason I want to know is that the parish council are of the opinion that the path referred to, which leads from one district road to another (and being a short cut), is damaged by the horses travelling that way. They could, however, go around the road but it would entail an extra distance of ½ to ¾ mile.

I cannot find that a parish council has any such power. If the public right of way is one of foot passage only, the owner of the soil of the footpath would have a right of action for trespass against persons using it in any way in excess of the public right. The parish council do not become owners of the soil by undertaking the repair.

**We have to draw the attention of querists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.**

## NEWQUAY PAVILION SCHEME.

### DETAILS OF CONSTRUCTION.

Plans and estimates for a new pavilion which they contemplate erecting were approved recently by the Newquay Urban District Council, it being at the same time decided to apply to the Local Government Board for sanction to the borrowing of a sum of £4,250, the estimated cost of building and furnishing. The site is an ideal one, overlooking the bay and the town beach, and the freehold is the property of the town.

In its issue of the 9th ult. the *Illustrated Weekly Western News* reproduced the accompanying drawing of the proposed new pavilion. The building will comprise a main hall, 72 ft. by 61 ft., with stage or platform, 30 ft. by 21 ft., connected with retiring rooms and offices, also a vestibule facing the sea, 62 ft. by 9 ft., a part of which can be opened into the hall if required. The main building will communicate with a lounge and tea-room, 24 ft. by 20 ft., overlooking the sea, with suitable cloak-rooms, having a kitchen and heating chamber below. The walls will be of brick and rough cast, with ornamental dressings. The roof will be segmental in shape, covered with copper, and will be supported by steel trusses carried on stanchions. There will be balconies extending over the lounge, front vestibule, and side aisles.

Newquay's Proposed Town Pavilion.

The main hall will comfortably seat 750 persons, and is so arranged as to be adaptable for various purposes. The whole building will be heated on the low-pressure hot-water system, and lighted by electricity and gas.

**Missing.** We have received the white cardboard cover of a postal packet addressed to the Editor, and as the contents have not yet reached us we shall be glad if the sender will communicate with us. The postmark is quite undecipherable.

**New Town Hall for Kirton.** A start has been made with the erection of a new town hall at Kirton, near Boston, which is to be presented to the parish by Mr. William Dennis, J.P., as a Coronation memorial. The contract for the work is £1,100.

**Military Traffic on Roads.**—Major-General Robb, writing from the headquarter offices of the Aldershot Command to the Farnham Rural District Council, states that the War Office has decided to discontinue the existing system of payments to the council in respect of extraordinary military traffic over the roads of the district, due to flying columns proceeding to and from Aldershot, Bordon, and Ewshot camps, in the immediate vicinity of Farnham, for training purposes. For the council to establish a claim in regard to such traffic in future it would have to be shown that the articles carried and the use of the roads were so exceptional as substantially to alter the burden imposed by the ordinary traffic of the road, and to give rise to special expense directly attributable to these exceptional circumstances. If the ordinary traffic on the roads were increased by some exceptional cause, such as building operations on a large scale or the establishment of a considerable camp, the damage arising therefrom could be properly attributed to extraordinary traffic, but any permanent increase in the traffic on the completion of such operations could not be properly regarded as extraordinary.

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

**Birmingham T.C.** (January 2nd. Mr. W. O. E. Meade-King).—£6,009 for the purchase of land at Hagge Farm for the purposes of a burial ground.—Dr. Robertson (medical officer of health) said he considered the site suitable for the purposes of a cemetery, and Mr. James Tart (manager to the estates department of the council) said the nearest Birmingham cemetery was 4¼ miles away, and the nearest at Smethwick, 3¼ miles. Mr. George H. Dallow, surveyor to the Halesowen District Council, gave evidence in opposition, and stated that the site formed a portion of the land which was selected for a town planning scheme by the late surveyor.

**Cromer U.D.C.** (December 19th. Mr. H. R. Hooper).—£1,500 for the purchase of land adjoining Sandy-lane, Cromer, and partly in the parish of Runton, and the erection of a refuse destructor.—The surveyor, Mr. R. Croome, stated that the total tender for the erection of the destructor was £1,146, Messrs. Dawson & Manfield, of Manchester, being the firm. The destructor site was at the west side of Cromer. The refuse consisted chiefly of trade refuse. There were about 1,097 loads a year, and each load was about a ton. In the winter months there were some 17 tons a week, and the maximum in August, 31 tons weekly. Mr. Manfield (Messrs. Dawson & Manfield), in reply to Mr. Pank, said there was no drying at all with their destructors. He had had sixteen years' experience of them. The clerk said, in reply to the inspector, that he thought a period of twenty years for the whole loan would be acceptable.

**Knaresborough U.D.C.** (December 15th. Mr. F. H. Tulloch). £750 for private street improvements. The necessary details were given, and there was no opposition.

**Leeds T.C.** (January 3rd. Mr. H. R. Hooper). £60,000 in order to carry out extensions to existing electric mains, and to improve the plant at the distributing stations. It, as is probable, the Local Government Board's consent is obtained, the money will be spent during the next three years at the rate of £20,000 a year.

**Manchester T.C.** (December 22nd. Mr. Edward Leonard).—£16,105 for the purposes of a scheme, under the Housing of the Working Classes Act, for the erection of dwellings at Barrack-street, Hulme.—The town clerk said the corporation desired to erect ninety houses or cottage flats, and the Sanitary Committee asked that the repayment of the loan should be spread over a period of sixty years.

**Newtownards (Co. Down) U.D.C.** (December 21st. Mr. P. C. Cowan).—£1,400 for the purpose of constructing a roof over Ballycullen reservoir, in connection with the district waterworks.—Mr. John Ernest Croasdaile, engineer to the council in respect of the water and sewerage schemes, deposed that the original plan was for a reservoir with sloping sides which would have cost £1,000 less than what had been constructed. But they had pointed out to the council the possibility of the water deteriorating under the action of sunlight, and that it would be well, in the first instance, to make a reservoir suitable for covering. It was, in his opinion, necessary that the reservoir should be covered, and he believed that reinforced concrete was the best covering. It would cost slightly more than galvanised iron. A good galvanised iron roof would cost £1,000. The £1,400 applied for was made up as follows: Amount of tender, £1,163, covering roof with 12 in. of soil, £45, engineers' fees and supervision, £105, contingencies, £87.

**Sidmouth U.D.C.** (December 13th. Mr. Courtenay Clifton).—£2,000 for improvements in Station-road and Knowle Grange. The question of a footpath in Station-road had been before the council for many years. At present there is no footpath whatever, while the vehicular traffic plying to and from the railway station is very heavy. Mr. P. H. Mischelmere (clerk) explained the alterations proposed to be carried out.

**Wandsworth B.C.** (January 2nd. Mr. A. A. G. Malet). £10,400 for the purchase of land as an addition to Putney Vale Cemetery.—The town clerk, Mr. H. G. Hills, said the land it was proposed to acquire was the only piece available for the purpose, and the Wimbledon Common Extension Committee had an option on it which they were willing to surrender. The price, £50 per acre, was considered very moderate.

### APPLICATIONS FOR LOANS.

**Ashton-in-Makerfield U.D.C.**—£627 for the purposes of a depot.

**Bristol T.C.**—£7,037 for paving certain streets.

**Camborne U.D.C.** £620 for a new sewer.

**Church U.D.C.**—£2,100 for new council offices.

**Croydon T.C.**—£1,050 for the erection of a handicraft centre.

**Helmsley R.D.C.**—£1,700 for water supply purposes.

**Huddersfield T.C.**—£10,000 for workmen's dwellings.

**Loughborough T.C.** £905 for sewage disposal purposes, and £700 for the purposes of the destructors.

**Nottingham C.C.**—£980 for the enlargement of the Huthwaite Council School.

**South Westmorland R.D.C.** £300 for water supply purposes.

### LOANS SANCTIONED.

**Ashton-in-Makerfield U.D.C.** £786 for the public baths.

**Bridlington T.C.** £5,000 for street improvements in the Old Town.

**Colne T.C.**—£428 for sewering purposes, and £2,115 for the provision of sludge-pressing plant.

**Daventry R.D.C.** £8,985 for a sewage disposal scheme.

**Eastbourne T.C.**—£29,559 for works of surface drainage.

**Finchley U.D.C.** £3,020 for paving works.

**Fulwood U.D.C.**—£10,000 for laying a new main.

**Great Harwood U.D.C.**—£5,000 for working-class dwellings.

**Hemel Hempstead R.D.C.**—£1,150 for working-class dwellings.

**Hoylake U.D.C.** £2,650 for the provision of bathing places.

**Melton Mowbray U.D.C.**—£150 for the construction of two additional septic tanks at the new sewage works.

**Middlesbrough T.C.**—£1,713 for works of sewerage.

**York T.C.** £1,155 for the purposes of a new street.

### FORTHCOMING INQUIRIES.

| JANUARY. | £ |
|---|---|
| 8. **Hammersmith.** For the provision of public conveniences (Mr. A. A. G. Malet) ... ... ... ... ... ... | 4,356 |
| 9.—**Barry.** For the provision of underground conveniences (Mr. P. M. Crosthwaite) | 1,350 |
| 9.—**Llandrindod Wells.** For street improvement purposes (Mr. W. O. E. Meade-King) ... ... ... ... ... ... | 1,200 |
| 9.—**Tredegar.** For works of sewerage (Mr. R. G. Hetherington) ... ... ... | 31,000 |
| 9.—**Whitley.** For cemetery purposes (Major J. Stewart) ... ... ... ... | 5,000 |
| 10. **Aberayron.** For water supply purposes (Mr. W. O. E. Meade-King) ... ... | 5,000 |
| 10.—**Brandon.** For street works (Major J. Stewart) ... ... | 2,500 |
| 10.—**Devonport.** For street works (Mr. F. H. Tulloch) ... ... | 3,749 |
| 10. **Malvern.** For works of sewerage (Mr. R. G. Hetherington) | 6,700 |
| 10. **Mossley.** For the purposes of the gas undertaking (Mr. M. K. North) ... ... | 28,260 |
| 10. **Wetherby.** For water supply purposes (Mr. A. W. Brightmore) ... ... | 2,500 |
| 11. **Darfield.** For street widening works (Major J. Stewart) | 1,136 |
| 11. **Droitwich.** For works of sewerage (Mr. R. G. Hetherington) | 1,702 |
| 11.—**Hazel Grove.** For private street works (Mr. M. K. North) | 1,800 |
| 11.—**Llandilo Fawr.** For water supply purposes (Mr. W. O. E. Meade-King) | 750 |
| 11. **Plymouth.** For street works and the purchase of property (Mr. F. H. Tulloch) | 2,091 |
| 11. **Swinton.** For sewage disposal purposes (Mr. A. W. Brightmore) | 6,330 |
| 12.—**Chesterfield.** For sewage disposal purposes (Mr. A. W. Brightmore) | 4,574 |
| 12. **Leicester.** For the provision of a public hall (Mr. M. K. North) ... ... ... | 17,350 |
| 12.—**Pontardawe.** For water supply purposes (Mr. W. O. E. Meade-King) | 7,805 |
| 12.—**Teignmouth.** For street works, &c. (Mr. F. H. Tulloch) ... ... | 1,340 |

# Municipal Work in Progress and Projected.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Bournemouth £60,000, Lanark £15,000, Lancaster £8,515, Spalding £3,000; housing and town planning—Cloneygowan £5,277; refuse collection and disposal—Lincoln; roads and materials—Bristol £7,037, East Preston £2,719, Ilkeston £2,663; sewerage and sewage disposal—Eastbourne £29,599, Kirkby-in-Ashfield, Lewes, £5,180; water, gas and electricity—Northampton £120,000, St. Thomas; miscellaneous—Baildon £10,500.—Particulars of other works projected will be found on our "Local Government Board Inquiries" page.

## ADMINISTRATION.

**Pembroke T.C.**—As the sequel to an incident connected with one of the officials, the borough surveyor, Mr. H. R. Crabb, has, by resolution of the council, been vested with the full control of the workmen.

## BUILDINGS.

**Bournemouth T.C.**—The council on Tuesday last gave instructions for the preparation of a scheme to provide a pier pavilion at a cost not exceeding £60,000. The site is that of the Belle Vue Hotel, acquired some years ago for this purpose. The previous pavilion scheme, costing £70,000, met with objection at the Local Government Board on account of licensed premises on the ground floor being open to the public without charge for admission. It is proposed in the revised scheme not to abandon the licensing arrangements in the lower part of the building, but to promote a Bill in Parliament to overcome the objection of the Local Government Board.

**Burnham (Somerset) U.D.C.**—The promenade extension and the marine pavilion pier, constructed from designs by the engineer to the council, Mr. W. H. Chowins, are described and illustrated in an article appearing in a Special New Year's number of *Ferro-Concrete*. The original designs provided for construction with cast-iron columns, steel beams, and reinforced-concrete decking, but it was afterwards decided to execute the whole in Hennebique ferro-concrete.

**Kingston-upon-Thames T.C.**—The question of providing a new fire station has been referred to the Property Committee for consideration.

**Lanark C.C.**—It has been agreed by the Middle Ward District Committee to reconstruct the bridge over the Clyde between Hamilton and Motherwell. The cost of reconstructing a bridge on suitable lines will be from £15,000 to £20,000.

**Lancaster T.C.**—The Streets Committee have submitted a recommendation for a footbridge over the Lune, at a cost of £8,515, or £665 above the estimate, but the council have asked them to give the matter further consideration.

**Merton U.D.C.**—The surveyor, Mr. G. Jerram, has reported that he is enquiring as to prices for land suitable as a site for a swimming bath.

**Spalding U.D.C.**—The Local Government Board's reply has been received to the application of the council to borrow the sum of £3,000 for the purpose of erecting public swimming baths in Ayscoughfee Gardens. The board vetoes the Ayscoughfee site, and advises the council to prepare and submit a scheme for an alternative site in Priory-road.

**Wednesbury T.C.**—It was reported at a meeting on Monday that negotiations had been proceeding with the West Bromwich Corporation and the county council with regard to the widening of Wednesbury Bridge, on the Wednesbury and West Bromwich boundary, and that it was expected an application for a grant from the Road Board for the purpose would be jointly made. Mr. Steadman said the widening, if carried out, would effect a great public improvement and remove a source of danger to traffic on the main road.

## HOUSING AND TOWN PLANNING.

**Cloneygowan R.D.C.**—A scheme has been adopted for the provision of labourers' cottages at a cost of £5,277.

**Great Harwood (Lancs) U.D.C.**—After declining twice to sanction a loan for municipal dwellings at Great Harwood, the Local Government Board have yielded to persuasion and petitions. Their sanction was read at a recent meeting of the council. The board had questioned the financial basis of the scheme, and had disapproved of the plans because they clashed with the local by-laws. The only stipulation attached to the sanction now received is a provision that the by-laws shall be immediately amended. Anticipating the sanction the council had already secured tenders for the building of houses to meet an acute demand.

**Hayes (Middlesex) U.D.C.**—The plans of the surveyor, Mr. D. C. Fidler, for a housing site have been adopted, subject to the approval of the Local Government Board, and the surveyor has been instructed to prepare plans and specifications of the houses, roads, drainage, and fences.

**Shrewsbury T.C.**—A report of a special housing committee, who recommended that facilities should be provided under the Housing and Town Planning Act for the erection of workmen's dwellings on garden city lines at a suburb known as Port Hill, has been referred to a committee of the whole council.

**Southport T.C.**—The Town Planning Committee have passed a resolution recommending the council to take the necessary steps for authority to prepare a town planning scheme for an area of land to the west of Liverpool-road.

## PARKS AND OPEN SPACES.

**Aberdeen T.C.**—The Links and Parks Committee have been requested to report as to the expediency of providing a public park for the city in the district lying between Great Western-road and Queen's-road, and the probable cost.

**Glasgow T.C.**—The question of providing an open space for the Coweaddens Ward has been referred to the Committee on Health.

**Paisley T.C.**—It has been agreed to purchase the Barshaw properties for the purpose of converting them into a public park. The lands are situated in the east end of the town, and comprise an area of 95 acres. The price to be paid for the property is £24,000.

**York T.C.**—The Estates Committee have been in negotiation for the purchase of land in Heworth for a recreation ground for Monk Ward. They will recommend the council to acquire about 8½ acres adjoining "The Glen," at a cost of £3,000, and to apply to the Local Government Board for power to borrow the money.

## REFUSE COLLECTION AND DISPOSAL.

**Lincoln T.C.**—A committee has been appointed to consider the question of providing a refuse destructor, and to submit sites and the approximate costs to the council at an early date.

## ROADS AND MATERIALS.

**Aberayron (Cardigan) U.D.C.**—The proposal to construct a new road from Llanarth to New Quay has been favourably reported upon by the engineers appointed by the county council to examine the main roads of the county.

**Bristol T.C.**—It has been decided to pave several streets at an estimated cost of £7,037.

**Cardiganshire C.C.**—At a special meeting convened to meet Colonel Crompton and Mr. Maybury had considerable statements with respect to the condition of the main roads. These were, they stated, in a satisfactory condition, and the county council could be congratulated on the way the roads were maintained by the surveyors. They considered the quality of the stone obtainable in the county excellent, and on the whole the roads in Cardiganshire were second to none in England. They made several suggestions with a view to effecting a saving in the transit of stone, and advocated the proposal for a new road from Aberayron to New Quay. It was decided to carefully test the views of the engineers in a report, and that this should be presented at as early a date as possible to the Road Board in support of an application for a loan to reduce the annual expenditure on the main roads.

**Chester-le-Street R.D.C.**—The council have decided to make up certain streets at Tatfield under the Pri-

vate Street Works Act, 1892, and have accepted the offer of the Lambton Collieries, Limited, to repay the full cost over a period of three years.

**Christchurch T.C.**—Grove-road East is to be sewered, levelled, paved, metalled, channelled, and made good under the provisions of the Private Street Works Act, 1892. The surveyor, Mr. H. J. Farmer, reports that the cost represents a sum of £447. The same steps are to be taken with regard to Avon-road East and West, Grove-road West, and Avenue-road, and the surveyor has been instructed to prepare the necessary estimates, specifications and provisional apportionments.

**Devonport T.C.**—The Surveyor's Committee have decided to apply to the War Department for permission to carry out certain improvements at the top of Fore-street, including the setting back of the wall from the Park Steps to the Public Hall on the north side of the road, and on the opposite side to take down the boundary wall of Raglan Barracks, and set it back in line with No. 1 Fore-street. These improvements would widen the road to 55 ft., whereas the average width at present is 38 ft.

**East Grinstead R.D.C.**—The surveyor, Mr. C. Turton, has been instructed to complete his plans and specifications in accordance with his proposals for making up Hamsey-road, West Hoathley, under the Private Street Works Act.

**East Preston (Sussex) R.D.C.**—A letter has been received from the West Sussex County Council intimating that they would be prepared to take over that portion of the Portsmouth to Brighton road in the rural council's district if a sum of £2,719 was spent in putting it in order. The surveyor, Mr. H. Vail, stated that for the last two or three years the council had spent between £600 and £700 on the road annually. The length of the road was about 7¾ miles. It was decided to comply with the county council's conditions, and apply to the Local Government Board for a loan of £2,500 for five years.

**Exeter T.C.**—Compulsory powers are to be asked for the acquisition of premises in Well-street, Blackboy-road, and Paul-street, for an improvement scheme.

**Glamorgan C.C.**—The following resolution has been passed by the council: "That, having regard to the damage caused by excessive speed and weight of motor cars and traction engines to the surface of the roads and the adjacent property, the council should apply to the County Councils Association with a view to united action in applying to Parliament for legislation to remedy the nuisance caused to the general public using the roads and the damage caused to the roads."

**Ilkeston T.C.**—Improvements are to be carried out in Heanor-road and Burns-street, at a cost of £2,663.

**North Mayo C.C.**—Intimation has been received by Mr. J. J. Noonan, county surveyor, that a grant of £16,000 will be made by the Road Board for steam rolling the entire stretch of road, 40 miles in length, between Ballina and Belmullet. Only a "nominal" contribution from the local rates will be expected. The estimated cost of steam rolling is stated to be £400 a mile, so that the grant should fully cover the cost of this project.

**Nottingham T.C.**—The Improvement Committee, reporting upon the question of the widening of Friar-lane, referred to them by the council, state that the cost of widening to 40 ft. would be £50,000, and the cost of widening to 50 ft., £60,000. In the circumstances the committee make no recommendation.

**Rushden (Northants) U.D.C.**—The surveyor, Mr. W. B. Madin, has prepared an estimate of the Church-parade improvement, amounting to £1,200. In the event of the improvement being carried out, it is estimated that the cost, amounting to £1,200, would be apportioned as follows: Road Board, £900; county council, £70; Rushden Urban District Council, £229.

**St. Albans T.C.**—The council have accepted the gift of a piece of land for the widening of the roadway at the junction of Hadfield-road and Beaconsfield-road.—King's-road, St. Michael's, is to be made up at a cost of £385.

**Saddleworth (Yorks) U.D.C.**—A sub-committee has been appointed to inquire into the cost and methods of paving lengths of roads in the district.

**Sevenoaks U.D.C.**—The General Purposes Committee have been asked to consider the desirability of providing the roadmen with waterproof capes and overall leggings.

**Steyning East (Sussex) R.D.C.**—It has been resolved to approach the Road Board direct for a grant in connection with the road improvement carried out by the council.

**Surrey C.C.**—The Road Board have informed the Highways and Bridges Committee that they considered that there were many desirable improvements in Surrey of greater urgency than the widening of Pain's Hill Bridge on the Portsmouth road, but they would be prepared to discuss the matter when the question of further grants to road improvement in Surrey was under consideration.

## SEWERAGE AND SEWAGE DISPOSAL.

**Eastbourne T.C.**—In sanctioning a loan of £29,559 for surface drainage, the Local Government Board write that they have excluded the sum of £250, being the estimated amount required for the foreman's wages, as it would be contrary to their practice to authorise a payment to be made out of loan moneys to a workman in the permanent employ of a local authority. The total cost of the drainage scheme, which is being carried out in divisions, is £70,000.

**Epsom R.D.C.**—The council have instructed their surveyor, Mr. E. R. Capon, to plant 100 additional apple trees at their sewage outfall works at Ewell, where last season 115 bushels of apples were grown, realising an average price of 4s. a bushel.

**Kirkby-in-Ashfield U.D.C.**—The necessary steps are to be taken for the purchase of a site for sewage works from the Duke of Portland for £1,000.

**Leicester T.C.**—The Sewage Works and Farms Committee recommend the construction of two sewage lagoons at Beaumont Leys.

**Lewes T.C.**—The Sewage Disposal Sub-Committee recommend the council to accept the tender of Messrs. George Bell & Sons, Limited, of Tottenham, at £5,180, for the construction of the outfall sewer (contract No. 1).

**Lichfield T.C.**—The Sanitary Committee report that the wheat at the sewage farm has been threshed. The 6 acres yielded 30 quarters of wheat and 8¼ tons of straw, and the wheat was sold at 35s. per quarter.

**St. Albans T.C.**—The estimate of the city surveyor, Mr. G. Ford, at £320, for laying a new surface-water sewer from the city boundary on St. Stephen's-hill to the river Ver, has been approved.

**Worcester T.C.**—The engineer having advised that the purification of the sewage, without occasional nuisance, could not be ensured unless the tanks which induced septic action were abandoned, it has been agreed to alter the tanks at Bromwich, at an estimated cost of £960. It has been decided to pay the contractor of the deep sewer £200 if he would complete the work by July 31st so far as to enable sewage to be conveyed to the works for treatment.

## WATER, GAS, AND ELECTRICITY.

**Belfast T.C.**—It has been agreed to promote a Parliamentary Bill for the extension of the gasworks.

**Carrick-on-Suir U.D.C.**—The plans and specifications of Mr. J. F. Reade for a high-pressure water supply have been approved.

**Loughborough T.C.**—The working of the electricity department for the last half-year shows a profit of £579.

**Northampton T.C.**—A preliminary purchase of land at a cost of £30,000 has been sanctioned in connection with a water supply extension scheme, which is estimated to involve an expenditure of from £120,000 to £150,000.

**Romney Marsh R.D.C.**—The medical officer has reported that the water supply of Dymchurch is so inadequate that he fears a serious outbreak of disease sooner or later, and the consequent extinction of Dymchurch as a holiday resort. At present, though the normal population of 500 is doubled during the holiday season, most of the houses have no supply, the only service being one semi-public well, of doubtful quality. He suggests that possibly the fact that some of the inhabitants make a trade of water-carrying may explain the neglect of the council to provide an adequate supply.

**St. Thomas (Devon) R.D.C.**—Mr. S. R. Lowcock, M.INST.C.E., in a report upon the water supply for Topsham, recommends the acquisition and extension of the supply at present owned by the local water company. The capital cost of this scheme is estimated

at £6,025, and the annual cost at £627. The council have approved the report and instructed the engineer to prepare the necessary plans and estimate for submission to the Local Government Board.

**Truro R.D.C.**—Some of the difficulties in connection with water supply schemes were alluded to last week when the clerk (Mr. Coulter Hancock) produced a provisional agreement for taking up leases for the Perranporth water supply. He said the council might wonder why they had not heard more about this scheme during the past few months, but the very small area from which they were going to extract water was so mixed up in its ownership and its leases that he had to deal with no fewer than eleven leases in order to obtain the water and the rights which the engineer and he (the clerk) thought to be absolutely necessary for the completion of the scheme. He had not brought up all the cases separately because there had been times when negotiations were in a critical state, and any statement made publicly—however well meant—would probably have hindered him in the course of those negotiations. Having obtained these provisional agreements, which only represented one-sixth, he hoped at the next meeting for sanitary purposes to submit provisional agreements for all the other leases.

**Wrexham T.C.**—A revision of charges has been adopted for supplying electric current to dwelling-houses. In future house consumers may pay a minimum of 12½ per cent of the rateable value of their premises, in return for which 48 units will be allowed for every 20s. paid of the minimum figure, the charge after the consumption of this quantity per 20s. being 1¼d. per unit, less ¼d. per unit discount.

## MISCELLANEOUS.

**Baildon (Yorks) U.D.C.**—The council are considering a scheme for a tramway service, a subject which has been discussed in a conference between representatives of the council and the Tramways Committee of the Bradford Corporation. The estimated cost of laying the lines was stated to be £10,500. The schemes presented were: (1) That the Baildon authority should obtain the running powers and lease the line to Bradford; (2) that the corporation should construct the line and find the capital for everything. The latter scheme was the most favoured by the Baildon representatives, and it was suggested that in case of this proposal being adopted it would be necessary for Baildon either to contribute in money or else make concessions in the way of freedom from liability to district rate.

**Coleraine U.D.C.**—The question of providing a public bathing place has been referred to a committee for consideration and report.

**Malvern U.D.C.**—The tender of Messrs. Dennis Bros., of Guildford, for the supply of a motor fire engine and appliances for £1,020, has been accepted, subject to the Local Government Board sanctioning a loan.—A report as to the provision of a system of motor omnibuses to link up the Malverns is to be presented at the next meeting of the council.

**Portsmouth T.C.** It has been decided to purchase the Great Salterns estate at a cost of £76,000, divided into two portions: £39,000 applicable to the municipal account to provide an area for wharves and docks, and £37,000 applicable to the urban sanitary authority to provide open spaces and so forth.

**Woking U.D.C.** The special committee appointed to advise as to the beautifying of the district have presented their first report. This recommended, among other things, the planting of trees and shrubs and the provision of seats at various points. The committee asked that they might be authorised to spend £25 in purchasing trees and shrubs, and suggested that the council should consider whether trees could not be raised by them in future for this purpose. The report has been approved.

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**Radcliffe Council Offices.** The formal opening has taken place of the new council offices at Radcliffe (Lancs.), built from designs of Messrs. Gillow & Holt, of Manchester, at a cost of £14,000.

**Concrete Institute.** On Thursday next, at a meeting of the Concrete Institute to be held at Denison House, 296 Vauxhall Bridge-road, S.W., a discussion will take place on two reports of the Reinforced Concrete Standing Committee, namely: (1) Report embodying suggestions on "The Standardisation of Drawings of Reinforced Concrete Work," (2) interim report on "The Consistency of Concrete." The chair will be taken at 8 p.m.

## PERSONAL.

Mr. J. W. Walshaw, city surveyor of Peterborough, has had his salary increased by £50 per annum.

Mr. A. O. Harpur, surveyor to the Caerphilly Urban District Council, has had his salary increased by £50 per annum.

Mr. C. Mayfield, surveyor to the Godmanchester Town Council, has been voted an increase of salary of £18 per annum.

Mr. Hibbert, of Denvilles, has been appointed surveyor to the Havant Rural District Council, in succession to Mr. L. A. Cozens.

Mr. F. E. H. Powell, surveyor to the Chelmsford Rural District Council, has been voted an increase of salary of £25 per annum.

Mr. E. Witton Booth, Assoc.M.Inst.C.E., F.A.S.I., has removed his offices from 29 Granville-road, Fallowfield, to 25 Cross-street, Manchester.

Mr. Charles Firth, of the Bradford city engineer's department, has been appointed chief clerk in the Hampstead borough engineer's office.

Mr. Rennie Thornton, of the Southport borough surveyor's staff, has been appointed an assistant inspector and engineer to the Public Works Department, Jamaica.

Mr. W. J. Potter, district surveyor to the South Stoneham (Hants) Rural District Council, has been appointed one of the four divisional surveyors to the Hants County Council.

Mr. John G. Ward, a member of the Loughborough borough surveyor's staff, has been appointed assistant to Mr. A. J. Mason, surveyor and waterworks engineer to the Swadlincote Urban District Council.

Mr. Arthur Ward has been appointed borough engineer of Portsmouth after a year's probation. Alderman Young, in moving the appointment, commended the year's work of Mr. Ward and his department.

Mr. F. E. Boaz, of Nailsworth, Gloucestershire, has been appointed surveyor and inspector of nuisances to the Seaham Harbour Urban District Council, in succession to Mr. James Burrell, who has resigned, and terminates his engagement in March next.

Mr. W. H. Longdin, surveyor, and Mr. A. J. Elson, assistant surveyor, to the Penge Urban District Council, have been voted £60 and £20 respectively for their services in connection with the supervision of the Festival of Empire buildings in the grounds of the Crystal Palace.

Mr. W. D. Jones has left Claremont for Uitenhage, Cape Colony, to take up the office of superintendent of works—as it has become the fashion in recent years in South Africa to style the municipal engineer. At the present time Woodstock, Mowbray, and Rondebosch, of the Cape municipalities, all have their superintendents of works instead of municipal engineers.

Mr. J. E. Swindlehurst, city engineer, presided at the annual workmen's supper of the Coventry engineer's department, a function at which the mayor (Col. W. F. Wyley) was one of the guests. His worship, in the course of his speech, impressed upon the men the necessity of their being efficient in their work, adding that he felt sure he could congratulate Mr. Swindlehurst on the excellent staff of workmen he had under his charge.

Mr. R. P. Hirst, borough surveyor and engineer of Southport, will assume the office of consulting engineer to the corporation of that town for a period of three years from March 1st next, at a salary of £400 a year. It has also been decided as from the same date to appoint a new borough surveyor and engineer at a commencing salary of £600 per annum, rising by annual increments of £30 to £800 per annum, and that after the expiry of the three years mentioned, Mr. Hirst should be paid a retiring or superannuation allowance of £250 per annum.

Mr. Gilbert Wood, whose death is announced by the *Times* was for over forty years associated with our contemporary the *Architect*, of which he was also for many years the managing proprietor, his partner being the late Mr. Robert Hobart, who died in 1908. In politics Mr. Wood was a strong Conservative, and it is stated that for his services to his party Lord Beaconsfield offered him a knighthood and a safe seat in Parliament, but these he declined for business reasons. Mr. Wood, who died in his seventy-

ninth year, was a Fellow of the Royal Geographical Society, and one of the original Fellows of the Imperial Institute.

Mr. Thomas H. Mawson delivered in November, in Convocation Hall, University of Toronto, a series of six lectures on "Civic Art and City Planning." The series aroused great interest, as city planning is one of the live questions in Canada at the present time, especially in the newer provinces. The lectures were arranged by the co-operation of the University of Toronto, the City Council, the Civic Guild, the Board of Trade, and the Playgrounds Association, and the publication of them is commenced in the December issue of *Applied Science*, the "Transactions" of the University of Toronto Engineering Society.

Mr. Louis Gustave Mouchel, so well known in connection with the introduction of ferro-concrete into this country, is the subject of an interesting memorial notice in *Ferro-Concrete* for the present month. Mr. Mouchel was a Norman, who, leaving France in 1875, took up his residence at Briton Ferry, in South Wales, where he established works for the manufacture of patent fuel. By sheer force of character he was able to overcome an almost universal prejudice against ferro-concrete, and eventually his triumph came when he was appointed by H.M. Office of Works consulting engineer for the new General Post Office buildings, as colleague of Sir Henry Tanner, principal architect. Instead of taking upon himself the financial cares of a contractor, Mr. Mouchel established a technical organisation, with offices under the charge of qualified engineers in different parts of the country, and so was able to cope with the increasing demand for designs, and at the same time to exercise thorough supervision over the execution of contracts. Notable among the new forms of ferro-concrete which he was the means of introducing are his patent hollow diaphragm pile and his patent cylinder pier for harbour and dock work.

Mr. T. H. Yabbicom, the late city engineer of Bristol, was the recipient last week of an address and two handsome silver candelabra and a silver fruit and flower bowl from the members of the corporation. The Warwick bowl, as well as the candelabra, bore the following inscription: "Presented to Thomas Henry Yabbicom, M.INST.C.E., city engineer and surveyor, on his retirement, after fifty years' service to his native city, 1861-1911, from members of the City Council and a few friends." The Lord Mayor, in making the presentation, said that from the time of the late Mr. Ashmead's retirement Mr. Yabbicom's position had been no sinecure, and the increasing duties which in course of time devolved upon him had only arisen to be met by him to the satisfaction of the citizens and to the benefit of the city. The cleanness of the city and the fine roadway improvements were but an outward and visible sign of immense labour and thought on his part, carried on none the less efficiently because quietly executed. Few men had been endowed with tact such as he possessed, and his quiet consideration for others and his personal delight in hard work had, without doubt, infused those under him with a similar spirit, and had brought out the best in them to assist him in the various projects he had taken in hand, while the smallest office boy would not fear to approach him in case of need, knowing he would obtain a patient hearing and full justice.

**John Tann's Safes.**—A glance through Messrs. John Tann's latest catalogue of safes, strong-room doors, boxes and locks is alone sufficient to illustrate the remarkable precautions which are necessary nowadays in guarding against fire and the unwelcome attentions of the burglar. The publication enables one to appreciate, perhaps as nothing else is likely to do, the very grave risks which are involved in allowing valuable property to remain unprotected, and its pages should be carefully scanned by all who have hitherto neglected to provide against loss from either of the causes referred to. The firm of John Tann are the original inventors and patentees of the system of rendering safes fireproof, and John Tann was also the originator of the compound drill-proof, unbreakable steel plate which is now used in all the best class work. Tests of this have been made by numerous engineers and others, and in all cases it has been found impenetrable by any tool. One of the firm's "Anchor Reliance" safes was, we are given to understand, used on the "Medina" for the conveyance of the Crown jewels to the Durbar.

## DIARIES AND CALENDARS.

The Standard Life Assurance Company, whose head office is at 3 George-street, Edinburgh, issue a date pad with a page for each week's dates and engagement memoranda. We note that the company was established in 1825, and its funds reach £12,750,000.

Messrs. John Smith & Co., who have been established for eighty-three years as engineers, millwrights, iron and brass founders, of Grove Works, Carshalton, Surrey, issue, as usual, a wall calendar for 1912, well printed in blue figures, divided by gilt rules.

The Commercial Process Company, Limited, of 76-77 Fleet-street, E.C., also issue a desk calendar with tear-off dates for each month, lettered in gilt on a green card. The firm have a high reputation as general process engravers and catalogue experts.

Atlas Foothold Paving Slabs.—The Atlas Stone Company, Limited, of Cambridge, issue a date calendar which can be used for either wall or desk. It is mounted on an aluminium backing, and is quite one of the daintiest and most tasteful reminders we have seen.

The Penlee and St. Ives Stone Quarries, Limited, of 67 Queen-square, Bristol, send us, as in previous years, a most practical desk blotting pad, which we find of every-day use. The form of the daily engagement reminder, which forms part of the pad, is admirably designed for its useful purpose.

To Messrs. Bristowe & Co., Limited, of 20 Tothill-street, Westminster, S.W., our thanks are due for a very handsome blotting-pad, cased in a most tasteful cover, with an effective cameo decoration, and fitted with a roomy inside pocket. The gift is a costly one, and would adorn the most daintily-appointed writing table.

An elaborately printed wall calendar of moderate dimensions has been issued by the London and Lancashire Fire Insurance Company, whose head offices are at 45 Dale-street, Liverpool. This is the company's jubilee year, and its excellent financial position is indicated by a short statement which, together with other information, finds a place on the card backing of the calendar.

The *Sanitary Record* Year-Book and Diary for 1912 represents the thirtieth annual issue of that useful production. As usual, a review of sanitary legislation is a feature of the year-book, while memoranda for engineers and surveyors and information with regard to Government departments and sanitary and allied associations form other valuable sections. In the diary ample space for daily entries is allowed, and the pages throughout are interleaved with blotting paper.

The Adamant Stone and Paving Company, Limited, of Palace Chambers, 9 Bridge-street, Westminster, S.W., have sent to their clients, by way of an acceptable New Year's greeting, a handsome pocket diary, specially adapted for surveyors and builders by Messrs. Charles Letts & Co. With the originality and enterprise characteristic of their business methods, the company have "gone one better" than in the case of any other diary we know of, for they provide that if the insurance coupon enclosed with their date reminder be returned to them they will attend to the registration themselves, so that the sender receives his policy from the insurance company with no expense or trouble to himself. Last year, it will be remembered, the Adamant Company distributed a booklet, entitled "Notes on Highways." It was intended to issue another edition, but as there was so little to add or revise the diary was substituted.

**The Delhi Water Supply.**—People say that even more wonderful than all the arrangements that were made to beautify the camps at the Delhi Ridge was the engineering feat which supplied the Durbar grounds with water. It was estimated (says the *Manchester Guardian*) that 2,000,000 gallons of water would be required each day. In order to provide this supply no less than 44 miles of cast-iron piping were needed to furnish the "mains," which varied from 16 in. to 3 in. in diameter. The pressure for this supply was furnished by the municipal reservoir, which is situated on the summit of the Ridge. The contract was given to a Calcutta firm of engineers, who only began work on the system in May, and it was finished by the middle of September.

## FOR OTHER ADVERTISEMENTS

See End of Paper.

### EPPING RURAL DISTRICT COUNCIL.
PARISH OF ROYDON.

The above Council invite Tenders for the Construction of Sewage Disposal Works at Roydon, Essex, and the Laying of about

| | | | |
|---|---|---|---|
| 380 | yards lineal | 6 in. | Sewer, |
| 600 | .. .. | 7 in. | .. |
| 680 | .. .. | 8 in. | .. |
| 1,420 | .. .. | 10 in. | .. |
| 450 | .. .. | 12 in. | .. |

together with the Construction of Manholes and all contingent works.

Plans can be seen, and further information obtained, from the Engineers.

Applications for Bills of Quantities, accompanied by a deposit of £2, which will be returned upon the receipt of a *bonâ-fide* Tender, must be made to the Engineers, Messrs. Tooley & Foster, of Queen's-road, Buckhurst Hill, Essex, not later than January 20th next.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
R. D. TROTTER.
Clerk to the Council.

Epping.
January 3, 1912.

### EPPING RURAL DISTRICT COUNCIL.
PARISH OF HARLOW.

The above Council invite Tenders for the Construction of Sewage Disposal Works at Harlow, and the Laying of about

| | | | |
|---|---|---|---|
| 1,850 | yards lineal | 6 in. | Sewer, |
| 1,150 | .. .. | 7 in. | .. |
| 3,300 | .. .. | 8 in. | .. |
| 800 | .. .. | 12 in. | .. |

together with the Construction of Manholes and all contingent works.

Plans can be seen, and further information obtained, from the Engineers.

Applications for Bills of Quantities, accompanied by a deposit of £2, which will be returned upon the receipt of a *bonâ-fide* Tender, must be made to the Engineers, Messrs. Tooley & Foster, of Queen's-road, Buckhurst Hill, Essex, not later than January 20th next.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
R. D. TROTTER.
Clerk to the Council.

Epping.
January 3, 1912.

### HERTFORDSHIRE COUNTY COUNCIL.
TENDERS FOR GRANITE AND SLAG.

Tenders are invited for the Supply of Broken Granite and Slag required for the Main Roads during the year ending March 31st, 1913. Forms of Tender and Conditions of Contract may be obtained on application at my office, or will be sent through the post upon receipt of a stamped addressed foolscap envelope. Tenders, which must be upon the forms provided, are to be delivered not later than February 5th, 1912.

The lowest or any Tender will not necessarily be accepted.

URBAN A. SMITH, M.I.C.E.,
County Surveyor.

County Surveyor's Office,
Hertford, Herts.
January 2, 1912.

MR. A. KLEMIN SCHMIDT, B.Sc., Hons. London, Int.B.A., A.C.G.I., exempt A.M.I.C.E., an experienced and highly successful tutor prepares for INSTITUTION OF CIVIL ENGINEERS and UNIVERSITY EXAMINATIONS. Particulars of THREE WEEKS' FREE TRIAL on application.—29 West Cromwell-road, S.W.

### COUNTY BOROUGH OF WEST HAM.
TENDERS FOR SUPPLIES, &c.

The Council hereby invite Tenders for the Supply of

Paving Materials.
Broken Granite and Chippings.
Road Flints.
Sand for Tramways.
Tar and Pitch.
Ironmongery, &c.
Iron Castings.
Lime, Plaster, &c.
Portland Cement.
Rope and Tarpaulins, &c.
Hardwood.
Lead, Zinc, and Solder.
Oils and Colours, &c.
Stoneware Pipes, &c.
Brooms and Brushes.
Boots.
Sanitary Articles and Disinfectants.
Domestic Articles.
Clothing.
Soaps.

Forms of Tender and further particulars may be obtained at the Borough Engineer's Office, Town Hall, West Ham, E. (where the Standard Samples may also be seen).

For the Supply of
Newspapers and Periodicals,
New Books, and for
Bookbinding,

for the Public Libraries and Technical Institute.

Forms of Tender and further particulars may be obtained at the Central Public Library, Water-lane, Stratford; or the Public Library, Barking-road, Canning Town, E.

For the Supply of
Meat,
Fish,
Ice,
Bread and Flour,
Druggist's Sundries,
Groceries,
Tea and Coffee,
Linen and Cotton Goods, &c.,

for use in the Council's Hospitals.

Forms of Tender and further particulars may be obtained of the Medical Superintendent, at the Hospital, Sampson-street, Plaistow.

For the Supply of
Engine-room Stores.
Chemicals.
A.C. House Service Wattmeters.

Forms of Tender and further particulars may be obtained of the Electrical Engineer, 84 Romford-road, Stratford, E.

A deposit of £1 will be required in respect of each Form of Tender, which will be returned on receipt of a *bonâ-fide* Tender.

NOTE.—No Tender will be considered unless the same is delivered at the Office of the Town Clerk, Town Hall, West Ham, E., in the envelope supplied, by registered post, not later than 12 o'clock noon on Thursday, January 18th, 1912.

The Tenders will be opened at the Town Hall, West Ham, on Thursday, January 18th, at 6.30 p.m., and persons tendering may be present if they so desire, but no guarantee is given that any information, beyond the names of persons tendering, will be read out.

The Council do not bind themselves to accept the lowest or any Tender. The Contractor will be required to enter into a bond with sureties for the due performance of the Contract, and no Goods, Materials, &c., will be ordered under any Contract until such bond has been duly executed.

The Contractor whose Tender is accepted, and with whom a Contract is entered into, will be required to pay to the whole of his workmen such rate of wages and observe such hours of labour, as are recognised by the Workmen's Trade Unions, and in force at the time of signing the Contract. In the event of any breach of such agreement, the Council will enforce the penalty clause in its entirety.

By order of the Council,
FRED. E. HILLEARY,
Town Clerk.

Town Hall,
West Ham, E.
January 3, 1912.

# Public Lighting.*

By E. GARSED, Elland, Yorks.

A glance through the yearly returns of the gas undertakings in the United Kingdom will reveal rather an astonishing fact in the matter of public lamps—*viz.*, the number of flat-flame burners still in use—and it would seem that, speaking generally, the extent to which these latter do survive is greatly under-estimated. It is a matter of wonder at once why the number is so large. The answer may be found in a number of causes; but perhaps the chief reason is that in so many cases the public lighting is controlled by a public department separate and distinct from the gas undertaking of the district, especially so where gas is supplied by a private company. In the latter case it may even be the fault of the gas authority; but far more likely from the inability of the latter to act, through the difficulty or impossibility of approaching the local authority.

It may be that the cost of replacing old lanterns with those of the type claimed to be storm-proof is considered prohibitive, though often enough lamps have been converted to incandescent without even a thought of consequences in this direction, many old lanterns being used. The question of the increased cost of maintenance through breakage of mantles, also, has doubtless something to do with this large number of the now obsolete flat-flame burners.

### THE QUESTION OF CONTROL.

At all events it would appear that, whatever the cause, the public lighting department does not receive, or has not (with all due respect to those districts where efficient control of this department does exist) received due attention from the right quarter, especially in small towns and villages. And it is not unreasonable for us to expect that the "right quarter" should be the gas authority, working under amicable and equitable arrangements with the local authority, whether the former be part of or separate from the latter. This view is, however, far from being shared by local authorities where gas is supplied by a company, though one has only to point to some of our large cities to show the distinct advantages and public comforts enjoyed by some such system of efficient control.

One of the greatest disadvantages of the administration being carried out by the local authority is the system of average consumption usually prevailing for ascertaining the total consumption per period. Such a system as where lamps are only metered one in, say, ten cannot be wholly satisfactory, as there is no real straight edge, so to speak, of working. In the first place the responsibility for complaints or faults cannot easily be settled upon either party, which may create a position so undesirable as to be a source of controversy or friction. Also the indirect or round-about reporting of and remedying of faults causes unnecessary delay and loss of efficiency; such delay, when in reference to meter lamps, being, of course, a serious matter to the gas authority, who stand to lose tenfold in these faults as compared with unmetered lamps. Again, the fact of two parties being involved causes much unavoidable expense to each; and this, in the case of the gas authority, for whom it is necessary to keep a more or less strict watch against all possible irregularities (which may or may not increase unaccounted-for gas), is a matter of no small consideration.

If, then, by proper and equitable agreement, the gas authority were to become solely responsible for the administration of public lighting, many at present undesirable factors and conditions would be swept away, better satisfaction would be given all round, more efficient lighting would, in general, be the rule: while, by no means least, the system would, judging from the figures given below, be a less expensive item in the general district rates.

The following particulars have reference to three districts, joining up to each other, the lighting of which is controlled by the respective district councils:—

| No. | Total Lamps. | Cost per Lamp. d. | Incandes cent. Per Cent | Incandes cent. Average Per Lamp | Cost. Average. s. d. |
|---|---|---|---|---|---|
| 1 | 343 (Gas) 59 (Incandescent electric) | 36 7½ | 50 | — | — |
| 2 | 141 ... | 30 2½ | 88 | 60 | 34 9 |
| 3 | 236 ... | 34 1 | 41 | — | — |

* Paper read before the Yorkshire Junior Gas Association.

The average consumption of gas coming into the rentals of the gas authority from the above per lamp were: No. 1 district, 7,450 cub. ft.; No. 2, 6,730 cub. ft.; No. 3, 7,730 cub. ft. The respective reports stated that the lamps had been burning (for the season to which the figures apply) for nearly 2,000 hours in each case. The figures for No. 1 district, of course, include the cost of the fifty-nine electric incandescent lamps (arcs having been purposely omitted).

But it will be seen that, in all three cases, there is a wide difference in the costs and recorded consumptions, and therefore, we may take it, in the administration—a difference far too wide for districts so close to each other, and which are supposed to be lighted somewhere about the same number of hours. At the same time only 60 per cent of the total lamps are fitted with incandescent burners, which means that the full possible efficiency of the whole system is not being attained. Facts of this kind are anything but satisfactory from the gas authority's point of view, and only go to show the further disadvantages accruing when the latter are excluded from control of the lighting.

In assuming a case in which the public lighting of a district is to be carried out by the gas authority, we may take it that all the lamps will be at once adapted for incandescent burners, straightway aiming at the best possible efficiency and obviating the difficulties arising from the combined effects of variations in pressure and candle power, through the continued mixed flat-flame and incandescents; and, in estimating the costs of a season's lighting, we arrive with a good deal of certainty at the following figures:

| | s. | d. |
|---|---|---|
| An average of sixty lamps should be lighted by one lamplighter, at 18s. per week—this figure to include the time taken up in cleaning, re-mantling, &c., which, at thirty-six weeks for the season, is equal to, per lamp ... ... ... ... ... | 9 | 0 |
| Add for mantles used, say four to five ... ... | 1 | 0 |
| " chimneys or other glasses, say two ... ... | 0 | 3 |
| " general repairs, glass and painting ... ... | 0 | 9 |
| Total cost of maintenance ... ... | 11 | 0 |

A lighting table which will meet the requirements of the most exacting local authority can be drawn up, with a total of 1,800 lighting hours as a maximum, and taking the consumption per hour per lamp at 4½ cub. ft., this lighting table will provide for a charge of 8,000 cub. ft. per lamp coming into the rentals, which, with gas, at, say, 2s. 6d. per 1,000 cub. ft.—the price in the above-mentioned cases—brings the total cost of lighting to 31s. per lamp per season. In character and costs of lighting, therefore, a comparison based on some such figures as the above does not leave much doubt as to whether or not the public would be the gainers, so far as concerns the outside lighting, if the gas authority were directly responsible.

### LIGHTING AND EXTINGUISHING.

The lighting and extinguishing of street lamps by means of torches carried by lamplighters is, despite improvements made over the earlier methods, becoming somewhat antiquated, and any means by which the operations can be carried out simultaneously in the whole or even different sections of systems of street lamps is a favourable step forward in this direction. The many forms of apparatus—clockwork, pressure-wave, or the like—are bidding fair to bring about a revolution in this department, not only through their practically dispensing with the lamplighting staff, but by the fact of their attaining, or even surpassing, the convenience of electricity.

These forms of apparatus are, of course, worked in conjunction with the pilot-flame—a fact which perhaps, in some opinions, is sufficient to bring about their non-acceptance, though the continued success of such apparatus in several parts of the country should tend to remove any prejudice. In cost, no objection can be raised against the pilot-flame, as in a total of thirty-six weeks the consumption per lamp does not exceed 1,500 cub. feet.—calculated from 6,000 hours at ¼ cub. ft. per hour. The flame can, of course, be regulated so as to consume as low as ¼ cub. ft. per hour; but if the by-pass fails, the whole system fails, and therefore safety in this direction is imperative. Moreover, it is found that when the flame is of such a size as to consume ¼ cub. ft. per hour, it

can be counted upon as safe in lanterns which have at least some pretension to being stormproof.

Some four years ago a district which I have in mind was fitted out with one well-known form of pressure-wave apparatus—principally as an experiment—and, to be candid, there was from time to time some fun with it. The most extraordinary behaviour of some of the things was at once the cause of much combined anxiety and amusement. While perhaps the majority would be acting properly, a few would fail; at other times portions of the district would be without light through failure of one or other of the machines; and even in the daytime it was a more or less frequent occurrence to find lamps which had commenced operations on their own account, and so on. The apparatus was, of course, of the earlier type. It was found that the wind was partly responsible for the disturbances, though perhaps insufficient margin of available holder pressure had more to do with it. In the summer of last year the whole sets were replaced by more up-to-date apparatus of the same make, resulting in much more satisfactory working.

Another installation, I may mention, has been recently fitted out with the same type of apparatus, but adapted to the inverted burner; and when a week or two ago I inquired as to the working, I was informed that every satisfaction was being given. After some ten weeks of working, during which period, in the early part of November, heavy gales had been experienced, not the slightest trouble had arisen through the apparatus failing to act. The lamps are giving a good and steady light under all conditions, and in no single instance has it been necessary to renew a mantle through being shattered by the wind—showing a distinct saving as compared with the system fitted with upright mantles.

UPRIGHT *v.* INVERTED MANTLES.

With regard to the relative merits of upright and inverted mantles for use in outside lamps, there seems to be no question as to the superiority of the latter, experience having sufficiently proved this in the case of the two last-mentioned districts. As a further example, I may state a case which has come within the notice of one of our members. On converting a street lamp from flat-flame to incandescent (upright), the fact was disclosed that the lamp was subjected to almost exceptional buffeting by the winds, resulting repeatedly in a shattered mantle—no less than four being put on in less than two months in the first half of the lighting season. Eventually the burner was replaced with one of the inverted type, and it is a fact that the first mantle lasted the rest of the season. After this more of the lamps were converted, and recent figures show an average of mantles used over one lighting season in the ratio of 3½ for uprights to 1 for inverteds. In this case the saving in the mantle bill is quickly compensating for the cost of alterations to lamps.

If what I have said serves in any way to emphasise among us the unquestionable efficiency and distinct benefits which can be given to the public by the gas industry in the matter of public lighting, through the judicious adoption of some of the many up-to-date systems at our disposal, I shall to some extent have attained my object in introducing the subject. The very name public lighting at once suggests publicity, about which we are hearing so much just now; and surely this direction is one in which we can shine at least so far as the observant public are concerned.

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**Municipal Engineering** (Edited by Sydney G. Turner, Assoc.M.Inst.C.E. Price 3s. 6d. nett. London: St. Bride's Press, Limited, 24 Bride-lane, E.C.).—This volume consists of model answers to questions set at recent examinations of the Institution of Municipal and County Engineers, and is the second edition. It is practically identical with the first issued. It is not suggested that it should take the place of recognised text-books, but it provides useful summaries of various subjects, as well as indications as to how different types of questions may be answered. The answers are founded upon examinations held in Birmingham, London and Manchester. The appendix contains examples of questions on sewerage, sewage disposal, tramway construction, bridges, water supply, road construction, buildings, sanitary science as applied to towns and buildings, drainage, and other matters. It will be seen, therefore, that the book is comprehensive, practical and exhaustive.—*Local Government Journal.*

## WATER SUPPLY IN HOWDEN RURAL DISTRICT.

### LOCAL AUTHORITY'S ACTION.

Situated on a low, flat, marshy plain, bounded by the river Ouse on the west and south, and the Yorkshire Wolds on the east, the Howden rural district has been for many years in great difficulties as regards water supply. The population is small and widely distributed, amounting to only 12,625 over an area of 150 square miles, and the only town of any magnitude is Howden with a population of 2,000. A company was formed in 1886 to supply water to Howden and the contiguous villages, but the only available source of supply was a boring into the new red sandstone. The water obtained therefrom is hard and highly charged with iron, the result being that, although mains were laid in Howden, the water has never been supplied to the town, and is now only available in two small villages adjacent to the works. In the meantime the company went into liquidation, and the property was acquired by a local resident for a small sum.

The private wells upon which the inhabitants of this district rely nearly all yield water of doubtful quality, and pressure has been brought to bear upon the rural district council to provide a public supply, a prominent resident (recently deceased) going so far as to take action under the Public Health Act, 1875, to compel the council to provide a supply. This action has been actively supported by the East Yorkshire County Council, and in October last the Local Government Board held a local inquiry, at which the rural district council admitted default, but pleaded "excessive cost" in extenuation. Evidence was, however, given which showed the possibility of obtaining the supply required, and the vital question of "reasonable cost" was left over on the rural district council undertaking to prepare a scheme.

In accordance with this undertaking the rural district council have recently engaged Mr. Percy Griffith, M.Inst.C.E., F.G.S., of Westminster, who carried out the Selby waterworks, to advise them upon the matter, and we understand that Mr. Griffith is now engaged in preparing his report.

It appears that two alternative schemes have been proposed—apart from boring to the sandstone, the prospects of which are by no means encouraging—one being to take a supply in bulk from the Selby Urban District Council, who are fortunately in a position to offer a supply from their new works, and the other is to obtain a supply from springs thrown out at the base of the chalk escarpment at the eastern boundary of the district. Whatever scheme is ultimately adopted, the cost is bound to be large in proportion both to the population and the rateable value of the district, the estimates being from £50,000 to £60,000, and a general rate of considerable amount must of necessity result. In the interests of public health, however, the council and the residents are prepared to make the necessary sacrifices, and it only remains for a practicable and, at the same time, reasonable scheme to be designed and carried out.

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**Tea Kettle Tar-Grouting.**—A thrilling little story, having for its background a prosaic paving job, comes from a small Ohio town. It seems that several months ago the village council awarded a contract for paving with brick several streets and the public square. In honour of this being the first town outside of the county seat to have paved streets, the citizens had arranged for a grand celebration on the completion of the work. The date for this celebration had been decided upon and arrangements made for a grand jollification. But, alas! weather conditions and scarcity of labour began to retard the contractor. On the day before the celebration the work was almost at a standstill. What was to be done? The leading citizens could hit upon no plan, and then the leading women of the town came to the aid of the men. They volunteered to donate their tea kettles and to pour the tar-pitch while the men aided the contractor in laying the brick. The offer was accepted, and, according to a voracious press despatch, "The steaming tea kettles were snatched from the stoves and filled with tar and the real work commenced. While business and professional men worked as common labourers, wielding pick and shovel and setting the paving brick in position, the women poured molten pitch between the bricks, and encouraged the husbands, brothers, and sweethearts to redoubled efforts." The first tin pedlar that reached this town must have been astonished at the amount of tea kettles sold to the leading women.—*Engineering and Contracting.*

## AMERICAN HIGHWAY CONVENTIONS.

### ROAD BUILDERS' ASSOCIATION.

The American Road Builders' Association held their eighth annual convention from November 14th to 17th, in Rochester, N.Y., the attendance being over 1,450. There were nine sessions in all, and a specific subject was alloted to each, thus giving ample time for a thorough discussion on each topic.

The first session was devoted to addresses of a non-technical nature.

In the second session the main topic under consideration was "Highway Administration." The leading address was by Mr. John A. Bensel, State engineer and surveyor of New York, and a valuable discussion was contributed by Mr. George W. Cooley, State engineer of Minnesota.

The subject before the third session, "Adaptability of Roads and Pavements to Local Conditions," was presented in a paper by Mr. Nelson P. Lewis, chief engineer of the Board of Estimate and Apportionment of New York City. The leading discussion was by Mr. W. A. McLean, provincial engineer of the Province of Ontario, Canada, who was followed by delegates from the floor.

Major W. W. Crosby, chief engineer of the Maryland State Roads Commission, was the principal speaker in the fourth session, his subject being "Problems of Construction." Papers were also read upon the same subject by Mr. R. A. Meeker, State supervisor of roads of New Jersey, and Mr. Charles Ross, street commissioner of Newton (Mass.).

The fifth session was devoted to "Contractors' Criticisms of Road Contracts," which was presented in a paper by Mr. C. A. Crane, secretary of the General Contractors' Association, and thoroughly discussed.

In the sixth session a further discussion was held on the same subject.

In the evening (session seven) illustrated lectures were given as follows: "European Roads," by Mr. Arthur H. Blanchard, Professor of Highway Engineering, Columbia University, New York City; "American Roads," by Mr. Paul D. Sargent, assistant director of the Office of Public Roads; and "New York Roads," by Mr. Fred Buck, assistant deputy, Bureau of Town Highways, New York State Highway Department.

In the eighth session (on November 17th) the main address was on "Maintenance of Roads and Pavements," by Mr. James Owen, county engineer of Essex County, New Jersey. Mr. A. W. Dean, chief engineer of the Massachusetts Highway Commission, and Mr. J. C. Travilla, street commissioner of St. Louis, Mo., led the discussion, which was afterwards participated in by several other prominent engineers.

A most successful and complete exhibition of road machinery and materials was held in conjunction with the convention, and proved of great educational value.

### ASSOCIATION FOR HIGHWAY IMPROVEMENT.

The first convention of the American Association for Highway Improvement was held in Richmond, Va., on November 20th, 21st, 22nd and 23rd, the attendance being about 800.

The four days were known as "National Day," "Highway Engineers' and Contractors' Day," "Road Users' Day," and "Association Day" respectively. Addresses were delivered by city, State and national officials and officials of various associations interested in highway improvement.

The first day was devoted to the general questions of road improvement, and the speakers emphasised many points relative to this subject, the essential ones being the extension of national aid, the advantage of convict labour for road work, and the importance of proper maintenance of all highways. General T. Coleman du Pont, of Delaware, described the plans and stated the purpose for the £400,000 road which he is to have built across the State of Delaware; also the advisability of training for highway work was especially emphasised.

On the second day (at the morning session) the following engineers presented papers: Mr. W. A. McLean, provincial engineer of highways of Ontario, Canada, on "Gravel Roads"; Captain P. St. J. Wilson, State highway commissioner of Virginia, on "Sand-Clay and Earth Roads"; Major W. W. Crosby, chief engineer of the Maryland State Roads Commission, on "Bituminous Roads"; Mr. Arthur H. Blanchard, Professor of Highway Engineering at Columbia University, New York City, on "Road Costs and Maintenance"; and Mr. W. P. Blair, secretary of the National Paving Brick Manufacturers' Association, on "Brick Pavements." In the afternoon session Mr. Onward Bates, past-president of the American Society of Civil Engineers, spoke on the subject of "Contracts and Contracting"; Captain D. L. Hugh, president of the United Engineering and Contracting Company of New York City, followed with an address on the same subject, and Mr. Frank Terrace, of Washington, spoke relative to "Convict Labour."

On the third day the subjects considered were of a nature especially interesting to road users, such as automobile laws, traffic regulation, and automobile industry as related to good-roads movements. A committee presented resolutions embodying the following recommendations: To endeavour to establish the principle of national aid; to cause the subject of maintenance to be duly considered by road authorities, and to seek for the providing of proper supervision by State legislation; to advise the employment of only experienced highway engineers for construction and maintenance work; and to recommend the enactment of laws providing convict labour for road improvement.

On the last day the addresses related to convict labour; the safety of highways, especially at level crossings; association work; a progress report of the work of the Lincoln Memorial Highway Association; and the good-roads work of the American Automobile Association.

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**Belfast's New Water Supply Scheme.**—At a meeting of Belfast Water Commissioners recently, the chairman, Mr. James Hollywood, explained an elaborate scheme for increasing the water supply of the city owing to the scarcity which followed the prolonged drought of the past summer. He said the present supply was brought from the Mourne Mountains, in County Down, a distance of 35 miles, and it was now proposed to construct in the Silent Valley, situated among the mountains, a storage reservoir, with an estimated capacity of 3,000,000,000 gallons more than the capacity of all the other reservoirs. The scheme comprises, in addition to the reservoir, certain contingent works, the chief of which is the building of a new bridge in Belfast across the river Lagan from the County Down side to the County Antrim side to carry a number of large mains. The board, it was stated, was now promoting a Bill in Parliament giving a certain time for the construction of the reservoir, which would require at least five or six years, and seeking power to raise an additional £500,000 capital to cover the cost and also provide money for future pipe extensions, which otherwise would require to be charged to revenue account.

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## APPOINTMENTS VACANT.

**Official and similar adver isements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such adver tisements may, in cases of emergency only, be telephoned* **(No. 1359 Holborn),** *subject to later confirmation by letter.*

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CLERK OF WORKS.—January 6th.—Hendon Education Committee. £3 10s. per week.—Mr. J. Anderson, secretary.

INSPECTOR OF NUISANCES.—January 8th.—Thirsk Rural District Council. £110—£130.—Mr. W. Swarbreck, clerk.

ROLLER DRIVER.—January 8th.—Corporation of Congleton.—Mr. J. H. Walters, surveyor.

BOROUGH SURVEYOR.—January 8th.—Heywood Town Council. £175 per annum.—Mr. G. G. Bouchier, town clerk.

CLERK OF WORKS.—January 8th.—Corporation of Salford. £3 3s. per week.—The Town Clerk.

ASSISTANT COUNTY ROAD SURVEYOR.—January 10th.—Worcester County Council. £200 per annum.—Mr. S. Thornley, clerk.

ASSISTANT COUNTY SURVEYOR.—January 13th.—Cornwall County Council. £150—£175.—Mr. Christopher L. Cowlard, clerk.

SEWAGE WORKS ENGINEER.—January 13th.—Radcliffe Urban District Council. £2 per week.—Mr. S. Mills, clerk.

SURVEYOR.—January 15th.—Thorne Rural District Council. £150 per annum.—Mr. G. Kenyon, clerk

Borough Surveyor and Engineer.—January 15th.—Corporation of Southport. £600—£800.—Mr. J. Ernest Jarratt, town clerk.

Assistant Engineer.—January 24th.—Public Works Department, Rangoon Municipality. 600 rupees per mensem.—Messrs. Ogilvy Gillanders & Co., 67 Cornhill, London, E.C.

Clerk of Works.—North Bromsgrove Urban District Council.—Mr. P. Levens, clerk.

Junior Draughtsman.—Rhodesia. £200—£240. D. H., care of Street's, 30 Cornhill, E.C.

## MUNICIPAL COMPETITIONS OPEN.

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Banbury.—January 8th.—Designs for workmen's dwellings, for the corporation.—Mr. A. Stockton, town clerk.

Spennymoor.—January 9th, 1912.—Designs and plans of a public hall, market, and offices, for the urban district council. Premiums are offered of £50, £25, and £10.—Mr. F. Badcock, clerk.

Stafford.—January 9th.—Designs for a public library. Mr. Henry T. Hare has been appointed assessor.—Mr. W. Plant, borough surveyor.

London.—February 17th, 1912.—Sketch designs for new head offices, for the Port of London Authority.—The Clerk.

Harrow-on-the-Hill.—March 16th.—Enlargement of public offices, for the urban district council. Cost not to exceed £4,500. Premiums of 30, 20 and 15 guineas are offered.—Mr. J. P. Bennetts, engineer and surveyor.

## MUNICIPAL CONTRACTS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned* (No. 1359 Holborn), *subject to later confirmation by letter.*

### Buildings.

Guildford.—January 6th.—For the erection of twenty cottages, for the corporation.—Mr. C. G. Mason, borough engineer.

Berwick-upon-Tweed.—January 6th.—For alterations to a school, for the Education Committee.—Mr. A. H. M. Weddell, clerk.

Manchester.—January 6th.—For the erection of a school, and supply of terra-cotta, for the corporation.—Education Offices, Deansgate.

Cornwall.—January 6th.—For additions and alterations to school buildings, and erection of a county school for girls, for the Education Committee.—Mr. F. R. Pascoe, secretary, Education Office, Truro.

Middlesbrough.—January 8th.—For alterations to police residences, for the corporation.—Mr. S. E. Burgess, borough engineer.

Pembroke.—January 8th.—For the erection of a council school, for the Education Committee.—Mr. H. E. H. James, clerk, County Education Offices, Haverfordwest.

Hull.—January 8th.—For the erection of a school, for the Education Committee.—Secretary, Education Committee.

Birmingham.—January 10th, 22nd.—For the erection of a swimming bath, for the corporation.—The Chairman of the Works Sub-Committee, Bath Department, Ration-street.

Mayfield.—January 10th.—For alterations and additions to a [illegible] for the Education Committee.—Mr. F. May, clerk.

Walthamstow.—January 11th.—For the erection of a school for girls, for the Education Committee.—Mr. R. Dempster, clerk, 2 Tower-chambers, Hoe-street, Borough, Walthamstow.

Merthyr.—January 11th.—For the erection of [illegible] for the corporation.—Mr. T. A. Rees, town clerk.

Radstock.—January 11th.—For the erection of twenty-eight cottages, for the urban district council.—Mr. G. H. Gibson, surveyor.

Cumberland.—January 12th.—For the widening of a stone bridge, for the county council.—Mr. W. Finch, acting county surveyor, The Courts, Carlisle.

Lancashire.—February 12th.—For the completion of the erection of an asylum for 2,000 patients, for the Asylums Board.—Mr. Harcourt E. Clare, clerk.

West Riding.—January 12th.—For the erection of two schools, for the Education Committee.—Clerk, County Hall, Wakefield.

Pontypridd.—January 15th.—For the erection of a girls' school, for the Education Committee.—Mr. D. M. Jones, secretary.

Northampton.—January 15th.—For the erection of a public school, for the Education Committee.—Messrs. Gotch & Saunders, Bank Chambers, Kettering.

Durham.—January 16th.—For the erection of two schools, for the county council.—Mr. A. J. Dawson, Shire Hall, Durham.

Flintshire.—January 16th.—For the erection of a school and other works, for the county council.—Mr. S. Evans, county surveyor, Mold.

Tottenham.—January 16th.—For the construction of underground convenience, for the urban district council.—Mr. W. H. Prescott, engineer.

Ilford.—January 23rd.—For the erection of an elementary school, for the urban district council.—Mr. Adam Partington, clerk.

Cheltenham.—January 23rd.—For the construction of concrete filter tank and filter-house, for the corporation.—Mr. J. S. Pickering, borough engineer.

Lancashire.—January 31st.—For additions to a school, for the Education Committee.—Mr. H. Littler, 16 Ribblesdale-place, Preston.

Bangkok.—March 15th.—For the erection of an electric power station, for the municipality.—Mr. F. B. Shaw, engineer-in-charge, Municipal Electric Power Station, Local Sanitary Department, Bangkok.

### Iron and Steel.

East Kerrier.—January 6th.—For laying a water main, for the rural district council.—Mr. M. H. Truscott, clerk.

Swansea.—January 6th.—For the supply of water-tube boilers, superheaters and mechanical stokers, for the corporation.—Mr. H. Lang Coath, town clerk.

Birmingham.—January 8th.—For the supply of steel rails and fishplates, for the corporation.—Town Clerk.

Manchester.—January 9th.—For the supply of tramway rails, for the corporation.—Chairman Tramways Committee

Belper.—January 10th.—For the supply of cast-iron pipes, for the rural district council.—The Clerk.

Southampton.—January 11th.—For the construction of economiser flues and building, &c., for the corporation.—Town Clerk.

Hinckley.—January 12th.—For the supply of seven miles of cast-iron socketed water pipes and specials, valves, and laying water mains, for the rural district council.—Mr. John W. Preston, clerk.

Radcliffe.—January 13th.—For the supply of electric-driven pump at the sewage disposal works, for the urban district council.—Mr. S. Mills, clerk.

Cornwall.—January 16th.—For the supply of gates and railings, for the county council.—Mr. W. J. Mock, county architect, Truro.

Glasgow.—January 17th.—For heating installation and supply of boilers, for the corporation.—Mr. A. W. Miles, town clerk.

Dartford.—January 23rd.—For the supply of electricity plant, for the urban district council.—Mr. W. Kay, clerk.

Brisbane (Australia).—January 30, 1912.—For designs, detail, specifications, supply, erection, &c., complete under working conditions, including twelve months' maintenance, for alternatively two or three complete units of pumping plant, capable of delivering 6,000,000 British gallons of water delivered at an elevation of 400 ft. per day of twenty-four hours, for the Water and Sewerage Board.—Mr. Geo. Johnston, secretary.

Stourbridge.—January 30th.—For the erection of a pumping engine, for the Water Board.—Mr. J. D. Harward, clerk.

BURNLEY.—January 31st.—For the supply of petrol-driven motor fire engine, for the corporation.—Mr. P. Thomas, town clerk.

## Miscellaneous.

WHITLEY.—January 8th.—For team labour for road work and scavenging, for the urban district council. —Mr. A. Whitehorn, clerk.

NORTH RIDING.—January 9th.—For the supply of roadmen's tools, for the county council.—Mr. W. G. Bryning, county surveyor, County Hall, Northallerton.

PLYMOUTH.—January 11th.—For the supply of fire hydrants, lead pipe, and pig level, stopcocks, cast-iron work, sluice valves, &c., for the Waterworks Committee.—Water Engineer.

BURY.—January 11th.—For the supply of retorts, fire-bricks, and fireclay, for the corporation.—Town Clerk.

LEEDS.—January 13th.—For the supply of retorts, &c., for the Gas Committee.—Town Clerk.

CROYDON.—January 15th.—For the supply of men, horses, carts and harness, for the corporation.—Borough Road Surveyor.

ADELAIDE.—January 16th.—For the supply of copper tubes, for the Supply and Tender Board.—Mr. S. A. Strickland, 85 Gracechurch-street, E.C.

POPLAR.—January 22nd.—For the renewal of road sweepings, and the supply of iron castings, brooms, rotary machine brushes, points, &c., for the borough council.—Mr. H. Heckford, borough surveyor.

## Roads.

WEST HAM.—January 6th—15th.—For making up two roads, for Education Committee.—Education Department, 95 The Grove, Stratford, E.

LEEDS.—January 8th.—For paving and flagging certain streets, for the corporation.—Town Clerk.

PERRY BARR.—January 9th.—For the supply of rag and blast furnace cinder, for the urban district council.—Mr. E. Ward, clerk, King's-court, 117 Colmore-row, Birmingham.

NORTH RIDING.—January 9th.—For work of steam rolling and scarifying, for the county council.—Mr. W. G. Bryning, county surveyor, Northallerton.

ALDERSHOT.—January 9th.—For the supply of flints, for the urban district council.—Mr. W. E. Foster, clerk.

MIDHURST.—January 9th.—For the supply of granite and tar-macadam, for the rural district council.—Mr. A. G. Gibbs, surveyor.

MERIDEN.—January 9th.—For the supply of granite, for the rural district council.—Mr. A. W. Liggins, clerk.

CREWE.—January 9th.—For making up a street, for the corporation.—Mr. H. K. Feltham, town clerk.

WALLINGFORD.—January 10th.—For making up a road, for the rural district council.—Mr. G. F. Slade, clerk.

MACCLESFIELD.—January 10th.—For road-making and other works, for the corporation.—Mr. C. W. Stubbs, borough engineer.

BRECON.—January 11th.—For road improvement work, for the county council.—Mr. W. L. Harpur, county road surveyor, County Hall, Brecon.

BEXLEY.—January 13th.—For the supply of highway materials, tar, pipes, Portland cement, &c., for the urban district council.—Mr. T. G. Baynes, clerk.

CROMPTON.—January 13th.—For completing certain roads, for the urban district council.—Mr. F. F. Gartside, clerk and surveyor.

HITCHIN.—January 15th.—For the supply of broken granite, for the urban district council.—Mr. W. O. Times, clerk.

WANDSWORTH.—January 15th.—For executing works of repair in three roads, for the borough council.—Mr. Henry George Hills, town clerk.

ST. PANCRAS.—January 15th.—For the supply of road and other materials, removing road sweepings, horsing water vans, and road-sweeping and other machines, &c., for the borough council. Mr. C. H. F. Barrett, town clerk.

GLOUCESTERSHIRE.—January 15th.—For the supply of stone for roads, for the county council.—Mr. S. E. Sinnott, county surveyor.

WATFORD.—January 15th.—For the supply of broken granite, for the urban district council.—Mr. W. Hudson, clerk and solicitor.

FARNHAM.—January 16th.—For treating certain roads with tar, for the urban district council.—Mr. R. W. Cass, surveyor.

SURREY.—January 16th.—For the supply of granites, basalts, tar-macadam, tar, pitch and tar oils, for the county council.—Mr. A. Dryland, county surveyor.

GODSTONE.—January 16th.—For tar-spraying certain highways, for the rural district council.—Mr. G. E. Crowter, engineer and surveyor.

UCKFIELD.—January 17th.—For the supply of broken granite, broken Kentish ragstone, broken Sevenoaks stone, broken flints, and compo sand or chippings, for the rural district council.—Mr. Frederick Holman, clerk.

SPILSBY.—January 19th.—For the supply of broken granite, broken slag and slag chippings, for the rural district council.—Mr. G. Beaumont Walker, clerk.

INCE.—January 20th.—For paving, kerbing, sewering, for the urban district council.—Mr. A. T. Swaine, surveyor.

NORFOLK.—January 20th.—For the supply of roadmen's tools and implements, for the county council. —Mr. T. H. B. Heslop, county surveyor.

NORFOLK.—January 20th.—For the supply of gravel, flints, chalk, and marl, for the county council.—Mr. T. H. B. Heslop, county surveyor.

NORFOLK.—January 20th.—For the supply of granite, for the county council.—Mr. T. H. B. Heslop, county surveyor.

HALIFAX.—January 20th.—For the execution of private street works, for the corporation.—Mr. J. Lord, borough engineer.

CHELTENHAM.—January 23rd.—For the supply of road and sanitary materials, ironmongery, tools, files, electric-light fittings, &c., for the corporation.—Mr. J. S. Pickering, borough engineer.

NEWPORT.—January 24th.—For surface tarring 100,000 yds. of roadway, for the corporation.—Mr. H. Tremelling, borough engineer.

ESSEX.—January 27th.—For the supply of Norway granite kerb and setts, for the county council.—Mr. Percy J. Sheldon, county surveyor.

## Sanitary.

PENARTH.—January 6th.—For laying a sewer, for the urban district council.—Mr. E. J. Evans, surveyor.

PONTARDAWE.—January 6th.—For laying sewers and constructing manholes, for the rural district council. —Mr. W. Lewis, clerk.

ALEXANDRIA.—January 9th.—For the construction of main rain-water sewer and waste pipe, for the municipal authorities.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street.

BALLINASLOE.—January 9th.—For the supply of stoneware sewer pipes, for the urban district council. —Mr. J. L. Dunne, Creagh, Ballinasloe, town surveyor.

WILLENHALL.—January 9th—30th.—For the construction of sewage disposal works, for the urban district council.—Mr. R. Tildesley, clerk.

HENLEY-IN-ARDEN.—January 11th.—For cleaning beds at sewage disposal works, grubbing, &c., for the rural district council.—The Clerk, 10 Guild-street, Stratford-on-Avon.

HONLEY.—January 13th.—For the construction of a sewer, for the urban district council.—Mr. T. Smailes, clerk.

MELKSHAM.—January 13th.—For the construction of sewage disposal works, &c., for the urban district council.—Mr. A. G. Smith, solicitor and clerk.

RADCLIFFE.—January 13th.—For the supply of filtration material, for the urban district council.—Mr. S. Mills, clerk.

SALFORD.—January 16th.—For the supply of clinker for percolating filters, for the corporation.—Borough Engineer.

HALIFAX.—January 18th.—For the extension of the sewage works, for the corporation.—Mr. J. Lord, borough engineer.

MANCHESTER.—January 22nd.—For the construction of main drainage works, for the corporation.—Mr. Thomas Hudson, town clerk.

HATFIELD.—January 22nd.—For the construction of sewers, manholes, pumping station, and suction and settling tanks, for the rural district council.—Mr. Ernest J. Dunham, clerk.

### Stores.

KEIGHLEY.—January 9th.—For the supply of materials and work, for the corporation.—Mr. J. C. Dawes, borough sanitary inspector.

HAMPSTEAD.—January 11th.—For slopping, team work, supply of paving, granite, &c., for the borough council.—Mr. A. P. Johnson, town clerk.

LANCASTER.—January 12th.—For the supply of materials and labour, for the corporation.—Mr. T. C. Hughes, town clerk.

PLYMOUTH.—January 20th.—For the supply of paints, ironwork, petroleum oil, broomheads, brushes, iron and steel, Portland cement, lubricating oils, tar and pitch, disinfectant fluids, road metal, &c., for the corporation.—Mr. James Paton, borough engineer and surveyor.

CHISLEHURST.—January 30th.—For the supply of materials and labour, for the urban district council.—Mr. H. E. Knight, clerk.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President*—MR. ALBERT D. GREATOREX, M.INST.C.E., Borough Engineer and Surveyor of West Bromwich.

#### MIDLAND DISTRICT MEETING.

A Midland District meeting will be held at Stourbridge on Saturday, April 13, 1912.

#### EXAMINATION, 1912.

An examination will be held on March 28, 29 and 30, 1912, at the Examination Hall, Victoria Embankment, London, S.W.

Notice is hereby given that, in accordance with by-law 14, each member or associate member of the Institution desiring to nominate one member or one associate member for the council must send such nomination to reach me not later than February 1, 1912. Each nomination must be accompanied by the written consent of the nominee. No special form is required.

THOMAS COLE,
11 Victoria-street, S.W. *Secretary.*

## INSTITUTION OF MUNICIPAL ENGINEERS.

*President*—MR. E. A. STICKLAND, ASSOC.M.INST.C.E., Borough Surveyor, Windsor.

#### WESTERN DISTRICT MEETING AT BIRMINGHAM.

(Thursday, January 18th.)

PROGRAMME.

Assemble at White Horse Hotel, Congreave-street, at one o'clock. Lunch at the invitation of Mr. W. E. Farrer. Immediately after luncheon a district meeting will be held in the assembly room of the hotel, where a paper, "The Institution and its Benefits to Members," will be presented by Mr. Henry Hulse, borough surveyor and engineer, Droitwich, and chairman of the Western District. If time permits, a further paper, "The Proper Disposal of Domestic Wastes in Rural Districts," will be presented by Mr. J. Brook, the district secretary. Both papers will be printed for circulation and will be taken as read. Discussion will follow.

At the conclusion of the meeting a visit will be paid to the Star Sanitary Ware Works of Messrs. W. E. Farrer, Limited, Cambridge-street, where an inspection will be made of the various materials and appliances manufactured by the firm. Return will then be made to the hotel, where tea will be provided by Mr. Farrer.

Members of North-Western and North-Eastern districts are specially requested to attend.

J. BROOK,
*Hon. District Secretary.*
6 College-street,
Stratford-on-Avon.
January 3, 1912.

#### EXAMINATIONS.

The next examination will be held in May, 1912, at dates and centres to be arranged. Full particulars may be obtained of the Secretary, Institution of Municipal Engineers, 29 Victoria-street, London, S.W.

## ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

The following books and pamphlets were presented to the library of the above-named association during December:—

"Practical Sewerage and Sewage Disposal," by H. C. H. Shenton, M.S.E.; presented by the author.

Report upon Sludge Disposal, Report on a Visit to Germany, Report upon Indigo Dyeing, Biological Report on the Balne Beck, Report on the Treatment of Wool Scouring Refuse (West Riding Rivers Board); presented by Dr. H. Maclean Wilson, chief inspector.

Proceedings of the Joint Committee, Mersey and Irwell Watershed; presented by Mr. Hugh Stowell, ASSOC.M. INST.C.E., chief inspector.

## TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BROMLEY.—For the erection of a women's convenience at Martin's Hill, for the corporation:—

| | |
|---|---|
| J. L. Woodham & Sons | £327 |
| W. J. Penfold | 311 |
| Lister & Co. | 309 |
| W. Gratty | 294 |
| Treasure Brothers | 258 |
| A. P. Poingdestre | 250 |

Borough engineer's estimate, £280.

BROMLEY.—For making up Hilldrop and Gladwell roads and Nicholl-lane, for the corporation (the amounts being for the roads in the above order):—

| | | | |
|---|---|---|---|
| Fry Brothers | £702 | £498 | £363 |
| Peill & Sons | 695 | 502 | 347 |
| Mowlem & Co. | 677 | 480 | 331 |
| T. Wood & Sons | 692 | 496 | 341 |
| R. Tonge | 630 | 460 | 350 |
| H. Woodham & Sons | 678 | 483 | 339 |
| W. Pearce | 678 | 481 | 353 |
| E. Free & Sons | 710 | 508 | 352 |

The lowest tender for each road was accepted.

CHELMSFORD.—For private street work, for the corporation:—

| | |
|---|---|
| Wilson, Border & Co. | £581 |
| R. A. Bonnett † | 473 |

HUNTS.—For additions to council school, for the education committee.—Mr. H. Leete, county surveyor:—

| | |
|---|---|
| Kidman Brothers, Cambridge | £1,400 |
| W. Wade, St. Neots | 1,399 |
| M. J. Allen & Sons, Brampton | 1,338 |
| H. Rooke & Sons, Cambridge | 1,328 |
| G. Page & Son, Buckden | 1,307 |
| F. B. Thackray & Co., Limited, Huntingdon | 1,228 |
| H. F. Bull, St. Neots | 1,224 |
| G. Wrycroft & Sons, St. Neots* | 1,165 |

HOUGHTON-LE-SPRING.—For additions to the isolation hospital, for the rural district council:—

| | |
|---|---|
| Darlington Construction Company | £706 |
| Humphreys | 671 |
| F. Smith & Co., Stratford | 638 |
| W. Harton | 619 |
| Ginger, Lee & Co., Manchester | 579 |
| J. Brown, Houghton | 555 |
| Cowieson, Glasgow* | 522 |

KIRKCALDY.—For repairing, pitching, and concreting bank round the tidal basin at Kirkcaldy Harbour, for the corporation.—Mr. W. Lockhart, harbour engineer:—

| | |
|---|---|
| W. Pearce, Berwickshire | £1,204 |
| A. Gray & Co., Kirkcaldy | 1,054 |
| G. Smith & Son, Kirkcaldy | 978 |
| H. Robertson, Inverkeithing | 841 |
| A. Brunton & Son, North Queensferry | 821 |
| R. J. Morrison, Kirkcaldy | 744 |
| A. Fraser, Kirkcaldy* | 604 |

LANCHESTER.—Accepted for the construction of pipe sewer, with manholes, for the rural district council.—Mr. G. W. Westgarth, surveyor:—

J. Westgarth, Blackhall, Co. Durham, £139.

MAIDSTONE.—For improvements at the baths, for the corporation:—

| | |
|---|---|
| W. T. Burrows | £375 |
| E. Smith | 304 |
| H. Cruttenden & Son † | 359 |

REIGATE.—Accepted for the supply of new 6-ton steam roller, for the corporation.—Mr. A. Smith, town clerk:—

Aveling & Porter, Limited, £377.

## MEETINGS.

*Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.*

JANUARY.

6.—Junior Institution of Engineers. Mr. Marconi delivers his presidential address.

9.—Institution of Civil Engineers. Papers to be read:—"Reinforced Concrete Wharves and Warehouses at Lower Pootung, Shanghai," by S. H. Ellis, M.INST.C.E.; "The Direct Experimental Determination of the Stresses in the Steel and in the Concrete of Reinforced Concrete Columns," by William C. Popplewell, M.SC., ASSOC.M.INST.C.E., "Composite Columns of Concrete and Steel," by W. H. Burr, M.INST.C.E. 8 p.m.

JANUARY.
11.—Society of Architects: Mr. John Darch, F.S.I., on "Illumination as a Study for Architects." 8 p.m.
15.—Association of Consulting Engineers: Inaugural Meeting; Institution of Electrical Engineers. 4 p.m.
24.—Royal Institute of British Architects: President and Council's "At Home." Exhibition of Drawings submitted in Competition.
FEBRUARY.
10.—Royal Sanitary Institute: Sessional Meeting at Nottingham.
16.—Royal Institution: Sir John H. A. Macdonald on "The Road: Past, Present and Future." 9 p.m.

## APPOINTMENTS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No.* 1359 *Holborn), subject to later confirmation by letter.*

### COUNTY BOROUGH OF SOUTHPORT.
APPOINTMENT OF
BOROUGH SURVEYOR AND ENGINEER.

Applications are invited for the office of Borough Surveyor and Engineer.

Salary £600 per annum, rising by annual increments of £50 to £800 per annum.

Particulars of the conditions and duties of the office can be obtained on application to me.

Applications, stating age, qualifications and experience, and accompanied by not more than three recent testimonials, addressed to the undersigned, Town Hall, Southport, and endorsed "Borough Surveyor," must be delivered on or before 12 noon on Monday, the 15th of January next.

Canvassing is strictly prohibited, and will disqualify.

J. ERNEST JARRATT,
Town Clerk.

Town Hall, Southport.
December 20, 1911.

### CORNWALL COUNTY COUNCIL.
APPOINTMENT OF
AN ASSISTANT COUNTY SURVEYOR.

The Main Roads and Bridges Committee is prepared to receive applications for the office of Assistant County Surveyor to take charge (under the direction of the County Surveyor) of the Main Roads in the No. 1 District, which will comprise about 87 miles.

Candidates, who must not exceed 40 years of age, must have had practical experience of modern methods of road maintenance, including tar-macadam, pitch grouting, and tar-surface treatment, and be fully qualified to take levels, make surveys, prepare plans, and keep all necessary books and accounts.

The successful candidate will be required to devote the whole of his time to the duties of the office, and to reside at a centre to be approved by the Committee. Salary £150 per annum, rising by annual increments of £5 to a maximum of £175, to include all travelling and other expenses, except the cost of a railway season ticket within his district, carriage of a bicycle, postages and stationery. Office accommodation and clerical assistance will be provided by the County Council.

The appointment will be subject to three months' notice on either side. Applications, stating age, qualifications, and accompanied by copies of three recent testimonials, to be forwarded to the undersigned on or before the 13th January, 1912.

CHRISTOPHER L. COWLARD,
Clerk to the Council.

Bodmin.
December 21, 1911.

## COMPETITIONS OPEN.

### PRESTATYN (NORTH WALES).
TOWN PLAN.

Lord Aberconway and the Trustees of the Prestatyn Estate invite Designs for the Laying out of the Estate. Designs to be delivered on or before March 15th, 1912. Premiums £50, £30, and £20. Judge, Mr. H. V. Lanchester, F.R.I.B.A.

Applications for copies of Conditions, Plan and By-laws, and accompanied by a deposit of 10s. 6d., which sum will be returned to Competitors who submit *bonâ-fide* designs or return the conditions, &c., within 14 days of their receipt, should be sent on or before January 8th, 1912, addressed to Lord Aberconway and the Trustees of the Prestatyn Estate, 33 Henrietta-street, Strand, W.C.

### HALE URBAN DISTRICT COUNCIL.
TOWN PLANNING SCHEME.

The above-named Council invite schemes for the Laying Out of the unbuilt-upon portion of the District under the Town Planning Act, 1909. Premiums of £50 and £25 respectively will be awarded to the Competitors sending in the two schemes considered by the Council to be the most suitable for the District.

Forms of "Conditions and Suggestions" may be had by intending Competitors on written application to the undersigned, enclosing a stamped addressed envelope of foolscap size.

J. G. WHYATT,
Clerk.

Council Offices,
Hale, Cheshire.
January 4, 1912.

## TENDERS WANTED.

### CORPORATION OF CHELTENHAM.
CONCRETE FILTER TANK AND FILTER HOUSE.

Tenders are invited for the Construction of a Concrete Filter Tank (area 750 yards) and a Brick Filter House (70 ft. by 30 ft.) at the Waterworks Pumping Station, Tewkesbury.

Drawings may be seen, and Quantities, &c., obtained, after the 10th January, at the Office of the undersigned on payment of Three Guineas, which will be returned on receipt of a *bonâ-fide* Tender.

Sealed and endorsed Tenders are to be delivered not later than Tuesday, the 23rd January.

The lowest or any Tender will not necessarily be accepted.

J. S. PICKERING, M.INST.C.E.,
Borough Engineer.

Municipal Offices,
Cheltenham.

### BOROUGH OF CHELTENHAM.
YEARLY TENDERS.

Tenders are invited for the Supply of the following for the year ending the 31st March, 1913: Portland Cement, Forage, Stoneware Pipes, Broken Stone, Kerbs and Setts, Coal for Boilers, &c., Disinfectants, Oils, Colours, &c., Ironmongery (including Wrought-iron Tree Guards), Timber (including Wheelbarrows and Street Orderly Trucks), Indiarubber Goods, Lead (Sheet, Pipe and Tape), and Brass Fittings, Tools for Highways, &c., Wrought Iron, Steel, Files, &c., Electric Light Fittings, Household Goods, Sundries, &c. (including Cotton Waste, Bathing Drawers, Towels, Road Brooms, &c.), Lias Lime, Bricks, &c., Clothing (including Uniforms, Flannel Suits, Waterproofs, Overalls, &c.), Castings (for two years), Cast-iron Pipes (for two years).

Forms of Tender may be obtained from the undersigned, to whom sealed and endorsed Tenders are to be delivered not later than the 23rd January, 1912. The lowest or any Tender will not necessarily be accepted.

J. S. PICKERING,
Borough Engineer.

Municipal Offices,
Cheltenham.
January 1, 1912.

### THE RURAL DISTRICT COUNCIL OF GODSTONE.
HIGHWAYS AND BRIDGES DEPARTMENT.

The Council invite Tenders for Tar-spraying certain Highways during the ensuing season. The area of work cannot be guaranteed, but there will be approximately 450,000 superficial yards of surface to be treated.

Tender Forms can be obtained on application to the undersigned upon receipt of a stamped and addressed envelope.

Tenders must be sealed and endorsed "Tender, Tar-spraying," and must be delivered to me not later than 12 noon on Tuesday, the 16th day of January, 1912.

The Council will not bind themselves to accept the lowest or any Tender.

GEO. E. CROWTER,
Engineer and Surveyor.

High-street,
Godstone,
Surrey.
January 1, 1912.

## HINCKLEY RURAL DISTRICT COUNCIL.

*BARWELL AND EARL SHILTON WATER SUPPLY.*

CONTRACT No 1.—WATER PIPES.

The above Council invite Tenders for the Supply and Delivery of about 7 miles of Cast-Iron Socketed Water Pipes and Specials of various diameters.

Copies of Conditions of Contract, Specification and Bill of Quantities, together with Form of Tender, may be obtained from the undersigned on payment of the sum of £3 3s., which amount will be returned on receipt of a *bonâ-fide* Tender.

Any other information may be obtained from the Engineer for the scheme, Mr. E. H. Crump, ASSOC.MEM. INST.C.E., Hinckley.

The Council do not bind themselves to accept any or the lowest Tender, and they also reserve the power to accept a part of any Tender.

Tenders must be sent to me, the undersigned, on or before January 12th, 1912, and each Tender must be endorsed "Contract No. 1.—Water Pipes."

JOHN W. PRESTON,
Clerk to the Council.

Church-street,
Hinckley.
December 23, 1911.

## HINCKLEY RURAL DISTRICT COUNCIL.

*BARWELL AND EARL SHILTON WATER SUPPLY.*

CONTRACT No. 2.—VALVES, &c.

The above Council invite Tenders for the Supply and Delivery of the necessary Hydrants, Stop Valves, Air Valves and Boxes for the same in connection with the above scheme.

Copies of Conditions of Contract, Specification and Bill of Quantities, together with Form of Tender, may be obtained of the undersigned on payment of £1 1s., which amount will be returned on receipt of a *bonâ-fide* Tender.

Any other information may be obtained from the Engineer for the scheme, Mr. E. H. Crump, ASSOC.MEM. INST.C.E., Hinckley.

The Council do not bind themselves to accept any or the lowest Tender, and they also reserve the power to accept a part of any Tender.

Tenders must be sent to me, the undersigned, on or before January 12th, 1912, and each Tender must be endorsed "Contract No. 2.—Fittings."

JOHN W. PRESTON,
Clerk to the Council.

Church-street,
Hinckley.
December 23, 1911.

## HINCKLEY RURAL DISTRICT COUNCIL.

*BARWELL AND EARL SHILTON WATER SUPPLY.*

CONTRACT No. 3.—LAYING OF WATER MAINS.

The above Council invite Tenders for the Laying and Jointing only of about 7 miles of Cast-Iron Socketed Pipes, and the Fixing of the necessary Hydrants, Valves, &c., in connection with the above scheme.

All pipes, hydrants and valves will be provided and delivered on to the site by the Council.

Copies of Conditions of Contract, Specification and Bill of Quantities, together with Form of Tender, may be obtained from the undersigned on payment of the sum of £2 2s., which amount will be returned on receipt of a *bonâ-fide* Tender.

Any other information may be obtained from the Engineer for the scheme, Mr. E. H. Crump, ASSOC.MEM. INST.C.E., Hinckley.

The Council do not bind themselves to accept any or the lowest Tender.

Tenders must be sent to me, the undersigned, on or before January 12th, 1912, and each Tender must be endorsed "Contract No. 3.—Laying Pipes."

JOHN W. PRESTON,
Clerk to the Council.

Church-street,
Hinckley.
December 23, 1911.

## SPILSBY RURAL DISTRICT COUNCIL.

TENDERS FOR GRANITE AND SLAG.

The above Council are prepared to receive Tenders for the Supply of about 5,000 tons of Broken Granite, 9,000 tons of Broken Slag, and 400 tons of Slag Chippings, to be delivered in such quantities and at such times as the Council shall require and direct.

Specifications, Conditions of Contract, and Forms of Tender, showing the Stations at which the Material is to be delivered, and the approximate quantity to be delivered at each Station, may be obtained on application to Mr. Wm. Cooke Brakenridge, District Surveyor of Highways, Spilsby, to whom a small sample box of stone must be sent.

Tenders, endorsed on the cover "Tender for Road Material," must be delivered at my Office not later than the 19th day of January.

The Council do not bind themselves to accept the lowest or any Tender.

(Signed) G. BEAUMONT WALKER,
Clerk.

Spilsby.
January 1, 1912.

## ESSEX COUNTY COUNCIL.

HIGHWAYS COMMITTEE.

The Essex County Council are prepared to receive Tenders for the year ending 31st March, 1913, for the Supply of Norway Granite Kerb and Setts.

Forms of Tender, and the special envelope in which the Tenders are to be delivered, and all other information and particulars, can be obtained at the County Surveyor's Office at Chelmsford.

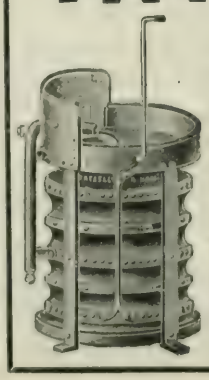
Tenders to be delivered on or before Saturday, the 27th January, 1912.

PERCY J. SHELDON, M.INST.C.E.,
County Surveyor.

Office of the County Surveyor,
Chelmsford.
January 3, 1912.


WE MAKE
SUPERIOR
QUALITY
TOOLS
OF EVERY DESCRIPTION.

JOHN
YATES
& CO., LTD.,
Aston Manor,
BIRMINGHAM



Telephones EAST 400, 401 and 402.
Private Branch Exchange.
Telegrams "YATONIAN, BIRMINGHAM."

ESTABLISHED
1804.

# The Surveyor

And Municipal and County Engineer.

Vol. XLI. JANUARY 12, 1912. No. 1,043.

## Minutes of Proceedings.

**The Road Board: Specification No. 7 and the Appendix.**

We heartily welcome the Appendix to Road Board Specification No. 7, and it would be mere affectation to attempt to hide our satisfaction in finding that the Road Board is giving effect to a policy which has been strongly advocated in these columns, and accepts, in principle, the importance of studying a road as a whole before embarking on crust improvement. This appendix contains a brief outline of the scope of a proper survey of the road, and suggestions for making notes on just those points the importance of which we have often alluded to. It is possibly by inadvertence that the actual procedure to be adopted under certain circumstances appears in solitary prominence as a kind of parenthesis in section 10, for, with this one exception, the directions are general in character, though they are quite definite in pointing out what kind of information should be recorded. Surveyors who are troubled by surface water flowing on to the roads from the banks, or by seepage from water accumulating on the land alongside the road will see in section 2, a suggestion that our efforts to bring this important matter to the front have not been unsuccessful, and that in a quarter to which the local road engineer must look for help in dealing with these difficulties. Section 8, too, involves a recognition, small but significant, of the importance of taking into account the knowledge and experience of the man on the spot. This citation of important points to which attention should be paid in these studies is described as applying to "roads which require a preliminary examination and reformation of contour before a steam-rolled macadam surface can be satisfactorily applied to them," and possibly the Board intends to issue a similar note referring to roads generally, or to roads which, though they may have had fairly good crusts, or good but costly crusts, for many years, need to be improved as earthworks before an attempt is made to give effect to economy and efficiency in crust construction and maintenance. At the same time this appendix to Specification No. 7 really covers such cases almost as well as the cases of roads which, as regards crusts, are at an elementary stage of development. Probably it is needed more for main roads than for by-roads, for reasons into which we cannot enter here.

**The Specification and its Scope.**

As regards the specification itself we have read it with feelings very different from those aroused by a perusal of the much more important appendix. It purports to contain "general directions for surfacing an existing road with steam-rolled water-bound macadam," but the whole of it is not covered by this heading, and the parts which really refer to surfacing do not amount to a thousand words. Is it possible, we ask, to give general directions of such a kind within the limit of a thousand words? A typical case, with given materials, might have been presented; but that is quite another matter. Section 7 seems to be an attempt to give, on one point, the procedure in a typical case—surely not "general" in character. Again, in section 9, the weight of the roller may be an average or an ordinary weight, but not a general weight suitable all round. Section 2 relates to investigations which may be made, conveniently, when a road is soon to be re-coated, but preferably a couple of months before, and this might have more suitably appeared in the appendix. Section 3, in spite of the concluding words of section 1, deals with bottoming, and section 4 with the crust generally. The process of elimination of pertinent matter, and that of selecting considerations of an extra-sequential character, must have been mentally painful, and the result is vague rather than general as regards its application to practical road engineering. If we look, for instance, at section 3, we find a valuable principle recognised as regards the strengthening of the haunches, but this reference is intertwined with one relating to bottoming with stone of a gauge from 3 in. to 4 in., nothing being said about packing material. Then, turning to section 5, we find that a finished thickness of from 2 in. to 3 in. is specified—not necessarily more—and in section 7 a specification of the sizes of the stone for this. Since it is not suggested in section 3 that the old crust should be taken up and put back on the top of the 3-in. or 4-in. stuff, or that, if this is not done, the "if" of section 5 becomes a "must," a good deal is assumed to be understood.

There are valuable hints in this note—for instance, in sections 4, 8, 9, and 11, the last being especially welcome; but the whole does not "bind." We understand what a specification is, and what a covering specification is, but, frankly, we do not see how general directions can amount to a specification. There cannot be a general specification of any process or thing, and within its assigned limits a covering specification is as definite as a specification proper. A cross-fall of 1 in 24 may be a fair average one for roads generally, but cannot as a specific cross-fall apply to roads in general, road crusts of all materials and carriageways of all widths, and with varying lengthwise slopes. A covering specification would give the usual limits from the steepest to the flattest, which happens to be 0 in 24. Again, the tight rolling in the dry would fail to be effective with some materials, because the binder would not go in if applied in the

manner described. The idea is excellent, because much good stuff is spoiled by too much rolling in the wet; but it is an idea which cannot briefly be embodied in directions. There are excellent ideas in this note, but they do not "materialise"; possibly the "medium" is unsuitable.

The administrative work of the Road Board is so valuable that, as we have said before, it is a pity that the Board has no adequate means of putting into coherent and useful form the equally valuable technical resources which are available, and particularly, as in this instance, the advice of the Technical Committee, which is especially useful as being that of practical men closely occupied with responsible and important duties in the same and similar spheres.

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**Tramway Congestion.**

The London traffic problem is so acute as to render it beyond dispute that some drastic remedy is nothing short of an urgent necessity. Any practical suggestion for improving the present conditions at the most congested points is worthy of all consideration, and we have therefore no hesitation in complying with the request of the Roads Improvement Association that we should give the fullest possible publicity to the memorial dealing with the congestion due to alleged excessive tramway traffic, which that body have recently submitted to the Board of Trade. The form of the memorial is excellent. It puts the case clearly and concisely, and every statement is fully substantiated by facts ascertained by actual observation. The complaint against the trams is fourfold. It is first said that undue traffic congestion is caused by the frequent and close running of an unnecessary number of cars during those periods of the day when tramway passenger traffic is small. The existence of a by-law providing for a distance of at least 50 yards between cars on the same track will be a surprise to many. It is certainly honoured more in the breach than in the observance; and the Association are unquestionably justified in asking that while it exists it shall be duly enforced.

In support of the suggestion that the number of cars should be materially reduced during the slack hours of the day some cogent statistics are given of the number of passengers per car on several routes, the most striking being those of observations taken in City Road on November 27th, which show an average of about eight passengers for each of the 945 cars which passed the point in question between 11.20 a.m. and 6 p.m. At the same point the by-law mentioned above was on this day infringed no fewer than 165 times! The next complaint is as to the congestion which takes place at the junctions of tramway lines. In this connection also statistics are given, and the gravamen of the complaint is the excessive and unnecessary number of cars, which, being confined to a fixed track, occasion the maximum amount of inconvenience to general traffic. In the third place the memorial calls attention to the widespread practice of stopping tramway carriages abreast on parallel lines. This, again, is in direct contravention of a by-law, which is encouraged in many instances by placing the "stop" notices for up and down tracks directly opposite each other. Finally, complaint is made of the badly regulated manner in which certain of the track repairs are carried out, particularly where both tracks are up at the same time.

In questions which affect the user of public highways we hold the view that the deciding factor must be the balance of public convenience. This is by no means easy to ascertain. The Roads Improvement Association have stated an *ex parte* case, which we confess is *prima facie* convincing. It is now for the tramway authorities (in the language of the Law Courts) to "show cause," and we shall be interested to hear what they have to say. The matter is one of great importance, and we venture to hope that the Board of Trade will take some action, which might best perhaps take the form of a round-table conference.

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**Tar-Macadam in Canada: City Streets in Ontario.**

In our issue of October 21st, 1910, we published a review, specially prepared for The Surveyor, of a valuable report on the highways of Ontario, by Mr. W. A. MacLean, provincial highway engineer, and this review was prefaced by a brief note, in which were set forth in outline, and in comparison with the United Kingdom, the leading features of the province from the highway engineer's point of view. In the present issue we have reproduced a paper, a copy of which was kindly sent us by Mr. MacLean, in which are described the methods adopted in making street pavements in the cities of Ontario. The use of tar-macadam in a climate so severe as that of this province—in which the range of temperature is from 20 deg. below zero to 103 deg. Fahr., and where there are extremes of moisture in spring and autumn, with long periods of dry weather in summer, and really severe cold, with deeply-frozen ground, in the winter—will be followed with much interest by highway engineers. Limestone seems to have been the material chiefly used, and generally, Mr. MacLean thinks, tar-macadam is not debarred by climatic conditions as a useful road material, though, as municipal engineers will not be surprised to learn, it has been less durable under concentrated wear than sheet asphalte. Mr. MacLean's notes at the end of the paper will be read with interest by all who are concerned with the maintenance of city streets.

Important points to which he draws attention are the grading of the stone, maximum density, coarseness near the surface, a gradual building up of the crust. The paper relates to city streets, including roads with light traffic in residential quarters, and in one of such roads the pavement has lasted well for some six years. A matter demanding attention as regards the use of tar for country roads is the possible effect of clay in emulsifying bituminous binders; and on this point, raised some time ago by the State Highway Engineer of Maryland, Mr. MacLean cites the experiences of Chatham (Ontario), as tending to show that some action of the kind does occur.

* * *

**Municipal Progress in Belfast.**

The signs of municipal progress in Ireland continue to be very marked. While in Dublin an impetus is being given to the spirit of reform in the housing conditions and the betterment of the side streets and alleys, many of which are in a deplorable state, the information in respect to Belfast is still more satisfactory in so far as it relates to street improvement works and housing, because it tells of much that has been actually accomplished, and points to further tangible developments in the future. The corporation, thanks in no small measure to the skill and industry of the city surveyor, Mr. Henry A. Cutler, M.Inst.C.E., and his assistant, Mr. James Munce, M.Tn.I.C.E., have succeeded in getting their Omnibus Bill passed to enable them to provide a series of new tramway routes to meet the growing volume of traffic, to construct a bridge in place of a level crossing, to undertake a variety of works for the prevention of floods—a matter that has long been a grievance in Belfast—and to enable the civic authority to exercise certain extended powers over buildings, both new and old, including a provision to permit the construction of iron, steel, and reinforced concrete buildings. All this is excellent in its way, and the citizens will doubtless benefit from the larger authority of the corporation, in the added facilities for travel that will be created, as well as the improved amenities that will in due course materialise as the result of a new jurisdiction. But in addition there is now in process of completion, so far as the preliminaries are concerned,

a scheme under the Housing Acts which will leave its mark permanently upon the topography of the city. The project is a considerable one, involving the clearance of a large slum area, and the negotiations are necessarily extensive, and not very easily expedited. Nevertheless steady progress is being made with the scheme, so much so that the Public Health Committee has recommended the corporation to obtain competitive designs for the houses. Side by side with the improvement of the face of the city there is apparent a continued growth of its area, which makes constantly increasing demands upon the responsibilities of the corporation and the duties of the city surveyor's department.

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**Efficiency in Municipal Engineering.**

In a recent issue of our contemporary *Engineering Record* (New York) we notice an interesting article, entitled "Efficiency in Municipal Engineering," in which the writer starts by asserting that "the municipal engineer and his assistants, as a class, are not rarely considered by the general public, the business man and other engineers as being less systematic, capable, and energetic than engineers in private employment. In fact, previous employment by a city has occasionally been found detrimental to a man who desires to make a change. There is much less reason for this opinion to-day than ever before, but as it is an opinion which still finds expression it is worth while considering it from several points of view."

This was, of course, written *à propos* of American practice only, but one or two of the matters discussed are in our view of sufficient interest to British municipal engineers to warrant our commenting on them. For example, office records in regard to technical matters are often not kept with the same strictness as applies, for instance, to the allocation of time and materials. Field books, level books, and so forth are often regarded as the private property of the assistant who uses them. If they were numbered and filed as office records, it would no doubt result in an increased sense of responsibility. Further, the record maps of gas and water pipes, sewers, and so on should not be suffered to get out of date. The assistant in a municipal engineer's office, however, needs some incentive if he is to be thoroughly efficient in his work—an observation which also applies to a chief. Lack of efficiency is in our opinion generally due to inadequate remuneration and a feeling that the best work will not receive due appreciation. British municipal engineers as a class are intelligent and capable public servants, and, given a fair degree of encouragement, they perform a most difficult task with credit to themselves and benefit to the populations which they serve.

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**"The Surveyor" Special Issue: Chief Contents.**

The Special Annual Issue of THE SURVEYOR will be published on Friday, the 26th inst., and its chief feature will, as usual, be a carefully-compiled forecast of municipal works projected. These works involve the expenditure of many millions of pounds, and there is absolutely no other source from which such comprehensive details as to their nature and extent can be obtained. In addition to illustrated articles, retrospects, contributed by specialists, will be given of the past year's work in connection with Sewerage and Sewage Disposal, Water Supply, Roads, Bridges, Refuse Disposal, Municipal and Public Buildings, Municipal Tramway Work, Electricity Supply, and Street Lighting. Legal precedents and the legislation of 1911 in relation to municipal engineering will form the subjects of other valuable contributions to the issue, which also contain the customary Law Notes, Assistants' and Students' Section, Reports of Municipal Work in Progress and Projected, Local Government Board Inquiries, personal notes, and the fullest information relating to vacant appointments, municipal contracts and competitions. All matter intended for insertion in the Special Issue should reach us without delay, and readers desirous of obtaining extra copies are requested to order in advance to prevent disappointment.

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**Institution of Municipal and County Engineers.**

The unfortunate necessity which has arisen for the holding of farther special general meetings of the Institution of Municipal and County Engineers in connection with the changes in the constitution appears to be entirely due to the Board of Trade, who have now admitted that the view taken by the solicitor to the institution in regard to certain matters is correct. We have always expressed the opinion that there are considerable disadvantages attaching to the institution's connection with the Board of Trade, and the present case appears to be an example of this. The council are now endeavouring to complete the matter with the minimum amount of inconvenience to the members, and to this end have fixed the first special general meeting for to-morrow (Saturday), when a council meeting will also be held, and the second for February 9th, when a metropolitan district meeting will take place. At the latter meeting a paper on "The Relation of Modern Road Surfacings to Fish Life" will be read by Mr. W. J. A. Butterfield. It is hoped that at both gatherings the necessary quorum may be obtained, so that the matter may be finally disposed of.

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**The Virtue of Tidiness.**

In the season when the consumption of such fruits as bananas and oranges is at its maximum accidents due to the careless throwing of skins on to public footways occur with unfortunate frequency. The exercise of a little care and thoughtfulness is all that is required to avert occurrences which often result in serious injury, or even permanent disablement, to entirely innocent victims. There are some people, however—and we suppose there always will be—who are apparently incapable of even the smallest attention to simple matters which concern their neighbours' safety and comfort, and for these some threat of penalty is the only method which is likely to succeed. We observe that in Paris a new police decree will shortly come into operation, providing for the prosecution of any one throwing paper or fruit-skins on the public footpath. We have seen notices on the subject in our own metropolis, but these are often entirely ineffective. A by-law for "good rule and government," under the Municipal Corporations Act, providing a substantial penalty, would appear to be the best remedy for what is really an intolerable public nuisance.

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**Old Houses at Guildford.**

The proposal to demolish some beautiful old cottages at Guildford for the purpose of widening Farnham-road has drawn a protest from the Master of Charterhouse, who speaks as a member of the public interested in the preservation of that which is most charming in a very lovely old town. The alternative method of carrying out a very necessary improvement is to acquire some larger and more expensive buildings on the opposite side of the road. The amount of the additional expense which would be involved is not known to us, but as ourselves lovers of the charming old town of Guildford we venture to suggest to the council to consider, if they have not already done so, that in these matters mere economy is not everything. "A thing of beauty is a joy for ever," and the possession of beautiful examples of appropriate, if humble, architecture will be a perpetual source of pleasure to the citizens, as well as a magnet of attraction for visitors—a matter of no little importance to the town.

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# Surfacing an Existing Road with Steam Rolled Water-Bound Macadam.

## ROAD BOARD'S GENERAL DIRECTIONS.

**[We reproduce herewith the General Directions and Specification (No. 7) which, as we reported last week, have been prepared for the Road Board by their Advisory Engineering Committee, and have been issued by the board in the hope that they will be useful to surveyors and others engaged in the work of road construction and maintenance.]**

(1) These general directions are intended for use in cases where a new surface coating is to be laid with steam rolled water-bound macadam on any road which has a proper foundation or sub-crust of adequate thickness.

TRIAL TRENCHES.

(2) Before laying the new surface, the thickness of the old crust, including the foundation, should be ascertained by opening trial trenches at intervals averaging about 150 yds. apart, extending from the side to the centre of the road, such trenches to be made alternately on opposite sides of the road. A careful record of the facts disclosed by these trenches should be kept with plans and sections for future reference.

(3) If a proper foundation or sub-crust of adequate thickness does not exist, or if the road is weak at the haunches, the following steps should be taken:—

In the case of heavily-trafficked roads the haunches should be strengthened and the crust thickened either with stone of any kind suitable for bottoming work, broken to a gauge of from 3 in. to 4 in., or with hard core, clinkers or other suitable materials, according to the nature of the subsoil. In some cases, where the surface of the broken stone, after being steam rolled, is sufficiently smooth for the purpose of traffic, it may be possible to allow the bottoming material to be used as the wearing surface of the road for a short period, not exceeding twelve months, if it is important for financial reasons to postpone for that period the laying down of the final surface coating in accordance with the other provisions contained in these general directions.

TOTAL THICKNESS OF CRUST.

(4) Even when there exists a good natural foundation, the total thickness of the road crust, including the old and the new macadam, after consolidation by rolling, should not be less than 4 in. In the case of well-drained subsoil, which cannot be materially softened by the infiltration of surface water, the total thickness, including the new consolidated surface coating, as well as the sub-crust and foundations (if any) should not under ordinary circumstances be less than 5 in. In the case of fairly hard clay, or other yielding subsoils, the total thickness, including foundations, should not be less than 9 in. In the case of soft, wet clay, or bog or marshy subsoil, foundations of a special character may be required. (See No. 10, Appendix.)

THICKNESS OF NEW SURFACE COATING.

(5) The thickness of the new surface coating of macadam when consolidated by rolling should be from 2 in. to 3 in., according to the traffic requirements. If it is desired that the new coating should have a greater thickness than 3 in. when consolidated, the stone should be applied in two coatings separately rolled.

CROSS-FALL.

(6) The finished surface should have a cross-fall of 1 in 24, or 1 in. to the foot. If the old crust is not sufficiently thick at the crown to enable this cross-fall to be obtained when a new coating of the thickness above mentioned is superadded, the old surface should be left intact and uncut-ted, and the thickness of the new coating of macadam should be increased as far as may be necessary. If the crust is of ample thickness, but the cross-fall excessive, it should be reduced by scarifying the surface and removing material from the crown to the sides previous to the application of the new coating. The material so removed by scarifying should be screened, and all material finer than 1¼ in. should be put on the sides to be used for top dressing during rolling operations.

STONE AND SCREENINGS.

(7) The road stone for the new surface coating should be stone of approved quality, broken as cubically as possible, and should contain about 70 per cent of stone which will pass through a 2¼-in. ring, but which will not pass through a 1¾-in. ring, about 20 per cent which will pass through a 1¾-in. ring, but which will not pass through a screen with rods ¾ in. apart. The screenings forming the residue from the above, which will be obtained by the use of the ¾-in. rod screen, should be kept separate and used as a top dressing during rolling operations.

SPREADING.

(8) The stone must be spread by careful men selected for their knowledge and experience of such work, as the durability and evenness of wear of the surface obtained by steam rolled coatings greatly depend on judicious, uniform spreading. The whole of the stone should be turned over in the process of spreading. Care must be taken not to allow the stone to be tipped upon the road close to the point of spreading, as this prevents a thorough turning over of the material in the act of spreading. When stones are transported by rail or by road over long distances the different sizes of stone are liable to separate themselves, and it is important that during the act of spreading they should be well mixed, so as to obviate the possibility of having larger stones on some parts of the road and smaller stones on other parts.

NOTE.—One ton to cover 8 to 9 sq. yds. may be taken as an average quantity required to give a consolidated thickness of 3 in. When stones are spread in thick coatings, so that 1 ton covers less than 8 yds., there is a greater liability to unequal consolidation, inasmuch as stones are pushed in front of the roller until the roller surmounts them and thus a corrugated or wavy surface is formed.

ROLLING.

(9) The rolling should be carried out by a roller of a weight of about 10 tons. This must be in charge of a skilled driver, who has been specially trained for the purpose. The macadam should be consolidated by starting the work at the sides and gradually working towards the centre. No water or binding should be applied until dry rolling has been carried out to a sufficient extent to form a smooth, hard surface, with the correct cross-fall, with the stones well knit together, and showing their faces on the surface. The cross-section of the newly-rolled surface should be frequently checked by the use of a long straight-edge and level to ensure that the cross-fall of 1 in 24 is correctly obtained. No spreading or rolling is to be carried out in frosty weather. When the road cannot be entirely closed to traffic, care should be taken to minimise inconvenience to the travelling public during the progress of the work by coating one-half of the width at one time. No unrolled stone should be left on the road overnight. Care should be taken not to leave a vertical or steep edge of the new coating, but the edge should be thinned out so as to afford an easy passage from the new coating to the old surface. Notice-boards warning the public that steam rolling work is in progress should be placed at reasonable distances from each end of the work.

BINDING.

(10) The binding material should be the best reasonably obtainable. It should be either of the same material as the new coating, or of granite, limestone, or slag chippings, or failing these, suitable pit gravel, and the largest stone in it should not exceed ¾ in. in its greatest dimension. The binding material is not to be applied until the stones have been tightly rolled as above described. It should then be spread, watered and swept over the surface during the final rolling operations, working it from the channels towards the centre so as to fill the interstices or voids between the rolled stones. Care should be taken not to use more binding material or water than is absolutely necessary to ensure proper consolidation. The success of water-bound steam rolling so greatly depends on the quality and quantity of the binding material used that extreme care should be taken in its selection and application

REROLLING.

(11) In some cases it is advisable that a steam rolled water-bound macadam surface should be lightly watered and rerolled from a week to a fortnight after the first rolling.

RECORDS.

(12) A careful daily record should be kept of all particulars of the work, the number of men employed, the time occupied, the quantity of material used, the area of new coating finished, and also of the state of the weather and other details.

APPENDIX.

In preparing for the reconstruction of roads which require a preliminary examination and reformation of contour before a steam rolled macadam surface can be satisfactorily applied to them, attention should be given to the following points and careful records kept for future reference:—

(1) The relative levels of the intended road surface and that of the adjoining lands.

(2) The means of disposing of surface water by drainage.

(3) The nature of the fences.

(4) The width of the carriageway and the full width between fences.

(5) The gradients of the road.

(6) The character and condition of the existing carriageway and indications of any special features of weakness or wear.

(7) The cross-section of road from fence to fence.

(8) The material previously used for surfacing work and most readily obtainable for road construction and the cost thereof.

(9) The requirements as to foundations.

(10) The points at which, on account of soft, wet clay, or bog or marshy subsoil, special means are to be adopted. Good results can be obtained in some cases by supporting the road crust on a layer of dry ashes or clayey gravel, or by spreading heather or faggots, but in each case local circumstances and conditions must determine the means to be adopted.

(11) Whether it is desired to have footpaths on one or both sides of the road.

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**How Roman Roads were Built.**—In the course of a lecture on "Roman Roads through London," delivered at a meeting of the British Archæological Association at the Police Institute, Adam-street, Adelphi, last week, Mr. Reginald A. Smith expounded, with the aid of lantern slides, theories as to the original course of the more important Roman roads, based upon the numerous recorded Roman burials. The Romans, he explained, buried their dead, by preference, along their main roads, the rich being accorded a "front seat" in death as well as in life. The Romans generally built their roads straight, no doubt laying out their lines at night by means of fire signals, and pegging out the intervening spaces by day. It had to be some very great physical difficulty to cause the Romans to construct their roads other than in a straight line. Evidence as to this could be found in the Roman road at Leatherhead, which, though deflected by Box Hill, ran straight across the hilly downs of Mickleham, the road being at times like a "switchback."

**Progress of the Garden City Movement.**—Another sign of the great progress of the Garden City movement is the fact that the Garden Cities and Town Planning Association, in order to cope with their increasing work, have taken larger and more convenient premises at 3 Gray's Inn-place, W.C. The premises are upon the ground floor, and provision exists for the holding of classes and meetings. A programme of classes has been arranged, in order to give practical instruction in "What Town Planning Means," and in order to equip a number of lecturers for popularising the movement. It is proposed to deal with the legal, sociological, architectural, engineering, municipal, financial, and scientific aspects of the question, while the point of view of the private owner of land will be specially dealt with. Particulars of the classes may be obtained from the secretary.—The annual meeting of the Garden Cities and Town Planning Association will be held, by kind permission, at Carpenters' Hall, London Wall, E.C., on Monday, February 5th. The Hon. Mr. Justice Neville will be in the chair, Mr. Cecil Harmsworth, M.P., will speak on the progress of the movement, and Prof. S. D. Adshead, F.R.I.B.A., will give an address on the beautifying of London.

## ROYAL SANITARY INSTITUTE.

### HENRY SAXON SNELL PRIZE.

The Henry Saxon Snell Prize was founded to encourage improvements in the construction or adaptation of sanitary appliances, and is to be awarded by the council of the Royal Sanitary Institute at intervals of three years, the funds being provided by the legacy left by the late Henry Saxon Snell (Fellow of the Institute). The prize consists of fifty guineas and the silver medal of the institute, and is offered this year for an essay on "Suggestions for Improvements in the Ventilating, Heating, and Water Supply Appliances and Fittings for an Operating Room and its Accessory Rooms for a General Hospital of 400 Beds (no Students)."

Attention should be given to the following points, which are essential in a properly arranged operating room—*viz.*:—

(1) There should be perfect and even ventilation, and dust should be excluded as far as possible from all incoming air.

(2) There should be ample and unobstructed north and high lighting by day, and artificial lighting at night. Powerful artificial light should be arranged over and near the operating table, with special means of concentrating the light from all directions.

(3) The arrangements for heating should be ample, and easily regulated, as it is desirable in the case of certain operations to maintain a temperature of between 80 deg. and 90 deg. Fahr.

(4) All fittings should be of impervious materials, avoiding as far as possible all inequalities of surfaces, inaccessible parts or crevices, and internal angles capable of holding or concealing dust and organic matter.

GENERAL CONDITIONS.

(1) The essay to consist of not more than 5,000 words, to be type-written on foolscap, one side only, and to be illustrated by drawings or sketches. All drawings or sketches to be of not less than one-eighth full size.

(2) Two competitors of different professions or crafts may join in sending in an essay and plans.

(3) Essays must be delivered before 4 p.m. on or before August 30, 1912, addressed to the Secretary of the Royal Sanitary Institute, 90 Buckingham Palace-road, London, S.W.

(4) The essays are to be submitted without the name of the competitor, but with a motto legibly marked on the right hand lower angle of the first sheet, and to be accompanied by a letter containing the competitor's name and address, which is to be enclosed in an envelope sealed with a blank seal, and having on the outside "The Henry Saxon Snell Prize" and the same motto as that attached to the work submitted. The essay and sealed envelope must be enclosed in another envelope, bearing the words "Henry Saxon Snell Prize" and the competitor's motto at the right-hand lower angle, and must be directed to the Secretary of the Royal Sanitary Institute.

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At a meeting of the Royal Sanitary Institute, to be held at Manchester, on Friday, March 8th, discussions will be opened on "The Application of the Housing and Town Planning, &c., Act, to the Development of Suburban Areas now in Process of Transition," by Mr. F. W. Platt, building surveyor, Salford, and on "The Quantity of Water available from Upland Drainage Areas," by Prof. J. Radcliffe, M.Sc. On the following day visits will be made to places of local interest.

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**Society of Architects: Students' Section.**—The first social gathering of the winter session, organised by the Students' Committee, will take the form of a smoking concert, to be held at 28 Bedford-square, on Thursday next, at 8 p.m.

**Councillor and Surveyor.**—At a meeting of the Ashby Rural District Council on Saturday the surveyor, Mr. S. Spencer, complained of Dr. Atkinson, the councillor for Osgathorpe, having given orders to the roadman in the village contrary to his orders, and said he wanted to know whether he or the councillors had control of the men. Dr. Atkinson said the stone being put on the road was much too big. The chairman said it would be best for councillors to communicate with the surveyor if they had any complaints.

# The Building and Development of a Garden Suburb.

By MICHAEL BUNNEY, A.R.I.B.A.

**[In the following extracts from a paper read on Monday evening last at a meeting of the Institute of Sanitary Engineers over which Alderman W. Thompson, chairman of the National Housing and Town Planning Council, presided, those portions which refer to the construction of roadways are deserving of special attention.**

We may be specially sympathetic as a nation towards experiments for bettering the people even at costs which seem disproportionate to the good results obtained; but, after all, no reform or progressive movement of this nature is likely to take firm hold until it can prove its possibilities for being worked on a business basis; by that I mean a basis that will return at least a moderate dividend on invested money and a fair remuneration to those engaged in doing the work.

For the aims of the movement are wider than the purely theoretical ones confined to such abstract principles of town planning as the city development plan, city improvements, architecture, and its relation to civic ornamentation, treatment of open spaces, &c. These matters, of course, have their place and function even in the most practical considerations of suburb development, but we shall find that it is on the business issues of cheap, attractive and better houses, of their relation in numbers to the given acre, of the economies which a more sensible treatment of the road-making problem will make possible, and on the raising, not only of the standard of comfort, but of the standard of taste, that the town planning movement will push forward to an early and sure realisation.

A great amount of architectural, sanitary and reforming thought is being applied to this subject, with the inevitable effect upon the aspirations and requirements of the ordinary town dweller. Its ultimate result will, we hope, rouse him to demand and be satisfied with nothing less than a revolution in housing conditions. We trust he may come to realise what has been lost in the past by lack of forethought and fore-knowledge, and, in Mr. John Burns's words, "consciously order his present habitation, his future [illegible] and the development of his domestic life, and so arrange his civic expansion on lines that shall be healthy, wealthy, beautiful and wise, and so regulate his home, his town and city, that the ugliness, the squalor and [illegible] of many towns and suburbs which we [illegible] to-day shall be avoided in years to come."

Certain [illegible] in which people have shown a greater aptitude for education during the last ten years than in the hygienic way of living, and the [illegible] the present aim of the town planner first and foremost to foster.

Many apply the title "Garden City" to garden suburbs, and it would be well to clear up this little point before we go further into the details of garden suburb development. The term garden city involves an element that shall be self-contained; it describes a community independent, yet interdependent, with its own sources of livelihood, factories, industries and industrial community, common government, common ownership of public utilities—in fact, a town in itself. To all intents and purposes this is what Letchworth aspires to [illegible] and is rapidly becoming. On the other hand, the suburb is what the word implies; it is secondary to and an appanage of the city, and may vary in size from a whole administrative area of local government like, e.g., Croydon, to a congeries of a few [illegible] like [illegible] the small garden suburbs at Harborne near [illegible], or those on the outskirts of Warrington. The Hampstead garden suburb, for [illegible] the Hendon district; it [illegible] all the municipal services supplied by the council and takes its part fully in the local life of the [illegible].

[illegible]

[illegible]

as to the suitability of the land for the purpose and as to the financial possibilities of the scheme.

PRELIMINARY WORK.

The first practical piece of work to be done will be the collection of such data as will enable a properly-planned scheme to be prepared, and for this purpose the Royal Institute of British Architects have already drawn up valuable suggestions.

A fully-detailed survey must be made. By this I mean something more than is implied. Not only is it necessary to measure and plot the whole of the land, but levels must be shown by means of contour lines at least at every 10 ft., and preferably at every 5 ft. All physical features and trees, hedges, watercourses must be carefully plotted, and notes made of such a nature that the fullest possible information will be readily available to the site planner. Information must be collected and analysed as to the social and economic condition of the population likely to be attracted, as to the history of the development of the adjacent or related developments; as to buildings and other material survivals, or traditional associations worthy of preservation as tending to carry on the individuality of the district, and, finally, a complete record of social, educational and municipal services available.

Much of this information can be made available by means of diagrams or maps specially annotated and coloured; in fact, in the case of small estates all this data can be placed upon the survey plan, which will be found most useful if worked out to the scale of 25-in. ordnance maps. On most estates, also, there are special views or standpoints, the character of which it is worth preserving, and it is advisable for this purpose to have photographs taken recording these.

When all this information is collected, analysed, and reduced to summary and plan, two methods of dealing with the next steps present themselves. The first is to employ the services of a town planner, be he architect or surveyor, or both, of some repute, and capable of preparing a satisfactory development plan under the direct instructions of the promoters. Needless to say, this method wholly depends for its success on the capabilities of your planner.

The second method, which, in the present stages of the movement, I consider the better, is to promote an open or limited competition. For this purpose some well-known town planner, preferably again an architect, should be appointed to act as judge or assessor, and be empowered to draw up a schedule of conditions under which the competition is to be carried through, in consultation with the promoters and their professional adviser. Premiums can be offered for the best design, and if it is not desired to employ the authors of the premiated designs to supervise the eventual carrying out of the scheme, this fact should be made clear and the amount of the premiums raised accordingly. In this respect I may mention that it is generally found more convenient to carry out the scheme through the agency of the original professional adviser and the standing estate staff.

A properly drawn set of competition conditions will provide, *inter alia*, for restrictions as to the number of houses to be plotted to the acre; it will include suggestions as to dealing with existing buildings, open spaces, &c., and will also draw the competitors' attention or definitely instruct him as to the special housing problems required to be solved, to the type of dweller expected and the kind of house he will require, and to the ratio of open spaces proportional to some extent to the size of the plots and then relation again to the cost of the developed land and the distance from town. The conditions should also suggest that the new town plan shall be either (1) designed in conformity with the existing by-laws in force in the district or (2) planned with a view to its execution under a scheme prepared in accordance with the provisions of the Housing and Town Planning Act, in which case the competitor would be asked to state how far it would be necessary for the successful carrying out of his scheme to depart from or vary the existing by-laws.

The competitors should be asked for a detailed statement, setting out the areas to be devoted to public and semi-public buildings, to open spaces and to roads, and a schedule [illegible] the total num

ber of feet frontage of available building land, with the average depth and areas of the plots proposed.

In some cases a detailed plan of the estate drawn to a scale of 1/500, or 44·66 ft. to the inch, is useful as explanatory of the design. This scale, as you will appreciate, is large enough to show the plotting accurately and also the building lines, proposed grouping of buildings, and the relation of the groups to one another; it can also be made to show the road formation and arrangement of trees, &c. If, however, it is the intention of the promoters to do the actual laying-out work themselves through their usual staff, it is inadvisable to put competitors to the trouble of submitting a detailed plan.

The premiated designs in most competitions become the property of the promoters, and if, as is usually the case, the first premiated design is that which, though not necessarily the most original or embodying every desirable feature, contains least that is objectionable, both from the theoretical and practical standpoints, while the second or third may contain some markedly good idea worked in with much that is second-rate, it is then often found that the best plan for eventual realisation is to be had by judicious blending of the two or three best designs.

The method of open competition, notwithstanding some faults, has the great merit of unearthing latent talent, and incidentally widens the area of interest and experience among the competitors, and thus helps generally to promote the movement. It also provides an object-lesson to the public, and a means of education, especially if the designs are publicly exhibited, and the opportunities afforded by the public exhibition for local conferences and lectures upon the principles involved. All this publicity is invaluable to the promoters in advertising the new development and arousing interest among house hunters and others who may eventually be attracted to the estate for residential purposes.

Having now obtained the plan which on general lines seems likely to prove the most efficient for working purposes, operations of a more material nature can be commenced.

Again, let us suppose the garden suburb is to be laid out under a scheme made in accordance with the provisions of the Housing and Town Planning Act, as will undoubtedly be the case with a majority of new suburbs, and is actually so in the case of Rudolph Manor, one of the largest estates in course of development near London.

ROADS.

The Act, as you know, confers the power to suspend, as far as may be necessary for the proper carrying out of the scheme, any statutory enactments, by-laws, regulations, or other provisions under whatever authority made, which are in operation in the area included in the scheme, and will enable, therefore, the adoption of an economical construction of roads of varying types suited to the requirements of the traffic likely to pass over them, and of the type of houses abutting upon them. By-law roads of a uniform width of 40 ft. or 50 ft., with expensive formation, with elaborately paved footpaths, kerbed and channelled irrespective of the work they have to do, and their construction regulated more by the eventual cost of maintenance than by the effect on development of their heavy initial cost—these have been one of the material causes of the methods of development we all deplore, with its skimpy-fronted plots and large number of houses to the acre. The small house or cottage builder has been forced to cover this initial roadmaking cost by cutting down his plots and the accommodation of his houses, and to crowd the land to its utmost extent.

Under the Act there is little doubt that a very great modification in roadmaking will be allowed. In fact, the roads, some of them mere carriage drives, which have stood the test of three years' traffic at the Hampstead garden suburb, and were constructed under the special Act of Parliament obtained in 1906 by the Hampstead Garden Suburb Trust, will be taken as bases for further work and will in all probability be sanctioned by the Local Government Board.

Where in residential districts the only traffic to be provided for is the tradesman's cart and the occasional taxi-cab, a well-made carriageway of 16 ft., or even 13 ft., in width, will be found ample. The footway can even be dispensed with altogether where the larger drive is provided, and the total road width of 26 ft. made up by grass margins on each side. A 26-ft. road (16 ft. of carriageway, with two footpaths 5 ft. each, should be ample for any purely residential traffic of this kind. Two provisions alone must follow and be insisted on when this method of roadmaking is adopted, and these are that the land so saved must not be clipped from the plots, and the building lines must be kept at least 50 ft. or 60 ft. apart.

But this does not end the advantages which a saving on the cost of roadmaking allows; greater frontages can be given, with the consequent opportunities for the more sensible planning of the houses, for greater spaces all round the houses, and for a general resultant effect of openness and light and air.

Objections may be made as to the cost of properly maintaining roadways of this nature, but this cost is related only to the wear and tear, and it cannot be asserted that the traffic likely to pass over such a road is ever to cause as much as a tenth of the wear on a main road, which, under by-law regulations, has to be no better made than a side one. The 26-ft. drive road has also proved itself useful in developing back land, the awkward central spaces of triangular parcels, and even in positions where it in effect becomes a *cul-de-sac*, without detriment from an hygienic point of view, provided it is coupled with the reservations as to crowding, to which I have already alluded, it is bound to gain a wide acceptance as a practical method of development. In all the estates with which I have been connected no trouble has so far been encountered as regards the grass margins. At Hampstead, even in the industrial portion, *esprit de place* prevents the destruction of the grass, and many of the residents do much to tend and dress the margins themselves.

PLOTTING.

So much for roadmaking. Next in importance comes the method to be adopted in respect of plotting, the fixing of the building area in relation to the size and aspect of the plot, and the grouping of the houses. The site planner will to a large extent have borne this point in mind in making his plan. He will have arranged for buildings to form road terminals, and thus close what might otherwise form a too extended and monotonous view, for some treatment of studied arrangement when awkward corners had to be turned, and round his open spaces will have suggested a plotting which will secure to the maximum number of houses some outlook upon open ground. Trees and hedges, again, will have influenced the plotting, so that as many as possible of these physical features should be preserved from destruction, and the exigencies of varying levels will not have been neglected.

If the estate managers are in a position to plan out the plotting from the commencement, and substantially adhere to this, once it is decided on, as may be the case on estates, or portions of estates, wholly dealt with by the building owner—such, for instance, as the Co-partnership Tenants' Societies—a prearranged scheme, not only of grouping out of the types of architecture to be allowed, the materials to be used, roof and eaves levels, &c., can be insisted on. This is not quite so easily done where the owner proposes to dispose of plots as and when the demand comes along, though even in this case a scheme of grouping, &c., can be prearranged to a certain extent. Much diplomacy and tact, however, are required to get it carried through successfully and willingly accepted by plot holders; though it is surprising how far a little suggestive conservation, patient explanation of the ideals aimed at by the promoters, goes in bringing round a stubborn inquirer who will have his house his castle, and that as different from his neighbours' as it can by hook or by crook be made in size, plan, elevation, materials and position. Where a plotting plan can be made and adhered to it is best drawn out to a scale of 1·500, or 41·66 ft. to the inch, as on this scale can be shown every detail which must be made clear to the plot purchaser, the particulars of the [illegible] information as to any prearranged form of boundary treatment, fencing or hedging, the positions of the [illegible] ferrules, and the gas and electric connections [illegible] if the road-making charges—that is to say, the estimated cost which each plot holder will be liable for on the local authority taking over the roads—can be pooled over the whole estate and allocated definitely to each plot, and the amount duly marked on the plan, many disputes and recriminations with the sales department are thereby avoided.

ARRANGEMENT OF BUILDINGS.

A successful scheme of plotting must include an adequate provision of houses grouped [illegible]

semi-detached or in blocks of up to six in number. Though most of us prefer to live in a detached house, there is no question but that, from an architectural point of view, an estate covered entirely or principally with detached houses, especially if these be small in size, is a difficult one to treat successfully. The attached house, if a proper archway or back road be provided for access to the back gardens, or for purposes of drainage, has many advantages; it is warm, it is economical to build, and it requires less frontage, thereby releasing more land for open spaces—in fact, the arrangement of plots and building areas to produce an ordered result must be governed by other considerations than that of obtaining the maximum number of selling plots.

The town planner must foresee what effect the general mass of his buildings will produce, and vary the street picture by judicious settings forward or backward of his building lines. He must change now and then the spacing of his building areas, and in long roads definitely group the houses in compartments so as to confine the street effect to no more than the eye can comfortably take in. In short, plotting for a garden suburb becomes subsidiary to, and bears constant relation to, the arrangement of the buildings, and the difficulty of the problem lies in the blending of an economical and practicable plot plan with the architectural grouping of the houses to be built upon it. It is a problem that must be faced throughout, at every road junction, wherever the vista or the terminal are desired, at curves, round greens and squares, where buildings are to abut on large open spaces, and where fine trees or hedges must at all costs be preserved and made to harmonise with the scheme. In this way only can the dreary monotony we know so well be to a great degree avoided.

TREATMENT OF BOUNDARIES.

The treatment of boundaries also requires consideration at an early stage, and a comprehensive scheme for this worked out and enforced—simple treatments of posts and chains, with a hedge behind of privet, yew or holly, or wide-mesh oak trellis, with openings 6 in. square or so, and with Penzance briars or cheap climbing roses tied to the trellis; or, again, the cheery Rosa Rugosa behind a low brick kerb wall—all are really less expensive than the dwarf wall, its stone coping and cast-iron rails, or the park pale fence so dear to the speculative builder. For back divisions, where the plot holder will consent to forego the close fence, 2-ft. posts and wires, or galvanised square mesh with myrobolan plum or beech and hornbeam planted three deep, require but the patience of two or three seasons to give a hedge many times to be preferred to the usual 6-ft. close fence that makes a back garden no better than a cattle pen.

CONTROL OF BUILDING OPERATIONS.

As soon as the roads are in hand, and the plot, plan and building areas decided upon, building operations will begin, and here it is essential that proper control be exercised from the start.

Building regulations of a much more comprehensive character than those usually tucked away in the recesses of building agreements are required. They should be framed in such a way as to disarm the prejudices and quiet the alarms of the inquirer, for the man, especially the small man, who is about to build a house is a nervous individual; he is making the most important plunge in his life into what tradition has unfortunately taught him to look upon as an unfathomable slough of chicanery and scamping. Let the regulations be in plain English, and free from the technicalities of the legal draughtsman, let them do more than hint at the ideals of the promoters and convey the merits likely of their provisions rather in the manner of fatherly advice than in accents of dreadful threat. I have found little or no difficulty in turning up material and building construction in this way to a level, generally speaking, well above that of the usual by-law requirements, and such items as 14-in. grooved and tongued floorboards, and oak or teak window sills have been cheerfully agreed to even by the usual type of speculative builder. At the same time recommendations to consider that most lovely thing a garden suburb will be seen all round and should be treated accordingly, and with the minimum of unsightly outbuilding behind, suggestions as to type and colour of material required in given areas as well as the discouragement of the use of materials in imitation of others have been received and acted on without demur by architects, and, indeed, with evident appreciation of their intention.

COST.

I have little doubt that by this time the question as to what all this is going to cost and how it will affect the financial result must be uppermost in your minds.

So far as the cost of obtaining a suitable town plan is concerned, it must be obvious to you that the preparation of a proper survey, with contour lines marked on, and a fully-thought-out scheme of road development, by competition or otherwise, though their initial cost may be slightly greater than that of the usual estate plan, are well worth the outlay upon them, inasmuch as they will form the only basis upon which a successful garden suburb development can be built up; without them, too, the opportunity for the economies available under the provisions of the Housing and Town Planning Act could not be realised. For it is undoubtedly owing to the sensible treatment of road construction, and the saving in cost thereby effected, that more of the land can be developed usefully and made to yield returns. Notwithstanding this, one estate at least, where full by-law roads are being made, and the plotting, building and open spaces carried through on garden suburb lines, has been successfully started, and already passed well beyond the initial stages with satisfactory financial results.

Regulations, control and supervision are necessary on every well-conducted estate, and do not cost more if a little more brains are required to be put in, and they have, so far, attracted, rather than repelled, the ordinary suburb dweller. He realises by ocular as well as mental proof that there is no room for deception, and though he may not realise to the full Ruskin's words on liberty that "there is no such thing in the universe," "that, if there be any one principle more widely confessed by any utterance, or more sternly than another imprinted on every atom of creation, that principle is not liberty, but law," he still appreciates that the methods employed and the regulations enforced are for his good and the good of his own and his neighbours' properties. The garden suburb must, if it is securely to establish itself, appeal to the man in the street, to the man who fills the houses in miles and miles of middle-class roads in the older developments round London, and to him no less than to the strong-minded pioneers who will always come in with their indispensable support at the start of movements of this kind.

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**Trout in Burton Sewers!** A number of men employed by the Burton Corporation (says the *Burton Observer*) have had the unique experience of catching live trout in the sewers. They were engaged in cleaning the sewer which runs through the premises of Messrs. Allsopp's brewery, and during the operations they noticed trout swimming in the water. They quickly devised means of capturing some of them, and soon met with success. They landed two fine specimens, one of which measured 15 in. and the other 11 in. The presence of such fish in the sewer (our contemporary remarks) is an undoubted tribute to the efficiency of the Burton system and the purity of the sewage in the pipes, but everyone will endorse the wisdom of the impromptu fishermen in deciding not to take them home for a high tea.

**Law of Private Street Works.**—It is surely a commentary on our system of legislation relating to what may be termed domestic matters that the owner of house property (to say nothing of the occupiers of his houses) has to thread his way through a maze of statutes and decisions to ascertain his rights and his liabilities in connection with questions which may arise every day. Such, however, being the case, text-books dealing with what on the face of them might be deemed to be simple matters have become an actual necessity, although the owner of property is lucky if the text-book suffices and he is not driven to consult a specialist. The work before us* deals with one of such subjects, private street works under the Public Health Acts and the Private Street Works Act, 1892, but not with the Metropolitan Management Acts; the statements in the text are supported by decided cases, with references printed in the text; there is also a table of cases and an index, and it should prove a useful hand-book. We find the recent decisions included, and the work seems to have been carefully prepared. *The Builder.*

* "Notes on the Law of Private Street Works under the Public Health Acts." By J. B. Regginer Corder, a Solicitor of the Supreme Court. 3s. 6d. nett. London: St. Bride's Press, Limited, 24 Bride lane, E.C.

# History of Tar-Concrete Pavements in Ontario.*

By W. A. MACLEAN, Provincial Engineer of Highways.

Tar-concrete, or, more popularly, "tar-macadam," pavements have been in service in several cities of Ontario, Canada, for a number of years, and the history of the earlier of these, while not accompanied by all desirable data, presents features of interest in view of the growing use of bituminous materials for country highways.

Reference has from time to time been made in the technical press to the tar-concrete pavements of Hamilton, Ontario, and it is the purpose of this paper to include also the experience of Toronto, Ottawa, London (Ontario), and other cities. In all cases the pavements have been laid by the mixing process, and coal-gas tar (supposedly) was employed.

The beginning of tar-concrete roadways in Ontario was in the year 1880, when the gas company of Hamilton laid a short section (Mulberry-street), about 1,300 sq. yds., in that city. No further work of this class was done until 1891, when the same company laid 2,983 sq. yds. at a contract price of $1.50 per yard; and in 1893 another area of 3,768 sq. yds. was laid at a contract price of $1.75 per yard. Experience with these roadways was such that, in 1899, when a considerable extent of old cedar block pavement needed renewal, "tar-macadam" was selected, and about 10 miles of roadway were built of that material.

### HAMILTON.

The following is the specification under which the later pavements (since 1899) were laid in Hamilton:—

(1) "All earth or other material above the sub-grade shall be excavated so as to conform to the level of the sub-grade, which will be 12 in. below the finished surface of the roadway; and should the sub-grade be above the level of the natural ground, then earth shall be deposited until the level of the sub-grade is reached. The sub-grade shall be shaped to the profile and cross-section, which will be furnished by the city engineer.

(2) "After the sub-grade has been formed to the proper camber of the road, generally ½ in. per foot, or 6 in. for a 24-ft. roadway, to be thoroughly rolled with the steam roller, and if by this means soft spots are revealed, they shall be filled with good solid material.

(3) "The first 6 in. shall be made in the ordinary way for a macadam or telford roadway, thoroughly rolled. If so required it may be made of hard broken stone, furnace clinkers, or brick rolled smooth, and finished to the required camber of the road. Upon this shall be placed the tarred stone. The first layer, 3 in. of hand-broken stone to pass through a 2½-in. ring, then a 2-in. layer of machine-broken stone, the whole smoothed off with a hand roller, and after top dressing is applied, thoroughly rolled with a steam roller. On this a layer of fine gravel and quarry chippings, mixed in equal proportions, ¾ in. thick, shall be placed, and well rolled in so as to fill all interstices. Before finishing, a dressing of stone screenings, for the purpose of colouring, shall be scattered broadcast, to be worked in by the traffic. All layers, including the colouring layer, shall be thoroughly compacted by rolling.

(4) "The stone to be tarred shall, if moist, be heated on an iron floor, under which are flues from a fire, until the moisture is driven out. The material in its heated state is then thoroughly mixed with a sufficient quantity of tar. The broken stone in warm weather may be sun-dried, but in all cases the finer course must be artificially dried. At the same time care must be taken not to get this material too hot. The tar should be boiled in iron kettles holding 100 imperial gallons. Eight imperial gallons should be added to each cubic yard of the coarser material, or more if required to completely cover the stone, and 17 to 18 gallons to the finer kind of stone.

(5) "The tar must be pure coal-tar, free from all foreign substances, and containing not more than 5 per cent of water, and shall contain upon analysis not less than 56 per cent pitch.

(6) "The work must be done in the summer months, and all work must be suspended during wet weather."

The tar-concrete was used to replace cedar block pavement, and the preliminary work consisted in the removal of the old cedar blocks. As these were 10 in. in depth, it was necessary to remove 2 in. of sand upon which they were placed, to make room for the 12 in. of macadam, and bring it to the proper elevation with respect to the kerb.

The cedar blocks and surplus sand having been removed, the sub-grade was thoroughly rolled with a 15-ton steam roller.

Care was taken in forming the sub-grade, and in laying each layer of stone, to bring the surface in each case parallel to the finished crown of the roadway. The first 6-in. foundation course, referred to in section 3 of the specification, was made up of flat stones, from 6 in. to 12 in. in greatest dimension, laid roughly by hand on their natural beds. On this smaller stones were placed and broken into the interstices, so as to keep the bottom course in place.

The next two courses of tarred stone were then applied. Large kettles were hung close to the work, and in them the tar was kept at a workable temperature. Convenient to the kettles, the stone to be tarred was placed on mixing boards. With a dipper attached to a wooden handle, the tar was then applied to the stone, being scattered over it by a swinging motion of the dipper.

With shovels kept hot to facilitate the work, the stone was turned over twice after the first application of tar. More tar was then scattered over the stone, and the stone again turned over. These operations of tarring and turning the stone was repeated until each stone was seen to have a coating of tar, there being no bare spots on the stone. One part of tar to 22 parts of stone was specified for this course.

As soon as the stone had been tarred, it was shovelled into wheelbarrows, placed on the road to the desired depth, and raked to the required cross-section. It was found of advantage to roll the tarred stone immediately after being placed on the road, since, if left two or three days, it would not consolidate as perfectly.

The top course of fine, tarred gravel was mixed in the proportion of about 20 gallons of tar to 1 cub. yd. of gravel, or 1 part of tar to 8 or 9 parts of gravel. The gravel before mixing was screened through a ½ in. mesh. This material was prepared in an asphalt mixer, being brought hot to the road, and carefully raked to the required grade and cross-section. This having been rolled, stone screenings from the crusher were scattered over the surface to harden it and improve the appearance.

The cost of the various pavements varied considerably. In 1899 the average was about 79 cents a square yard, but labour then cost 15 cents an hour, and coal tar f.o.b. Hamilton $2.60 per barrel (50 U.S. gallons). The average in 1900 advanced to about 88 cents a square yard, with labour at 17 cents an hour, and coal tar at $3.75 a barrel. With the advancing cost of labour and materials, the cost in 1901 averaged nearly $1.08 per square yard, exclusive of kerb—about 30 cents per yard more than in 1899. Plain macadam laid in 1901 averaged 53 cents a square yard.

None of the pavements were constructed by contract, all work being done by corporation labour. The stone used was a hard limestone, quarried within the city limits, the average haul to the work being 1½ miles.

### TORONTO.

Following the experience of Hamilton, the city of Toronto, in 1900, laid an experimental tar-concrete roadway on Woolsley-street of three blocks, or approximately ¼ mile in length. This roadway did not have the heavy foundation characteristic of the Hamilton pavements, but after the sub-grade had been carefully prepared and rolled a course of broken limestone, 4 in. in thickness, was spread. This consisted of stone not less than 1½ in. or more than 3 in. in length or breadth. This was filled with sand, was flushed, and thoroughly rolled. On this course was spread a layer of tarred stone, which was required to be as uniform in size as possible, and not less than 1½ in. or more than 2 in. in size. This surface was evenly raked and rolled. Then a layer ¾ in. in thickness of fine granite chips thoroughly tarred was evenly spread over the whole surface and rolled. Before finishing a dressing ½ in. in thickness of approved pea gravel was spread over the entire surface of the roadway, to be worked in by traffic. The specifications for mixing tar were very similar to those employed in Hamilton. Additional pavements were laid in 1901 and 1902. For two or three years these

* A paper presented to the American Association for the Advancement of Science.

pavements were most favourably regarded as being smooth, noiseless, sanitary and dustless, but in 1903 marked signs of disintegration began to appear, and under specifications prepared for 1904 it was then provided that there should be a foundation course 5 in. in thickness. The intermediate course of tarred stone was eliminated, and a wearing surface 3 in. in thickness was provided. Three sizes of broken stone were used in this tarred surface—*viz.*, 1½-in., ½-in. and screenings. A mixture of these three sizes of stone, in the proportion of 2 parts of 1½-in. stone, 1 part of ½-in. stone, and 1 part of screenings, was found to give a dense aggregate. During the period 1900 to 1906 there were laid in all 7·16 miles of tar-macadam roadway on the streets of Toronto.

Work carried on in 1905 required a foundation course 5 in. in thickness after rolling, this to be of coarsely-broken stone, the surface interstices to be filled with 1½-in. stone, and covered with a layer of hot bitumen, using not less than 1 gallon per square yard. The specification provided that:—

"Upon the above foundation course is to be laid a surface course, or wearing surface, thoroughly saturated with the bituminous composition. This course shall be composed of good, hard and tough limestone, samples of which must be approved by the engineer before any is delivered on the ground, and shall be equal as to quality, size and fineness to the samples which may be seen in the office of the city engineer.

"Of this mineral aggregate—

"(3) 30 per cent shall be such as will pass a No. 40 sieve;

"(2) 12 per cent shall be such as will be held on a No. 40 sieve and pass a No. 8 sieve;

"(3) 10 per cent shall be such as shall be held on a No. 8 sieve and pass a No. 4 sieve;

"(4) 18 per cent shall be such as shall be held on a No. 4 sieve and pass a ½-in. sieve;

"(5) 30 per cent shall be such as shall be held on a ½-in. sieve and pass a ¾-in. sieve.

"These different sizes of stone shall be heated to a temperature of at least 225 deg. Fahr., and not to exceed 275 deg. Fahr. The No. 1, 2, 3 sizes of stone shall then be measured in accurate proportions by volume, and thoroughly mixed with a twin-pug, or other mechanical mixer; the previously prepared mixture of tar and pitch shall then be added, together with sizes No. 4 and No. 5 of the broken stone, and the whole mass mixed until the stone dust has become saturated with the mixture of tar and pitch, and is thoroughly mixed through the whole mass, and has a uniformly black appearance.

"This aggregate shall then be spread over the entire roadway to the required depth, so as to produce a thickness of not less than three (3) inches, after being rolled and consolidated. The surface shall be evenly raked, rolled, repaired, brought fully up to grade, and true to cross-section wherever required, and then rerolled until firm, compact and true.

"A flush coat of California asphalte, oxygenised asphaltum, or other equally good and suitable asphalte, in the engineer's opinion, having a melting point of about 170 deg. Fahr., shall be flushed over the entire surface at a temperature of at least 250 deg. Fahr., so as to fill all interstices, and present a smooth, perfectly unbroken surface. A sufficient layer of good, approved limestone chips, no particle of which shall be more than ½ in. in greatest dimension, shall then be spread over the whole surface and thoroughly rolled. More limestone chips shall be added where and as required from time to time, as the rolling progresses, so that the whole surface is completely and evenly covered with a uniform coating of limestone dust when finished of not less than ¼ in. nor more than ½ in. in thickness after rolling has ceased.

"On commencing work a measured quantity of tar and any quantity of pitch shall be heated in separate kettles of at least 100 imperial gallons capacity. When the pitch is melted a sufficient quantity shall be added to the heated tar to make a mixture as previously determined by laboratory tests from time to time, and the whole constantly agitated to ensure a perfectly uniform mixture ready for use. As more is needed, measured quantities of melted pitch and tar are added as the progress of the work shall be determined by laboratory test, and brought to a temperature of at least 200 deg. Fahr., and not to exceed 250 deg. Fahr. Reliable thermometers shall be used to determine temperatures.

"Paving pitch to have the following characteristics: Tenacious, not relatively brittle at ordinary temperatures, insoluble in water, specific gravity of about 1·150, and have a melting point not under 200 deg. Fahr.

"Tar is to be coal-gas tar, should be quite thick at 70 deg. Fahr., have a specific gravity of 1·200, and be entirely free from water and the lighter hydrocarbons. To ensure the above characteristics the crude tar should be previously heated to 250 deg. Fahr.

"Tar that has been refined to the desired consistency may be substituted for the mixture of tar and pitch specified. This refined tar shall have the following characteristics: Tenacious, insoluble in water, all carbonaceous matter soluble in ordinary tar menstrua, free from water and the lighter hydrocarbons. It shall have a flowing point, as determined in a dry oven, of 120 deg. Fahr., and shall be similar in consistency to the standard sample which may be obtained by the manufacturer at the city engineer's office."

LONDON (ONTARIO).

The city of London in the year 1900 laid a tar-macadam pavement on Queen's-avenue, one of the important streets of that city, of which the specification in part provided that, on the usual construction of sub-grade should be laid a 6-in. foundation of clean, coarse gravel, to conform with the cross-section and finished grade of the street. Upon this foundation of gravel, when thoroughly rolled, was then placed 3 in. of tarred stone capable of passing through a 2½-in. ring, 20 per cent of which being fine crushed and capable of passing through a 1½-in. ring. This crushed stone was heated on a steel platform or pans to 120 deg., and tar composition then poured until the stone was thoroughly covered. Tar was heated to boiling point (212 deg. Fahr.), and pitch to about 240 deg., and the whole thoroughly mixed. After mixing it was placed on the street and graded evenly to the required depth, then rolled with a horse roller, after which it was rolled with a steam roller. A second course 2 in. in depth of crushed tarred stone, passing through a 1½-in. and 1-in. ring respectively, mixed in the same manner, was placed and rolled with a horse roller. On this second course was then spread the finishing coat 1 in. in thickness, composed of a thorough mixture of sand, pitch and tar. The sand was thoroughly dry and heated to at least 120 deg. Fahr. This coat was applied while hot, spread evenly to the proper thickness, and rolled with horse roller, after which the whole pavement was rolled with the steam roller and sanded with dry sand ¼ in. in depth. Traffic was to be kept off for a period of at least one week. Tar was to be heated to 212 deg. Fahr., and pitch to 240 deg. Fahr., and properly mixed in the ratio of 10 gallons of tar to 1 gallon of pitch per cubic yard of crushed stone, and 11 gallons of tar to 1 gallon of pitch per cubic yard for the top coat. Tar was required to be clear coal-gas tar, containing no water-gas tar; the pitch also to be the best of its kind manufactured from pure coal-gas tar.

GUELPH.

The city of Guelph in 1908 laid one block of tar-macadam. This consists of a foundation of rough stone, 8 in. in depth. On this was laid a 3-in. layer of 3-in. stone. Then followed a 3-in. layer of 2½-in. tarred stone; then a 1-in. coat of ½-in. stone tarred. Both stone and tar were heated, the hot tar being poured over the dried stone. Several other streets, aggregating 27,016 sq. yds., have since been similarly paved. The tar is produced at the municipally-owned gasworks. For both coats of stone the amount of tar used averaged 2½ gallons per square yard.

These roadways are giving satisfaction, and show very little sign of wear. In the years 1910 and 1911 concrete foundations on tar-macadam roadways were found to be cheaper than stone. In laying the surface the concrete base was flushed with hot tar. The 2-in. broken stone was then spread to a thickness of 3 in., and rolled once or twice with a 15-ton roller. The stone was then sprinkled with hot tar sufficient to coat most of the stone, but not enough to fill the voids. For the surface, ½-in. stone, free from dust, was dried on plates and mixed on a mixing board with hot tar, then spread and rolled until well compacted.

In laying the earlier roadways the tar was boiled in ordinary tar kettles, but this method was too slow. The city now uses an old steam boiler set in brick-work in the ordinary manner. The tar is emptied into the boiler from an elevated platform, and after being boiled is drawn off by a pipe from the bottom into a tank wagon, and immediately taken to the street. The only refining is by boiling. A slow fire is necessary, and constant stirring to prevent boiling over. The tar is frequently tested by cooling a little in water, and the boiling is continued until the tar becomes of the desired consistency.

OTTAWA.

Tar-concrete pavements were first laid in Ottawa in the year 1902, and the total length laid has been 5·15 miles. In construction the roadway was excavated to the required sub-grade, which was then rolled with the 15-ton roller if soft or loose, until thoroughly compacted. Upon this the spalls were placed to a depth of from 8 to 10 in., and the top spalls broken up by hammers and made to conform to the shape of the roadway. On the spalls was placed a layer of 2-in. stone, 3 in. thick, and well rolled. The next layer consisted of a layer of 2-in. tarred limestone, 3 in. thick and put down while hot and rolled at once until cool. Great care was taken with this layer to see that it conformed to camber and grade in crown and gutter. The last coat or wearing surface consisted of a 1-in. layer of ¾-in. tarred limestone, laid down while hot and rolled until it presented a hard, smooth surface. This surface was then dusted over with limestone dust to fill up any interstices and render it watertight. The amount of crown on these pavements varied, according to the width, from 7½ in. to 8½ in., being reduced in amount as the longitudinal grade increased.

CHATHAM.

One block of tar-macadam was laid in 1898, but this has not been satisfactory, owing, apparently, to the surface of the tar-macadam being destroyed by a coating of clay brought by the wheels of vehicles from unimproved streets. In 1910 it was sufficiently intact, however, to be used as the foundation for a bitulithic pavement.

The specifications for the tar-macadam required: An excavation 12 in. below the finished grade of the pavement, an 8-in. layer of broken stone, a 4-in. layer of tarred stone, a ¾-in. layer of fine tarred surface coating.

The stone to be tarred was spread on an iron floor, under which were flues from a fire, and heated until the moisture was driven off. The stone in its heated state was then mixed thoroughly with tar. The tar was previously boiled in an iron kettle holding 50 imperial gallons, to which was added a bucketful of pitch. Eight imperial gallons were added to each cubic yard of coarse stone, and from 10 to 12 gallons to the fine stone. The cost of the tar-macadam was $1.23 per square yard.

RESULTS.

The tar-concrete roadways described have been made from commercial tars. The work was principally by day labour under corporation foremen and engineers. Reference to proprietary tar products has been purposely avoided. The writer is not personally familiar with the first tar pavements laid, but has observed construction and results in numerous cases since the year 1900. The general history of these pavements has shown much similarity. For the first three years the surface has been all that could be desired, but about the end of that period a disintegration of the top coat has commenced. At the end of five years a mottled condition has become general, where the seal coat has chipped away, exposing the coarser bed of tarred stone. At the end of ten years the surface has become generally disintegrated, but the foundation has rarely, if ever, broken through, and a portion of the tarred surface course remains in place. Sections of the Mulberry-street pavement in Hamilton, laid in 1880, can still be seen. In no case has it been found that adequate attention has been given to the repair of these pavements by tar-painting, or patching with tarred stone.

In the cities of Hamilton and Toronto, both of which have municipal asphalte plants, the tar pavements have been restored by giving a complete surface of sheet asphalte. The greater part of the tar-concrete roadways in Hamilton laid since 1899 have been treated in this way at the end of ten years, and results have been very gratifying. Hames-street South, in Hamilton, with central lines of car tracks, has been treated in this way, and is indicative of results under heavy traffic. Dupont-street, in Toronto, constructed as a tar-macadam road in 1903, was surfaced with a coat of sheet asphalte, 1 in. in thickness, in 1908, and the pavement is to-day (1912) in good condition. This was put on the tar-macadam merely as a seal coat. A section taken from the pavement shows the tar to be in a plastic condition. The cost in Hamilton for the asphalte surface was 75 cents. a square yard, where a binder course was required; and about 45 cents. a square yard where such binder course was omitted.

Under the later Toronto specifications, in which the tarred material was proportioned for greatest density of aggregate, superior results were obtained, as, for example, on Hawthorne-avenue, a street of light residential traffic. This street, paved in 1905, is now in excellent condition, and shows very little sign of surface disintegration.

The tar used was supposedly in all earlier cases the commercial coal-gas product, crudely heated to drive off water and volatile oils. In every case difficulty was found in obtaining a uniform quality, and no doubt much of the disintegration was due to the use of inferior tar. In view of the fact that in English practice a desirable tar contains not over 1 per cent of water, or 2 per cent of volatile oil, that it shall have at least 80 per cent of pitch, it is apparent from the specifications quoted in this paper that earlier Canadian construction was very indefinite in this regard, and permitted the use of a quality of tar not now sanctioned.

The tar pavement in Chatham is interesting from the fact that its more rapid disintegration apparently resulted from clay being tracked on from adjacent streets, and would corroborate the experience suggested by the State Highway Engineer of Maryland that clay would appear to have an emulsifying effect on bituminous binders.

A side-light is thrown on the use of tar by experience with foot-walks of tarred gravel. Early in the history of tar pavements sidewalks were used, but have now been almost entirely displaced by the more durable, but less agreeable, cement-concrete walks. These walks were laid by first putting down a foundation layer of gravel, which was well consolidated by pounding. On this was spread a 3-in. layer of tarred gravel, well rammed, and this finally given a paint coat, and sprinkled with clean, coarse sand. The tar used is the ordinary commercial gas-tar, merely heated to permit mixing with sub-dried gravel. Enough tar is used to coat each particle of gravel, about 1 part of tar to 8 or 9 parts of gravel. It is considered of primary importance to obtain a firm and unyielding foundation, and to thoroughly consolidate the tarred material. In Richmond Hill, a hamlet near Toronto, these walks, for example, were first laid in 1886; the earlier and more experimental were not a success, but others laid in 1889 are still in use. These, every two or three years, are given a paint coat of tar, gritted with clean, sharp sand. Made of gravel, there is a tendency for the crown to flatten not apparent in pavements of crushed stone.

Owing largely to the reduced price of asphalte, the use of tar (other than proprietary forms of construction) has been discontinued in Hamilton and Toronto, these having municipal asphalte plants. Ottawa has stopped the use of tar for this reason, and also because of the uncertain results which have attended its use there. The city of Guelph, having a municipal gas plant, continued the construction of tar-concrete roadways, using some care, however, in refining the tar to remove water and volatile oils.

Were exact data available as to the quality of material used, and variations from the prescribed specifications, numerous positive conclusions might be deduced from the tar-concrete work described. Under the circumstances, while reasonably positive in certain particulars, other factors are merely suggested. It may, the writer believes, be concluded that tar of uniform quality, and of composition within certain range of proportions, while susceptible to extremes of temperature, becoming brittle and slippery in cold weather, and soft under midsummer extremes of heat, is not debarred by climatic or other conditions as a useful road material; that best results require a dense mixture, preferably proportioning the aggregate for maximum density, in order that internal deterioration will not occur from moisture or atmospheric action; that some doubt may be attached to the complete durability of bituminous surfaces made by the penetration process, in which density of aggregate is lacking, and suggesting that the grading of stone in this method, rather than having a uniform size, is desirable; that a moderately coarse aggregate should be brought to the face, as far as practicable, to overcome slipperiness and take up wear; that tar-concrete is less durable under concentrated wear than is sheet asphalte, wearing rapidly when laid along street car tracks where traffic is confined to narrow lines, but is more resistant to moisture, as indicated by the greater durability of tar in gutters; that broken stone will provide a more suitable structure than will water-rounded gravel when bonded by tar; that a paint and grit coat is necessary as a preservative as frequently as signs of surface wear or oxidation appear; and it is probable that such treatment will add to the durability of any bituminous pavement, restoring necessary oil, and not merely repairing the worn surface, but gradually increasing its thickness.

E*

# Acton Infectious Diseases Hospital.

## NEW PAVILION: CONCRETE-BLOCK WALLS.

By FREDERICK SADLER, M.R.SAN.I., M.INST.M. AND C.E., Engineer and Surveyor to the Acton Urban District Council.

Some years ago the Acton Council erected in their district an infectious diseases hospital, comprising an administrative block, scarlet fever pavilion (fourteen beds), enteric fever pavilion (fourteen beds), observation block (five beds), laundry and disinfecting house. Since these buildings were erected, however, the extensive building development in the neighbourhood of London has largely affected this residential suburb. With the large increase in the population, it became necessary a year or two ago to increase the hospital accommodation. After careful consideration it was decided to provide an additional thirty-six beds.

There is no definite standard by which the hospital accommodation for infectious cases in any town may be fixed. The size and growth of the district, the housing and habits of the inhabitants, and the principal trade of the town have to be taken into consideration. Most authorities are agreed that the

*From photo by* NEW PAVILION, ACTON ISOLATION HOSPITAL. *J. F. Upston, Acton.*

[illegible] room should be one bed per 1,000 of the population. As the population of Acton is barely 60,000, an extra thirty-six beds brings the accommodation far above the minimum, and allows for some future extension of the population. For economical reasons and administrative purposes it was decided to provide this extra accommodation in one long pavilion, using it for scarlet fever, which is the most prevalent disease, and using the existing pavilion for other infectious cases. The pavilions then in existence had been constructed in the orthodox manner with brick walls and wood-block floors. The council, on the advice of the writer, took into consideration the erection of the additional pavilion in concrete construction.

Under a by-law in force within the district, concrete walls, even if reinforced with steel or when only acting as a filling between stanchions carrying floors and roofs, have to be one-fourth thicker than brick walls of similar length and height.

A compliance with this by-law would have [illegible] the erection of the proposed pavilion in concrete, and, being unwilling that the Local Government Board should be appealed to as to whether the by-law could be varied or not, as it finally was, the following by-law was approved by them:

"The [illegible] with respect to the structure of walls of new buildings in the by-laws with respect to new streets and building, which were made by the Urban District Council of Acton on the 19th day of October, 1897, and were confirmed by the Local Government Board on the 6th day of December, 1897, and the by-laws with respect to new buildings which were made by the Urban District Council of Acton on the 12th day of April, 1904, and were confirmed by the Local Government Board on the 9th day of September, 1904, shall not be deemed to apply to the erection of new buildings by the Urban District Council of Acton as an addition to Acton Isolation Hospital."

The barrier to the use of concrete walls being thus removed, tenders were obtained for a pavilion:—

(*a*) With walls of reinforced concrete.

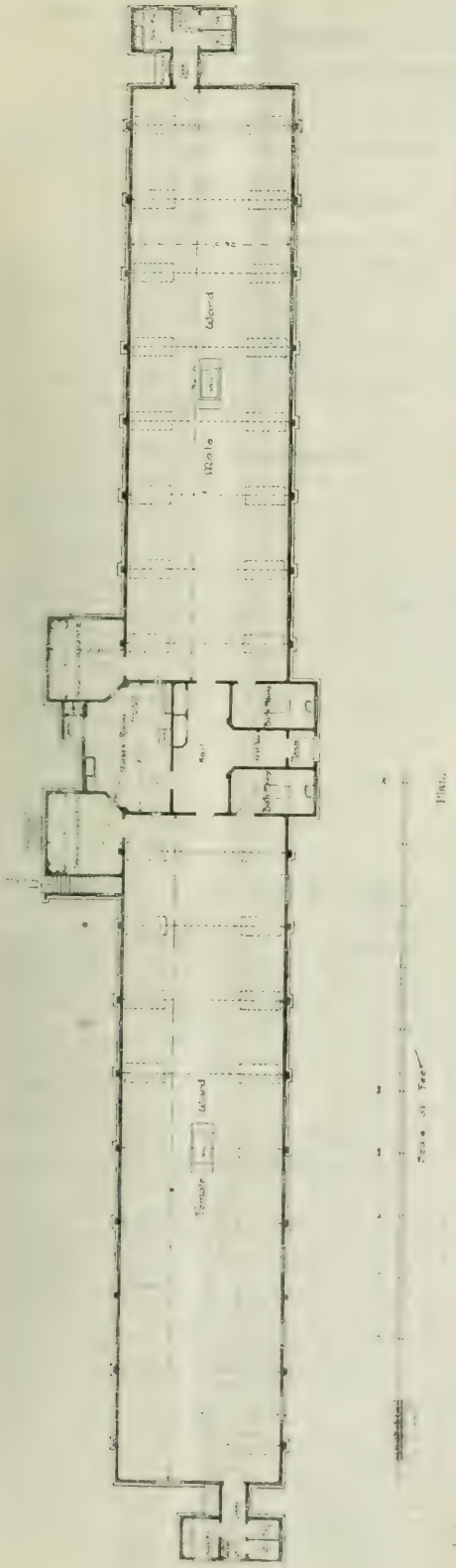
(*b*) With walls of concrete blocks, the roof being carried on steel stanchions.

A pavilion in the latter method of construction has been erected and recently opened, and as it is one of the first built in this way, it has been kept well under observation by the Local Government Board.

The plan shows the relative position of the wards and other rooms, from which it will be clear that all the beds are easily seen from the nurses' room by means of observation windows. A short description of the details of the construction may be of interest.

Steel stanchions, spaced 12 ft. apart centre to centre, and bedded on concrete foundations, carry the roof principals. The stanchions are connected at the caps by means of the sole plates, angle-iron stiffeners, bolted to the stanchions, carrying the window frames. The concrete blocks used in the walls are 4 in. thick, 3 ft. long and 12 in. high. The joints, both vertically and horizontally, are joggled and set in cement mortar. The walls are rendered externally in cement and coated with a waterproofing solution, and distempered light green. The stanchions projecting externally beyond the face of the wall are covered with expanded metal, which is filled in with cement concrete to form piers. Internally the walls are finished in Sirapite plaster, with a dark green painted dado, and distempered lighter green above. The ceilings are formed of fibrous-plaster slabs, screwed to joists and set in Keene's cement.

The floors are [illegible] with "Nowdenum" composite flooring, laid on cement concrete. This provides a jointless floor easily kept clean and free from microbes. For the same reason all the angles of floors, walls and ceilings are rounded, no mouldings are used in the internal woodwork, the doors are formed of skeleton framing covered with three-ply

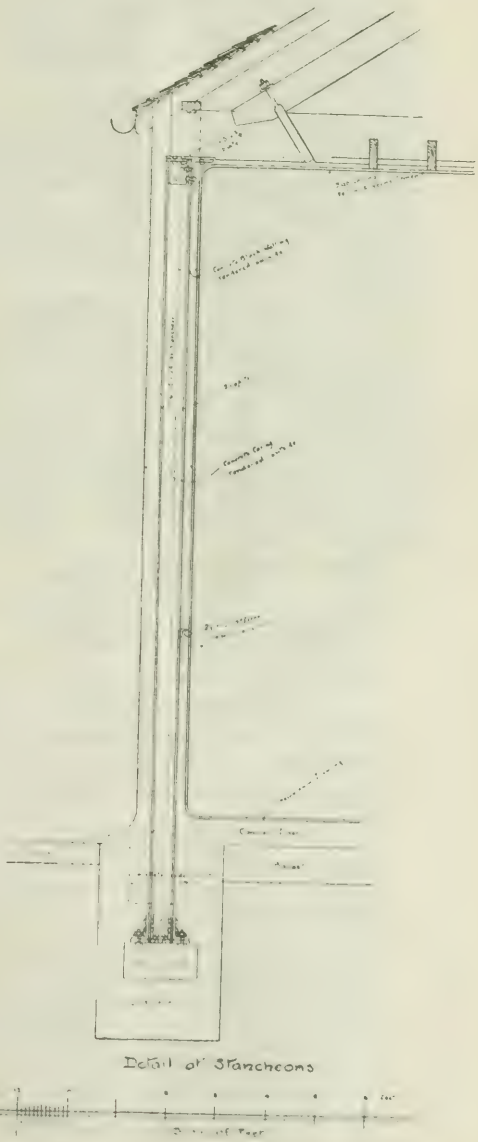



wood, and all the woodwork is finished in white enamel paint.

The building is heated on the low-pressure hot-water system. The fresh air enters the wards through hit-and-miss gratings under the windows, and is warmed by radiators, one being provided to each window. There is also a fresh-air inlet under each bed. Steam generated at the dust destructor adjoining is used in conjunction with a calorifier to provide the hot water, and the system is sufficient to raise and maintain an even temperature within the pavilion at least 30 deg. Fahr. above the temperature of the external air.

A steam closet is provided in the nurses' room for

Cross Section




NEW PAVILION, ACTON ISOLATION HOSPITAL.

warming food, &c. A gas stove is also fixed for emergencies. The sanitary fittings were supplied by Messrs. Adamsez, Limited, and include special slop sinks, bottle-washing sinks, and a fitting in which bed-pans, &c., can be left in disinfectant or running water. The pavilion is lighted throughout with electricity, all the fittings being controlled from a switchboard situated in the nurses' room.

The total cost of the building, including roads and drainage, is under £10,000. Exclusive of the sanitary fittings, drains, roads, paths, &c., this works out at about 4½d. per foot cube, or £71 per bed, or, including sanitary fittings, drains, roads, &c., 7d. per foot cube and £108 per bed—a very low figure as compared with the average cost of infectious diseases hospitals erected in recent years.

## CORRESPONDENCE.

*"All truth is precious, if not all divine."*—COWPER.

### THE ASSOCIATION OF CONSULTING ENGINEERS.

*To the Editor of* THE SURVEYOR.

SIR,—As announced some time ago in your columns, a meeting of practising consulting engineers, representing all branches of the profession, will be held on Monday, January 15th, at 4 p.m., in the lecture theatre of the Institution of Electrical Engineers, Victoria Embankment, W.C.

For the purpose of forming an association of consulting engineers a code of rules has been drawn up which it is believed will be in the best interests both of the public and of the profession, and it is hoped that all eligible consulting engineers who are able will attend the meeting in order that the subject may receive the fullest possible discussion.

It is inevitable that the rules will require alteration and improvements as experience may dictate, but it is felt that they form a basis on which consulting engineers may associate together in the best interests of the profession.

In the absence at present of any recognised list, it it obviously impossible to communicate individually with every eligible consulting engineer, and it is hoped that all such will accept this invitation to attend the meeting, to which admission can be obtained on presentation of their card at the entrance.

As it is sure to occur that a number of those who are in full sympathy with the aims and objects of the association will find themselves unable to be present at the meeting, it is hoped that they will assist by sending their views in writing to the honorary secretary, Mr. A. H. Dykes, 11 Victoria-street, Westminster, S.W., from whom copies of the rules and other information may be obtained.—Yours, &c., (Signed)

John Sydney Allard, M.INST.C.E.,
9 Victoria Street, Westminster, S.W.

Henry Percy Boulnois, M.INST.C.E., F.R.S.A.I.,
Past President Institution Municipal and County Engineers.
Past President Liverpool Engineering Society.
Member Road Board Advisory Committee.
7 Victoria Street, S.W.

William Tregarthen Douglass, M.INST.C.E.,
15 Victoria Street, Westminster, S.W.

Edward Mitchell Eaton, M.INST.C.E.,
7 Victoria Street, Westminster, S.W.

Robert Hammond, M.INST.C.E., M.I.E.E., M.I.MECH.E.,
64 Victoria Street, Westminster, S.W.

Joseph H. Harrison, M.INST.C.E., M.I.MECH.E., M.IRON AND STEEL INST.
Past President Cleveland Institute of Engineers.
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Parliament Mansions, Victoria Street, S.W.

Charles Lees, ASSOC.M.INST.C.E.,
37 Cross Street, Manchester.

Sydney Richard Lewcock, M.INST.C.E.,
20 Queen Anne's Gate, Westminster, S.W.

Ernest Lawson Mansergh, M.INST.C.E.,
5 Victoria Street, Westminster, S.W.

William J. Matthews, M.INST.C.E., F.R.S.A.I., F.G.S.,
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William Morris Mordey, M.INST.C.E., M.I.E.E.,
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William Henry Patchell, M.INST.C.E., M.I.E.E., M.I.MECH.E.,
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William Llewellyn Preece, M.INST.C.E., M.I.E.E.,
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John Francis Cleverton Snell, M.INST.C.E., M.I.E.E., M.I.MECH.E.,
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Alfred Herbert Dykes, ASSOC.M.INST.C.E., M.I.E.E.,
11 Victoria Street, Westminster, S.W.
Honorary Secretary.

### NON-PROFESSIONAL COMPETITION.

*To the Editor of* THE SURVEYOR.

SIR,—As a pupil taking up civil and sanitary engineering as a profession, may I ask if, when after having qualified for one or more of the several professional institutes, which necessarily entails considerable expenditure, these institutes have any provisional powers to protect their members against the manufacturer of sanitary appliances who styles himself a "sanitary expert," and who not only makes and sells his various sanitary appliances, but at the same time, while advertising his wares, solicits consultation, and, to my knowledge, draws up reports and plans, and is paid "professional" fees?

It seems to me that should there be no such protection the qualifications are merely farcical.—Yours, &c.,

FRANK E. BAYLISS.

Lyndhurst,
Arden-road,
Acocks Green.
January 5, 1912.

**Municipal Golf Course.**—The Yarmouth Corporation have decided to lay out a municipal golf course on the North Denes.

**Birmingham and Inland Waterways.**—At an influential meeting held on Wednesday at Birmingham the Lord Mayor in the chair, a resolution was adopted urging the Government to give effect to the recommendations of the Royal Commission on Canals by appointing a Waterways Board to acquire and manage the group of canals in which Birmingham is particularly interested, but without power to act as carriers. The cost of the project, which contemplates the improvement and linking-up of the canals so as to place Birmingham in direct communication with London, Liverpool, Hull, and the Bristol Channel, is estimated at £17,500,000.

**Manchester Building Exhibition.**—The building exhibition arranged to be held at Rusholme, Manchester, will be opened on March 9th, the closing day being March 23rd. Among the numerous patrons of the exhibition we observe the names of Messrs. R. E. W. Berrington, M.INST.C.E., Wolverhampton; A. Brown, M.INST.C.E., city engineer of Nottingham; A. T. Davis, M.INST.C.E., F.S.I., county surveyor, Salop; J. T. Eayrs, M.INST.C.E., F.S.I., Birmingham; A. D. Greatorex, M.INST.C.E., borough engineer of West Bromwich, and president of the Institution of Municipal and County Engineers; F. Griffiths, M.INST.C.E., Leicester; Maxwell and Tuke, Manchester; E. G. Mawbey, M.INST.C.E., borough engineer of Leicester; W. J. Newton, borough engineer of Accrington; H. Price, A.R.I.B.A., Manchester; R. Read, city surveyor of Gloucester; E. Rushton, engineer and surveyor to the Cheetham Urban District Council; T. Reader Smith, ASSOC.M.INST.C.E., engineer and surveyor to the Kettering Urban District Council; W. Stubbs, ASSOC.M.INST.C.E., borough engineer of Blackburn; H. E. Stilgoe, M.INST.C.E., city engineer and surveyor of Birmingham; Herbert Walker, M.INST.C.E., F.R.I.B.A., F.S.I., Nottingham; and C. F. Wike, M.INST.C.E., city surveyor of Sheffield.

# Institution of Civil Engineers.

## PAPERS ON REINFORCED CONCRETE.

Three papers on reinforced concrete matters, abstracts of which are appended, were presented at an ordinary meeting of the Institution of Civil Engineers on Tuesday evening last.

### REINFORCED-CONCRETE WHARVES AND WAREHOUSES AT LOWER POOTUNG, SHANGHAI.

By S. H. ELLIS, M.INST.C.E.

This paper described works recently constructed, under the author's supervision, beside the Whang-Poo River, near Shanghai, in North China. These comprise a reinforced-concrete piled wharf, 1,160 ft. long by 174 ft. wide, with a minimum depth of 21 ft. of water at its face; a reinforced-concrete quay-wall, 495 ft. long and 21 ft. high; and two reinforced-concrete four-storey warehouses, each 300 ft. by 100 ft. in floor area; as well as offices and staff quarters, sheds for temporary storage of goods, and a power and light installation.

The question of foundations was dealt with at some length, the site consisting of river-deposited silt to an unexplored depth. The wharves and lighter buildings are founded on groups of reinforced-concrete piles. The warehouses rest on a raft of reinforced concrete (girders, beams, and foundation slab), connecting the column bases with a grill 4 ft. 6 in. to 5 ft. deep.

A brief account was given of the methods employed in driving the wharf-piles, of which over 4,000 were used, and in the formation of the superstructure. The chief feature of the latter is that all members but the pile-caps, beams, and deck were moulded on shore, and erected in place when matured. The quay-wall is built along a tributary creek, and consists of a thin, vertical wall and horizontal deck connected by buttresses, the whole founded upon piles. A slight forward movement of the structure was described, and the means adopted to ensure its stability.

The warehouses have reinforced-concrete floors supported on columns, the chief feature of which consists in the vertical bars being bound with a continuous rod wound spirally and enclosing an area of heavily-stressed concrete. The interior first-floor columns are designed to carry a safe working load of 376 tons each.

The nature and method of preparation of the concrete were briefly described, and the average records were given of three series of compression tests which were made (on the site) with 8-in. cubes of 1:2:4 mixture. These gave average results of 2,540 and 2,811 lb. per square inch at three months, and 4,137 lb. per square inch at one year.

The various methods of reinforcement employed were outlined, and the basis of calculation was stated. The points chiefly dwelt on were, first, the reinforcement of the lower columns in the warehouse; secondly, the general methods of ensuring that the steel skeletons were firmly bound together, with no loose pieces; and, thirdly, the particular plan of effecting this in the wharf girders by employing a built-up reinforcement of angle and flat bars riveted together.

### THE DIRECT EXPERIMENTAL DETERMINATION OF THE STRESSES IN THE STEEL AND IN THE CONCRETE OF REINFORCED-CONCRETE COLUMNS.

By W. C. POPPLEWELL, ASSOC.M.INST.C.E.

In carrying out the experiments described in this paper the author sought for a satisfactory method of measuring the shortening of the steel bars and the simultaneous shortening of the adjacent concrete under the loads applied to reinforced columns. From these measurements, if they were reliable, he thought it would be possible to calculate the stresses in the steel and concrete, when the elastic moduli for the two materials were known. It was also thought that measurements made in this way would be the means of revealing any movement of the steel relatively to the concrete. The main experiments were carried out on five columns 6 in. sq., each reinforced by four round steel bars ¾ in. in diameter. Loads were applied in a testing machine, and corresponding shortenings of the steel and concrete were measured by means of Martens extensometers. For the steel these were applied to the ends of pairs of pins projecting from the reinforcing bars through holes in the concrete, and for the concrete they were applied to the surface as near as possible to the steel. From the results of the experiments, four pairs of curves were plotted for each column, one pair for each of the bars.

Besides the main experiments, others were carried out to compare the effect of loading when the load was uniformly distributed over the end of the column and when it was applied in the centre. This enabled a comparison to be made between the effect of having the load transmitted directly to the ends of the bars, and having it communicated to the bars through the holding grip of the concrete. The result showed practically no difference. The experiments to find out the value of the modulus for the steel and the concrete yielded values respectively of 30,200,000 lb. and 1,535,000 per square inch.

A further set of experiments carried out to determine the intensity of the frictional grip of the concrete on the steel resulted in values ranging from 300 to 600 lb. per square inch of bar surface, to cause slipping. The stresses in the steel and concrete, calculated for a working load of 13½ tons which the columns were designed to carry, were found to be, respectively, 437 lb. and 8,650 lb. per square inch. This gives a load on each bar of 1·7 ton, and, comparing this with the load required to push one of the bars through the concrete, as found from the experiments on frictional grip, it is evident that from this point of view there could not have been any slipping of the steel in the concrete.

The author considers that the manner in which the strain measurements were made proved very satisfactory, and that the method might be extended to other cases. A careful inspection of the plotted diagrams appears to show that, when all the effects of eccentric loading have been eliminated, there is no evidence to indicate that slipping took place; and it is evident that in columns of this kind made up with plain smooth bars the two materials behave like one so far as their strain effects are concerned.

### COMPOSITE COLUMNS OF CONCRETE AND STEEL.

By WILLIAM HUBERT BURR, M.INST.C.E.

The effect of a concrete filling on increasing the carrying capacity of a steel column having never been sufficiently investigated, the present series of tests were carried out by the author of this paper. The columns tested consisted first of two types of built-up columns of plain steel; and, secondly, of exactly similar steel members filled with concrete. The reinforced-concrete columns were filled with 1:2:4 concrete, and were tested at three months. The steelwork consisted in one case of four vertical steel angle-bars arranged as the four corners of a square, and braced together with lattice bars to form a square column 6⅜ in. in exterior dimensions; and in the second case of four vertical channels arranged with their flats forming four opposite sides of an octagon, and wrapped at intervals with batten plates bent round in the form of an octagon 7½ in. across the flats. Only the concrete lying within the exterior dimensions of the steelwork was included in the calculations. All the columns were 7 ft. long.

Four of each type were tested, two filled with concrete and two without concrete. The plain steel columns withstood an average total load of 67 tons on an area of 4 sq. in. in the case of the angle construction before failure, and of 68 tons on an area of 4·76 sq. in. in the channel construction, which was not so securely braced.

The addition of concrete increased the maximum loads before failure to an average of 98 tons on a total combined area of 42·25 sq. in. in the angle reinforcement, and to 96 tons and 112 tons respectively on an area of 49·75 sq. in. for the two channel-bar columns.

The modulus of elasticity of the steel being known, and the compression of each column under successive loadings being measured, the modulus of elasticity of the concrete and its corresponding stress can be calculated. In the case of the angle-bar columns this modulus was 2,321,000 lb. per square inch at a stress of 1,360 lb. per square inch, but decreased as the stress on the columns increased.

Finally, a description of the method of failure of the various columns was given; also curves showing the lateral deflection and main compression. The author concluded by suggesting that the tests would justify working stresses as high as 500 lb. to 750 lb. per square inch in columns of this nature, and possibly higher stresses for structures of unusual magnitude.

# Municipal Engineering Work in Birmingham.

## CITY ENGINEER'S ADDRESS TO STUDENTS.

In the course of his presidential address recently to the members of the Association of Birmingham Students of the Institution of Civil Engineers, Mr. H. E. Stilgoe, M.INST.C.E., the city engineer, gave an interesting account of some of the more important works with which the several departments under his charge are concerned.

Since the inclusion of the adjoining areas of King's Norton and Northfield (part), Yardley, Aston, Handsworth, and Erdington, the area of the city has increased from 13,477 to 43,537 acres, and the population from 525,960 to 842,291. The total rateable value is about £4,500,000.*

The city already supplied these districts with gas and water, and in some cases had agreements for the running of trams. King's Norton and Northfield used the city sewers, and a Joint Drainage Board dealt with the whole district (except Yardley and part of King's Norton) for drainage purposes. Each district had a different set of by-laws as to new streets and buildings, and various other regulations, which caused dissimilarity in the administration. These anomalies have been removed by the unification of the districts.

The main thoroughfares from the outside districts converge to the centre of the city, and direct means of cross and circular communication are practically non-existent. This (said Mr. Stilgoe) is not to be wondered at, for it could not be expected that the outside districts would unite for the purpose of laying down lines of through communication, nor had they in all cases the requisite statutory power. Now that the whole area is under one control this difficulty can be remedied, and in fact the corporation have under consideration a scheme for the construction of a ring road which will link up in the outer districts the main radial roads of the city. The proposed line of road follows as far as possible existing highways, and, taking what may be considered the more important portion of it—that from Erdington and traversing Yardley, King's Norton, and Northfield, and Harborne up to Hagley-road—the length is about 18½ miles, nearly 11 miles of which would entail the widening of existing roads, for the most part country lanes, and about 7½ miles of new road.

It is important that a project of this kind should be devised and decided upon so that the work may be carried out in sections as and when required by circumstances, and that estates may be developed and buildings erected on such lines that they will not interfere with the scheme.

### TOWN PLANNING.

It is very important for the health of the city that due regard should be had to the development of building estates, and now that the city is extended and unified it will be possible to give proper consideration to this important subject. In this connection the Housing, Town Planning, &c., Act, 1909, has endued municipalities with extensive powers in the matter of town planning, and interest in this direction has been aroused throughout the country.

This Act opens up a wide field for the municipal engineer, and affords the "responsible authority" the opportunity of town planning an area or entirely new [illegible] land from erecting buildings prejudicial to the [illegible] Town Planning Act it is possible to obtain authority from the Local Government Board to prepare such a scheme defining the direction, width, and construction of arterial and subsidiary roads, and of restricting the number and class of buildings, and providing such public or private open spaces as the Local Government Board may approve.

Under a town planning scheme it becomes possible to so arrange the streets that if arterial roads of a suitable width are provided for carrying the main traffic the residential streets can be laid out so as to accommodate their own district's traffic only, and therefore can be constructed in a less expensive and more attractive manner than the ordinary street made according to the requirements of the by-laws. In Germany town planning is more advanced than it is in England. Some of the towns are for this purpose divided into building districts, for each of which there are special restrictions as to the class of buildings to be erected, &c., and certain areas are set apart for works and factories, where by reason of the direction of the prevailing winds, such factories will not be a nuisance to the residential portions of the town. Attention is also paid to means of communication in the way of canals and railways, and as far as possible these are so laid out that they serve the manufacturing quarters.

### ROADS.

The highways of the city exceed 600 miles in length, about 17 miles having been added by the extension of the city boundaries. Of the 283 miles in the old city area 219 miles are macadamised and 64 miles are paved with granite setts and wood blocks.

The following figures show the average cost per mile of repairing macadam, granite, and wood pavements, and cleansing, watering, and gritting streets in the old city area for the year ending March 31, 1911: repairing macadamised streets, £102 0s. 1d.; repairing granite pavements, £71 13s. 10d.; repairing wood pavements, £242 17s. 9d.; cleansing paved streets, £300 12s. 5d.; cleansing macadamised streets, £72 5s. 7d.; watering paved streets, £13 13s. 7d.; watering macadamised streets, £7 10s. 10d.; gritting paved streets, £30 2s. 5d.

In Birmingham during the past summer we have tar-sprayed 93 miles of macadamised streets at a cost of ·619d. per square yard. To enable this work to be done cheaply and quickly we have large steam-heated storage tanks at our depots, and the tar is pumped from barges or tanks into these storage tanks, and from these, after being heated, it is applied to the streets by the distributing machines. Most of the work is done by 1,000-gallon spraying machines, drawn by steam tractors. The tar is sprayed on to the roads under pressure.

Of the new forms of carriageway surface, the corporation have laid Durax or Kleinpflaster paving, which is designed to meet the requirements of medium heavy traffic at less cost than the ordinary granite or wood pavements. It consists of granite setts of random sizes. These are generally made by machinery, and average from 3-in. to 4-in. cube. Those which we have laid are about 3¼-in. cube. The foundation for this class of paving need not be of concrete, as in the case of ordinary wood and granite sett paving. In laying the setts it is usual to remove the top coating of macadam to strengthen the foundation where necessary and to regulate it to the contour of the finished surface. The cubes are then laid in what is known as [illegible] pattern on a bed of ½ in. of tarred chippings [illegible]. The stones are rammed down into the bituminous bedding and are grouted in with pitch and oil. The cost of the paving is about [illegible] per square yard.

Pitch-grouted macadam has also been laid with good results. In this class of work, after the foundation has been prepared, the macadam, consisting preferably of good hard stone of 2-in. gauge, is laid and [illegible] bituminous mixture consisting of pitch, creosote, oil, and sand, or of one of the patent mixtures, such as "Plascom," is heated in the ordinary pitch boiler and applied hot to the surface of the road, which is then steam rolled before the mixture [illegible]. The surface is then grouted up with

* [illegible]

The Surveyor
And Municipal and County Engineer.

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the mixture, and stone chippings are applied, the whole being rolled to a finished surface. The cost of this work depends, of course, upon the thickness of the coating and amount of work necessary to be done to the foundations.

It will be understood that in selecting a class of pavement or form of road construction the most economical method is to provide that form of construction most suited to the traffic and the locality; and I need hardly say that a good foundation is absolutely essential in all cases.

### TRAMWAYS.

The tramways are constructed under the supervision of my department, and the repairs and maintenance are carried out under the supervision of the tramway manager. The length of tramways within the city before its extension was equal to 56 miles 67 chains of single track.

### STREET LIGHTING.

The street lighting of the city is by means of gas lamps. A considerable improvement was made some years ago by substituting for the flat-flame burners incandescent burners, and within the last two years the lighting of some of the more important streets has been improved by substituting inverted incandescent burners for the upright variety.

The upright incandescent burner consumes about 3½ cub. ft. of gas per hour, and gives out a light equal to 80-candle power. The inverted burner uses the same quantity of gas, and the candle power is about 80. The ordinary upright incandescent burners are, as a rule, arranged in groups of two where extra light is required, but in the ordinary lamps there is one burner only. The inverted burners, however, are arranged in groups of eight, six, and four; and this form of lighting lends itself better where particular concentration is required.

Experiments have recently been made here with lamps using high pressure gas. The pressure is equal to 60 in. of water. It has been found that the 200-candle power and the 1,000-candle power lamps (four burners in each) have given very good results. The consumption of gas is relatively less, the mantles cost more. The mantles used have averaged one per month for each burner in the case both of the ordinary inverted burner and the high-pressure burner; but in the former the mantles cost 2s. 6d. per dozen and in the latter 4s. 6d. per dozen.

The number of lamps in 285 miles of streets is: Upright incandescent, 10,443; inverted incandescent, 276; total, 10,719. In addition to these there are court lamps, 3,801; making a grand total of 14,520.

### ACCOUNTS.

I need hardly point out how important it is in connection with constructive works to keep accurate and detailed prime cost accounts. This and careful management are the only means by which the cost of work can be controlled and accurate estimates made for future works. Such accounts are also extremely useful in the case of the maintenance of works, and with respect to our highways we have a streets ledger referring to every street by which the cost of its upkeep can be ascertained. These forms of accounts, in addition to the ordinary accountancy in respect of labour and materials on current account, amount to about £150,000 per annum in respect of the old area of the city, and for this work we have a special branch department.

The object of my address has been not only to endeavour to interest you in the engineering works actually carried out in a large town, but to indicate the variety and extent of the duties that fall to a municipal engineer under modern conditions—duties which are being steadily increased by new legislation.

### ADVICE TO YOUNG ENGINEERS.

One important conclusion I hope I have made obvious—that the young engineer who wishes to attain to a high position in his profession must extend his studies, both theoretical and practical, over as wide a field as possible, and guard against too close a specialisation. It is most essential that he have a good general training in those subjects appertaining to the profession of a civil engineer, in order that he may the better accommodate himself to any branch which he may eventually take up. I mention this because I know from my own personal experience that a boy commencing his training for the profession of a civil engineer does not know exactly what branch he will take up, and even if he have an inclination towards a particular branch, and is articled to an engineer practising the same, he may never actually follow it.

The subject of the training of an engineer is always a difficult one. I believe it is now generally conceded that an engineering school or University training, followed by workshop or works practice, is the best form. Some boys do well who go direct from school into works or to an engineer's office. In the former case, if the works are well equipped with a good drawing-office staff, and with a chief willing to instruct, then good results are obtained; but it is not reasonable to expect therefrom, or to obtain in an engineer's office, that thorough grounding in the text-book work and in the principles that one can obtain at an engineering school, and without this "grounding" one cannot hope to attain so high a position. On the other hand, I have known lads who without any special training beyond that acquired by their own determination and hard work in an engineer's office, and by attending special classes in the evening, have passed the examination of the institution and have done well. Great credit is due to them, and they should receive every encouragement.

I would also impress upon you the necessity of being good men of business and of paying close attention to detail. The engineer is the more useful when he is useful economically. This is true both of design and of management. In the design of structures, having due regard to strength, there should be no more material employed than is necessary; in the design of machinery it is the effect and the economical working that count, and in the management and conduct of work success depends upon good administration and business capacity.

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**Sheffield Town Planning Scheme.** — The Sheffield Corporation are seeking the sanction of the Local Government Board to certain town planning proposals which will be the initiation of a scheme to develop the whole of the undeveloped land in the city.

**Water Diviners.**—The borough surveyor of Haslingden, Mr. J. S. Green, during a Local Government Board inquiry at Haslingden on Wednesday, said he knew the Local Government Board did not give much credence to water diviners, but in Haslingden repeated experience justified the corporation in having engaged a diviner. Quite a number of firms in the town for years had been obtaining large supplies of water which were indicated by diviners and which showed no diminution.

# Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

This week answers are invited to the following questions:—

## QUESTIONS.

**218. Aqueduct.**—What are the maximum centres at which the supports may be placed to carry a steel tube 2 ft. in diameter, full of running water, for a distance of 180 ft. at a height of 60 ft. above ground? (E. M. D., *Wood Green.*)

**219. Tram Rails.**—Describe an accurate, practical method of measuring the wear of a steel-girder tram rail. (T. R.)

**223. Reinforced Concrete Bridge.**—Design a reinforced concrete bridge to carry a 36-ft. main road over a river (at right-angles), single span 60 ft. between abutments, 36 ft. wide, 20 ft. from mean surface of water to the crown of arch. Banks 5 ft. above mean water level; foundations 15 ft. clay, then hard, red sandstone. Allow for usual main road traffic, and show calculations. (A. P., *Liverpool.*)

**224. Town Planning.**—What are the chief points to be considered in laying out a new town?

**225. Road Construction.**—Specify the construction of a new stone-pitched road to bear heavy town traffic, and draw a section of same. (T. R.)

## REPLIES TO QUESTIONS.

**221. A Problem in Mechanics.**—A trap door is 4 ft. square and weighs 75 lb. It is hinged by one of its horizontal edges, and is supported with its plane horizontal by a chain which passes from the middle point of the outer edge of the door to a point vertically over the middle point of the edge in which the hinges are fixed, and 7 ft. above it. Determine graphically the pull in the chain and the thrust of the hinges. (A.M.I.C.E.)

Let the trap door AB be hinged at A, and held horizontal by a chain BC at B, and fixed at C vertically above A.

The weight of the door (W) acts vertically downwards through its centre of gravity D, and tension of chain acts along BC.

Set up DE perpendicular to AB to cut BC in E.

Then 3 forces acting are:—

(1) Weight (W) of door acting along ED downwards.

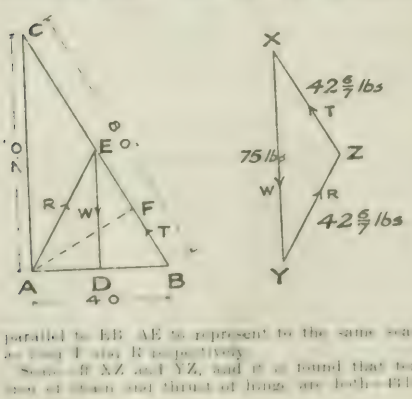
(2) Tension (T) of chain acting along BE.

(3) Reaction (R) of hinge A.

Now the lines of action of W and T meet at a point E, and since the forces acting on the structure are in equilibrium, their lines of action must pass through the same point.

∴ R must pass through point E, i.e., AE is the direction of R.

Draw XY parallel to ED to represent W to any convenient scale. Draw XZ, YZ respectively




parallel to EB, AE to represent to the same scale as XY, I and R respectively.

Scale of XZ and YZ, and it is found that tension of chain and thrust of hinge are both 43 lb. (nearly).

As a check on the graphical method, R and T can be found analytically as follows:—

Taking moments about A,

$$T \times AF = W \times AD$$

$$T = \frac{75 \times 2}{AF}$$

Now since the angle BAC is a right-angle

$$BC = \sqrt{AB^2 + BC^2} = \sqrt{49 + 16} = \sqrt{65} = 8 \text{ (nearly)}.$$

To find AF (the perpendicular distance of BC from A)—

$$\text{Area of the angle ABC} = \tfrac{1}{2}(AF \times BC) = \tfrac{1}{2}(AC \times AB)$$

$$\therefore AF \times BC = AC \times AB$$

$$\therefore AF = \frac{7 \times 4}{8} = 3{\cdot}5 \text{ ft.}$$

$$\therefore T = \frac{75 \times 2 \times 2}{7} = \frac{300}{7} = 42\tfrac{6}{7} \text{ lb.}$$

Resolve T into two components—viz., one along BA and the other perpendicular to BA—

Let $T_h$ = horizontal component of T,

$T_v$ = vertical component of T,

$$\text{Then } T_h = T \cos \angle ABC = \frac{300}{7} \times \frac{4}{8} = \frac{150}{7} = 21\tfrac{3}{7} \text{ lb.}$$

$$T_v = T \sin \angle ABC = \frac{300 \times 7}{7 \times 8} = 37{\cdot}5 \text{ lb.}$$

Resolve R into its horizontal and vertical components, $R_h$ and $R_v$ respectively.

Then since only horizontal forces acting on door are $R_h$ and $T_h$, these must be equal and act in opposite directions.

$$\therefore R_h = T_h = 21\tfrac{3}{7} \text{ lb.}$$

Also $R_v$, $T_v$ and W constitute a system of parallel forces in equilibrium.

$$R_v + T_v = W$$

$$\therefore R_v = 75 - 37{\cdot}5 = 37{\cdot}5 \text{ lb.} = T_v$$

$$\therefore R = \sqrt{R_h^2 + R_v^2} = T = 42\tfrac{6}{7} \text{ lb.}$$

(W. H. P., *Lytham.*)

**222. Building Materials.**—What is the chemical composition of the ordinary kinds of marble, and to what are the various tints attributable? Do you consider marble a good material to use for (*a*) outside work in towns, and (*b*) internal staircases? Give your reasons fully.

True marbles are composed of practically pure carbonate of lime ($CaCO_3$) in a highly crystalline form, resembling loaf sugar in structure. They have been formed from limestones, by metamorphosis by heat. The coloured marbles derive their colours from impurities in the original stones, metal oxide (chiefly oxide of iron), &c., and during metamorphosis these impurities have run, forming veins and markings, upon which the value of some marbles depends. Marble is obtainable in almost all colours and combinations of colour. In practice the term marble has come to mean any limestone, and also some stones other than limestones, such as serpentines, alabaster, &c., that are hard enough to take a polish, and having generally the physical characteristics of true marble—that is, a hard crystalline structure.

Serpentines, the best known of which are the Verte Antique and the Connemara marble, are igneous, metamorphic rocks, produced by heat from igneous rocks rich in olivine, and are composed chiefly of silicate of magnesia.

True Oriental alabaster, obtained from Egypt, Assyria, &c., is a translucent and nearly white limestone, with circular markings, indicating stalagmatic origin. It is difficult to obtain, and is consequently replaced in practice by a soft sulphate of lime, found in large quantities near Paris, also called alabaster.

Several stones belonging really to the class of compact limestones are known as marbles, such as Hopton Wood, Purbeck, and Barton stones. These stones take a good polish, and in that condition

display very beautiful markings, due to fossils, &c., embedded in the limestone. These stones will not, however, keep their polish long if exposed to wear or weather. Marble generally is durable and a good weathering stone, due more to its crystalline structure than its composition, with a crushing resistance almost equal to that of granite. Some marbles will not retain a polish if exposed to the weather, but nearly all retain their polish when used indoors.

The latter queries depend a good deal upon what marble is to be used, but generally marble, owing to its composition, does not weather well in smoky atmospheres, and would therefore not be suitable for outside work in towns. It is a good material to use for internal staircases, on the grounds of ornamentation, and, owing to its hardness and strength, it wears well, but in a fire it would be calcined into quicklime, which is its chief disadvantage. It is also rather costly. (J. A. R., *Milton Regis.*)

## SOME RECENT PUBLICATIONS.*

WILLING'S PRESS GUIDE. 1912. Price 1s. London: James Willing, junr., Limited.

Constant reference to its pages for many years past enables us to recommend this publication with every confidence to those in want of a concise and comprehensive index to the Press of the United Kingdom. The arrangement of the contents is admirable; the book is handy in size, and from our own experience of it we can testify to the accuracy of its information.

STRUCTURAL ENGINEERING. By Joseph Husband, ASSOC.M.INST.C.E., and William Harby. Price 7s. 6d. nett. London: Longmans, Green & Co.

It is difficult nowadays to conceive a text-book on any of the usual engineering subjects on a plan that is at all novel. The authors of the present work, however, have attempted this, and in our view they have succeeded. The literature of the theoretical aspect of structural engineering is fairly extensive, while, on the other hand, there are not a few books in existence which deal with the practical arrangement of structural details. The aim of Messrs. Husband and Harby has been to produce a work which, while dealing in outline with the essential parts of the theory of their subject, concerns itself primarily with the application of theoretical principles to the details of actual practice. In pursuance of this plan the first three chapters are devoted respectively to materials, loads, and working stresses, and bending moment and shearing force. The remaining chapters are concerned with the actual design of beams, columns and struts, plate girders, lattice girders, roofs, and other structures. The final chapter treats of masonry and masonry structures.

Although the work is not meant solely for students, it will appeal strongly to those preparing for the Institution of Civil Engineers and other examinations in engineering. The higher mathematics have been avoided, and numerical examples take the place of or illustrate the use of abstract formulæ. The authors are experienced teachers and lecturers, and this fact reveals itself in the clearness of the style. Copiously illustrated and well indexed, we think that the book should find a very appreciative public.

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The January issue of the Journal of the Royal Sanitary Institute includes an inset portrait of the chairman of the council of that body, Mr. H. Percy Boulnois, M.INST.C.E. The official account of the proceedings at the Belfast congress are continued in the number in question, among the papers reproduced being those submitted at the conference of medical officers of health.

In future only one volume of "Transactions" of the American Society of Civil Engineers will be issued annually, instead of four as heretofore. This volume will be printed on the best "India" paper, will contain approximately as much material as the four quarterly volumes combined, and its bulk will be less than half theirs. The date of issue will be about the end of each year.

Pictures by Sir Henry Raeburn, R.A. (London: Wallis & Son, The French Gallery, 120 Pall Mall, S.W. Price 10s. 6d.). A catalogue of the thirty portraits by the great Scottish artist now being exhibited at the French Gallery. The catalogue is a work of art, notable especially for the beautiful photogravures of the works on view, and supplemented by a biography of the painter and by the Press notices which have been given of the Exhibition.

The November-December issue of "Garden Cities and Town Planning" contains a strongly-worded article on "The Housing Tragedy in South Wales." The state of affairs described is certainly deplorable, and it is difficult to understand why it is not worth while building houses to meet the demand. The population of the Rhondda and neighbouring valleys is, it may be remarked, a difficult one to deal with, as the sense of home is lacking in many families, and the tendency to share houses is greater than in most parts of the country. This consideration is not an excuse for the present evils, but in fairness to the local authorities and their officials, the exceptionally rough character of a part of the population should be recognised as one of the difficulties in the way of reform.

DIARIES.

Messrs. J. Stone & Co., Limited, sanitary engineers, Deptford, have issued a red morocco pocket note-book for 1912 which, while being conveniently portable and presentable, is provided with some special features, notably a daily wants dictionary of things worth remembering, monthly engagement pages, and cash account. A coupon for £1,000 accident insurance is thoughtfully provided, and in all respects the pocket-book may be regarded as a complimentary token alike interesting and useful.

Messrs. E. Catchpole & Sons, of Plough Bridge, Rotherhithe, London, S.E., issue a 1912 pocket diary and note-book, prepared for them by Messrs. Charles Letts & Co., and usefully equipped with a back-loop pencil, pockets and other conveniences. Messrs. Catchpole specialise in a refined coal-tar which complies in all respects with the Road Board specifications, bituminous tar, a bituminous binder which is specially suited for patching work and tramway margins, coal-pitch for wood-block paving, creosote oil, black varnishes, disinfectants, greases and the like. We observe that the Chislehurst Urban District Council have recently again accepted their tender for the supply of tar for road treatment, this making the third year of their use of Messrs. Catchpole's material.

## HIGHWAY AND SEWERAGE MATTERS IN UXBRIDGE RURAL DISTRICT.

It appears from the second annual report of the engineer and surveyor, Mr. John Wm. Harrison, that tar-painting was carried out on a more extensive scale last year in the rural district of Uxbridge, Middlesex, than was the case during the preceding twelve months, 19,786 sq. yds. being done, as against 8,490 tar-painted and 3,890 made up with tar in the previous year, or a total of 12,380. Mr. Harrison is hoping to do still more next year, as the tarring, he considers, is a great saving in the wear and tear of the surface, as well as a dust layer.

The cost of tar-painting last year worked out at 1·77d., as against 0·93d. per square yard in the previous year, but this is accounted for by the use this year, for the first time, of granite chippings, and the increased price of tar. The use of granite chippings will, the surveyor believes, be a saving in the end.

In regard to the use of the sprinkling apparatus on the steam roller, Mr. Harrison remarks that, although he is unable to give actual figures, the saving effected by this must be considerable in the course of the year.

The last two pair of contact beds have been emptied of the old broken-down brick rubbish, and filled with good, clean, hard-burnt clinker; new valves have been fixed to all the coarse beds, and new rubbers to the valves to all the fine beds, with the result that the effluent is quite satisfactory. Mr. Harrison is continuing with the getting out of the gravel on this farm, and reports that a profit of £32 was made on the sale of the material for the first half-year, and over £37 for the last half-year.

The surveyor adds: "There is no doubt that the land is being improved, as well as the effluent, by being regularly ploughed and furrowed, and as time goes on I am endeavouring to get the land more level. A considerable saving is being effected by doing away with eleven out of the twelve flushing tanks on the sewers, and the stopping of the engines for about four hours during the early morning is proving a saving in the consumption of oil and the wear and tear of machinery."

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Blaydon (Durham) U.D.C.** (January 5th. Mr. Courtenay Clifton).—£350 for the purchase of two cottages known as Silver Hill, Blaydon, for purposes of street improvement; and sums amounting to £707 for the purchase of Manor House, Winlaton, and the Consett Iron Company's old colliery office and adjacent land at Chopwell, for purposes of council yards; also for approval of the application towards defraying the purchase of Manor House of the sum of £343, out of the balance of moneys received by the council in respect of the sale and transfer of their water undertaking.—Mr. George Symon (surveyor) said, with regard to Silver Hill, that it was proposed to demolish the two cottages, which were in a dilapidated condition, and to move the somewhat dangerous and acute angle in the road at the foot of Blaydon Bank. A public convenience was proposed to be erected at the place. The area of the land was about 200 sq. yds. Further improvements might be carried out in the vicinity in the future. In reference to Manor House, it was intended to convert part of the building into houses for three of the council's workmen. Fire appliances were also to be stored there, and there would be a depot for materials. As regarded the old colliery office at Chopwell, the council proposed converting the building into a dwelling-house. Materials would also be stored there, and fire appliances kept on the spot. Chopwell, he said, had now a population of over 10,000.

**Chelmsford R.D.C.** (January 3rd. Mr. A. A. G. Maley). £1,050 and £350 for water supply purposes for Great Baddow and Springfield respectively.—The money, it was stated, is required for the purchase of 50 acres of land adjoining the present water tower at Great Baddow for the purpose of protecting the springs from which the present supplies were drawn, and also for the construction of a reservoir to contain 70,000 gallons. The object of this storage is to ensure a supply of at least 40,000 gallons in case of fire. Evidence was given by Mr. A. S. Duffield, the clerk; Mr. J. Dewhurst, the surveyor and engineer, and Dr. J. C. Thresh.

**Coalville U.D.C.** (January 3rd. Mr. W. O. E. Meade-King). £2,400 for street improvement purposes. Mr. L. L. Baldwin, surveyor to the council, said the expected contribution towards the improvements for the flagging on the main roads was £449, leaving £2,100 required, and 12,936 sq. yds. would be flagged, covering a distance of nearly 3 miles. The flagging was not continuous, but would be distributed right through the urban district in thirty different sections, providing a continuous footpath in the populous area. Mr. McCarthy: On one side? The surveyor: Yes. Continuing, the surveyor said the present paths were gravel and tar-painted. The paths where not flagged were in a bad condition. The flagging would be 2-in. thick concrete, patent stone, provided by contract, laid on engine ashes, 1 in. thick, to bed the flags, which would be jointed in lime cement. Some short lengths of kerbing and channelling would be necessary. The paths varied in width on the London-road from 8 ft. 6 in. to 11 ft. 6 in. It was requested that the loan should be for a period of twenty years.

**Soyland U.D.C.** (January 2nd. Mr. A. G. Drury).—£6,700 for sewage purposes.—It was stated that the population of the district at the last Census was 2,935, a decrease of 200 on the 1901 Census. Mr. L. H. Longbotham, clerk, said the council were not very enthusiastic about the application, into which they had been forced by the Rivers Board. He did not think the river was as bad as in some districts.

**Wallsend T.C.** (January 4th. Mr. Courtenay Clifton). —£2,000 for work in connection with the water-carriage system.—The application was supported by the borough surveyor (Mr. G. Hollings), who submitted plans. The town clerk explained that the number of ashpits they proposed to remove was 342, and the number of earth-closets [illegible] The number of water-closets to be substituted was 991. The average cost [illegible] and substituting a water-closet and cistern for the ashpit would be £4 10s. One-half of this amount would be paid by the owners of the property. In anticipation of the loan forty-nine ashpits and one earth-closets had been removed, and seventy-[illegible] and seventy-three ashpits had been converted at a cost of £783, half of which had been paid by the owners. There was no opposition.

### APPLICATIONS FOR LOANS.

**Accrington T.C.** £6,750 for the provision of electricity mains and plant.

**Bray U.D.C.**—£3,500 for the extension of the electricity works.

**Blackburn T.C.**—£3,300 for flood-prevention works.

**Bristol T.C.**—£7,037 for paving works.

**Burgess Hill U.D.C.**—£2,250 for works at the sewage farm.

**Essex C.C.**—£740 for new kitchens at the Brentwood Asylum.

**Felixstowe U.D.C.**—£680 for the provision of an ejector and ejector chamber at sewage pumping station, and £400 for fire-brigade purposes.

**Hendon U.D.C.**—£11,288 for improvement works in Golder's Green-road and North End-road, and £15,700 for a new school on the Hampstead Garden Suburb estate.

**Hunstanton U.D.C.**—£1,200 for the erection of cottages and carrying out improvements to the water-works.

**Ilfracombe U.D.C.**—£2,400 for street improvements.

**Ilkeston T.C.** £2,663 for street improvements.

**Newry No. 1 R.D.C.**—£5,000 for the Rathfriland water supply.

**Torquay T.C.**—£3,000 for furnishing and equipping the new pavilion.

**West Riding C.C.** £2,700 for a school at Silkstone.

### LOANS SANCTIONED.

**Alfreton U.D.C.**—£9,000 for improving the water supply and the installation of filter-beds.

**Burnley R.D.C.**—£1,515 for supplying Higham with water from Nelson.

**Clevedon U.D.C.**—£2,842 for the reconstruction of the pier-head.

**Deal T.C.**—£4,560 for the central Deal improvement scheme.

**Essex C.C.** £2,040 for a school for defective children at Woodford.

**Leigh-on-Sea U.D.C.**—£7,505 for private street works, and £1,525 for gas-works purposes.

**Neyland U.D.C.**—£300 for a station gas meter and gas-main extensions.

**Stockport T.C.** £1,120 for greenhouse, shelter, bowl-house and tennis pavilion in the public parks.

**Torquay T.C.** £7,481 for erecting and furnishing a school at Homelands.

**West Riding C.C.** £9,700 for a school at Bentley.

### LOAN REFUSED.

**Spalding U.D.C.** £3,000 for the provision of public baths in Ayscoughfee Gardens. Refused on the ground that the proposed buildings would seriously interfere with the amenities of the gardens.

### FORTHCOMING INQUIRIES.

JANUARY.

| | | £ |
|---|---|---|
| 16. | **Bexhill.** For the construction of a sea-wall (Mr. P. M. Crosthwaite) | 4,115 |
| 16. | **Eaton Socon.** For sewage disposal works (Mr. A. G. Drury) | 150 |
| 16. | **Hendon.** For street, sewerage and surface-water drainage works (Mr. R. H. Bicknell) | 94,0 |
| 16. | **Poole.** For private street improvement purposes (Mr. F. O. Standerd) | 907 |
| 16. | **Wood Green.** For laying out a recreation ground (Major J. Stewart) | 6,081 |
| 17. | **Honiton.** For sewage disposal works (Mr. F. O. Standerd) | 800 |
| 17 | **Stevenage.** For the erection of a fire station (Mr. R. H. Bicknell) | 750 |
| 19 | **Frimley.** For sewerage purposes (Mr. F. O. Standerd) | 6,600 |
| 21 | **Earby.** For [illegible] sewerage (Mr. R. H. Bicknell) | 300 |
| 21 | **Chorley.** For water supply purposes (Mr. R. H. Bicknell) | 1,051 |

**Surrey Canal and Dock Scheme.** [illegible] recently been given to the Surrey County Council to [illegible] for the provision of a canal and dock the purpose of which is to afford barges easy access to large gravel pits near the river at Ham. At their meeting on Tuesday Richmond Town Council passed a resolution against the scheme, counsel in the interest of the inhabitants of the Thames not to sanction the project.

# Municipal Work in Progress and Projected.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Bootle £7,220, Boston £5,800, Cambridge £11,326, Essex £82,967, Leeds £4,000, Norfolk £6,000, Northampton £8,000, Torquay £15,000, Wood Green £6,000; roads and materials—Essex £1,503, Hendon £11,288, Southwick £4,689; sewerage and sewage disposal—Bristol £2,470, Burgess Hill £2,250, Evesham £10,000; water gas and electricity—Bradford £2,353.—Particulars of other works projected will be found on our "Local Government Board Inquiries" page.

## ADMINISTRATION.

**Carmarthenshire C.C.**—At a meeting of the Main Roads Committee last week discussion took place over a proposal made by Mr. F. D. W. Drummond, that the resolution passed by the Main Roads Committee at their last meeting, having reference to the appointment of a successor to the former surveyor of the Eastern Division, be not confirmed. There was down on the agenda a further motion by Mr. Drummond, "that in future there be one county surveyor for the entire county, with two (or three, as may be determined) assistant road surveyors under him, and that the care of all county buildings be henceforth placed under the supervision of the county architect." The chairman ruled they could not alter a system without first of all rescinding the resolution upon which that system rested, and he ruled the latter motion out of order. The former motion was agreed to.

## BUILDINGS.

**Belfast T.C.** The proposal of the Parks Committee to allocate a site in the Botanic Gardens Park for the proposed museum has been approved.

**Bootle T.C.**—A scheme for additional hospital accommodation for infectious diseases, estimated to cost £7,220, is under consideration.

**Boston T.C.** Mr. J. J. Webster, the consulting engineer, attended a meeting of the Paving and Lighting Committee last week, and, after discussing the position with him, the committee resolved to recommend the corporation to build a new steel-girder Town Bridge, at a cost of £5,800. The engineer estimated that the bridge would take five months to complete. Asked if it could not be built in less time, he said that period could be shortened by working day and night, but the work would not then be done so satisfactorily, and the cost would be considerably greater.

**Burnley T.C.** Three new shelters are to be erected in Ightenhill Park.

**Cambridge T.C.** The tender of Messrs. Kirkman Brothers, Cambridge, at £11,326 has been accepted for the erection of a new school.

**Carmarthenshire C.C.** The Main Roads Committee recommend a grant to the Llandovery Rural District Council of half the cost of erecting a new bridge over the Towy at Rhandirmwyn, provided it does not exceed £650. It is estimated that the bridge will cost £1,300.

**Essex C.C.** The tender of Messrs. H. Arnold & Son, at £82,967, has been provisionally accepted for the extension of the Colchester Asylum.

**Hunstanton U.D.C.**—The surveyor, Mr. J. C. Walker, has produced an amended plan for a shelter (without lavatories), at an estimated cost of £239 below the previous one (which included lavatories). It has been agreed that the shelters should be constructed with reinforced concrete walls, pillars and roofs, the top to be level and suitable for promenading and placing of seats.

**Leeds T.C.**—A scheme has been adopted for providing additional accommodation for the police at the town hall. Briefly, the scheme is to prepare the rooms at the south-east corner of the ground floor and the first floor and the old committee-room for use as police offices, the estimated cost being £850. The third floor of the Pearl Buildings in East Parade is to be rented for the use of the town clerk's department, and the tramways department is to be quartered in the old dispensary building at the junction of new Briggate and Vicar-lane. The latter proposal involves alterations to the building, estimated to cost between £3,000 and £4,000.

**Norfolk C.C.**—An agreement has at length been come to with respect to the long-delayed rebuilding of Magdalen Bridge. It is proposed to build an iron bridge, at an estimated cost of £6,000, and that a proportion of one-third be paid by the locality and two-thirds by the county council.

**Northampton C.C.**—Plans have been approved by the county council and the urban and rural district councils of Oundle for widening, at an estimated outlay of £8,000, Oundle North Bridge, which is on the main road from Wellingborough to Peterborough, and crosses the river Nene near Oundle Station on the London and North-Western Railway. The existing bridge, which unites the urban and rural areas of Oundle, is 370 yds. long, and consists of the main bridge crossing the Nene (four arches), another bridge at the mill at the west end (two arches), and six flood arches. It is to be widened on the south side to a uniform width of 36 ft. The engineer is Mr. C. S. Morris, of Northampton, the county surveyor, and the contractor Mr. O. P. Drever, of Kettering, his tender amounting to £7,953.

**Torquay T.C.**—The tender of Messrs. J. Lysaght, of Bristol, at £660, has been accepted for covering the service reservoir at Newton Abbot.—With respect to the proposed bathing place opposite Belgrave-road, it has been decided to construct a concrete platform, about 100 ft. in length, at an estimated cost of £525, and, in order that it may be ready for use by the next bathing season, provision is to be made in the new year's estimate for defraying the cost of the work.—The scheme for providing medical baths, at an estimated cost of £15,000, has been approved in principle.

**Wood Green U.D.C.**—Plans have now been approved for executing additions to the town hall and providing the additional office accommodation required, and also two new courts for the holding of the local petty sessions and county courts. The estimated cost of the work is £6,000, and an arrangement will be made with the Middlesex Standing Joint Committee for the payment of an increased annual rental for a fixed period as respects the petty sessions accommodation. The council have decided to support the Middlesex County Council's application to Parliament for power to construct a short line of tramway from the Manor House to Finsbury Park Station. The proposal is to erect a new central fire station, at an estimated cost of £4,000 and the building will probably be equipped with modern motor appliances, and also a substation in the Alexandra Park Ward.

## HOUSING AND TOWN PLANNING.

**Brentford U.D.C.**—The clerk, at the meeting last week, stated that he wrote the town clerk of Richmond, Mr. Sagar, asking to be furnished with the council's town planning scheme, and he received a reply that a definite scheme was not in force. A committee had been formed to draw up a scheme, which would cover a wide area, and included a portion of the Brentford district. The clerk said that he had since seen the Richmond map of the district to be affected, and it included Old England, and that portion lying between the docks and Syon estates. The idea was to preserve the amenities of the river and prevent the land being used for building.

**Holbeach R.D.C.**—The Public Works Loan Commissioners have declined to advance the necessary money for a housing scheme prepared by the council and sanctioned by the Local Government Board, on the ground that the rentals may not quite cover the repayment of both principal and interest, and that there may be a slight charge upon the rates. Matters being at a deadlock, the council are communicating with the President of the Local Government Board on the subject.

**Hunstanton U.D.C.** Amended plans have been produced by the surveyor, Mr. J. C. Walker, for workmen's cottages near the gasworks. The latter are to be six in number, built of brick, with rubble-ear facing to the front and red-brick groins to all angles. Each cottage will have five rooms, two on the ground floor (with pantry and storeroom), and three bedrooms. The estimated cost is about £160 per cottage.

**Surbiton U.D.C.**—The Buildings and Town Planning Committee on Monday reported that on December 19th the representatives appointed by the council met in conference the representatives appointed by the Esher and the Dittons and the Maldens and Coombe Councils and agreed to satisfactory resolutions as to joint action with regard to certain portions of the districts which are contiguous, and also as to the direction of the by-pass roads suggested by the Road Board.

## PARKS AND OPEN SPACES.

**Matlock U.D.C.**—The chairman of the council last week laid the first sods of a new bowling green in the new park, in the centre of the town, which has cost about £6,000.

**Merton (Surrey) U.D.C.**—The surveyor, Mr. G. Jerram, has been directed to ascertain particulars as to any sites in the district which may be suitable for recreation ground purposes.

**Newbiggin (Northumberland) U.D.C.**—The surveyor, Mr. R. Appleby, has received instructions to prepare plans for laying out North Seaton links.

**Swansea T.C.**—Estimates have been approved for the provision of drinking fountains, swings, bowling green, and bandstand in the parks, the estimate for the bandstand being £300.

## ROADS AND MATERIALS.

**Bootle T.C.**—Consideration is being given to proposals for widening Alexandra-drive, Linacre-road and Albert-drive.

**Bradford T.C.**—The Tramways Committee have submitted a recommendation to the council to renew sections of the tramway track, at an estimated cost of £18,110.

**Bristol T.C.**—Consent has been given to the borrowing of £2,470 for road improvement work in order to provide work for the unemployed.

**Doncaster T.C.**—Councillor Kay, moving the adoption of the minutes of the Sanitary Committee last week, referred to complaints made as to the condition of the roads of the town, and intimated that in the near future the corporation would have to adopt a different system. They would have to do away with the macadam and substitute setts. They could not blame their predecessors, who did not foresee the developments of the district. During the last five years the town had changed from a sleepy place to a hive of industry.

**Essex C.C.**—The tender of Messrs. W. Griffiths & Co., Limited, at £4,503, has been accepted for paving the margins of High-street, Ilford.

**Guisborough R.D.C.**—Plans have been passed for the road improvement between Guisborough and Redcar, near Tockets Bridge, at a cost of £850, to be apportioned between the rural and urban councils.

**Hendon U.D.C.**—Improvement works are to be carried out in the Golder's Green-road and North End-road, Golder's Green, at an estimated cost of £11,288. The scheme is to be executed in conjunction with the Middlesex County Council. The traffic along the roads since the construction of the tube railway has increased so much that the widening of the thoroughfares and new footpaths are rendered imperative. The question of widening the bridge which spans the Brent at Golder's Green is also under consideration.

**Hove T.C.**—The renewal of the wood paving in Church-road, at an estimated cost of £755, is under consideration.

**Leigh-on-Sea U.D.C.**—The tenders of Messrs. W. Isles & Sons, at £2,629, £1,550 and £350 respectively, have been accepted for making up Leigh Hall-road, Oakleigh Park-drive and Queen's-avenue, and the tender of Mr. W. J. Jackson, at £50, for works in Queen's-avenue.

**Lewisham B.C.**—The council have accepted the suggestion of the London County Council that the local authority should bear one-third of the cost of the necessary widenings of Bromley-road, Catford, in connection with the projected construction of the tramways from Rushey Green to Southend. The borough council's contribution is not to exceed £1,417.

**Mutford and Lothingland (Suffolk) R.D.C.** — The council have approved a plan and estimate of £2,630 for a proposed new road to Burgh St. Peter.

**Newcastle-under-Lyme T.C.** The building line in Clayton-road has been fixed to show a 50-ft. road and a carriageway of 30 ft., and for widening purposes it has been decided to purchase a piece of land at 6d. per square yard.

**Newquay U.D.C.**—It has been agreed to negotiate for the use of property in Broad-street as a stone depot; also to secure for the same purpose half an acre of ground in Tolcarne-road, at £25 per acre ground rent.

**Norfolk C.C.**—In consequence of the damage done to the roads by the dry summer, it has been agreed to spend £1,409 on works of improvement in the eastern part of the county.

**Pontefract R.D.C.**—The council are considering a scheme for the improvement of Ashton-road, at an estimated cost of £1,583.

**Poole T.C.**—A special committee has been appointed to consider the question of effecting a street improvement at the entrance to Serpentine-road, and if necessary acquiring land for the purpose.

**Southwick U.D.C.**—Street improvements are to be carried out, at an estimated cost of £4,689.

**Uckfield (Sussex) U.D.C.**—At the meeting held last week a resolution was adopted protesting against districts which had maintained the right of managing their own roads not receiving the same benefit from the Road Board grant in the matter of tar-spraying as other districts.

**Westhampnett (Sussex) R.D.C.**—It has been decided to accept the estimate of the county surveyor with respect to such portion of the Brighton to Portsmouth secondary road as is within the rural district of Westhampnett, and to raise £1,505 from the rates, and to execute the works necessary during the year ending March 31, 1913, upon the understanding that the county council will main and take over the road.

## SEWERAGE AND SEWAGE DISPOSAL.

**Bristol T.C.**—The Sanitary Committee has received authority to borrow £2,470 for sewerage works at Bedminster Down and St. George.

**Burgess Hill (Sussex) U.D.C.**—A scheme for the extension of the sewage works has been adopted making provision for two sets of sludge and sedimentation tanks with percolating filters and revolving sprinklers, with the necessary drains, valves, channels, chambers, &c., at an estimated cost of £2,250.

**Evesham T.C.**—Messrs. Berrington, Son & Watney, of Westminster and Wolverhampton, have received instructions to prepare specification and quantities, and obtain tenders for the extensions to the sewage works. The scheme is estimated to cost £10,000.

**Exmouth (Devon) U.D.C.**—The surveyor, Mr. S. Hutton, has received instructions to report on the question of providing more public lavatory accommodation.

**Felixstowe U.D.C.**—An ejector chamber and ejector to discharge 250 gallons per minute are to be provided at the Bath ejector station, at an estimated cost of £680.

**Paignton U.D.C.** — The council on Monday last decided to invite schemes from engineers for the drainage of the district. The first premium will be £300, second £200, third £100; 50 per cent of the premium will be merged in the commission to be paid to the person who carries out the work. The redrainage of the district has become necessary, having regard to the rapid development of the town, especially on the higher levels and the outskirts. The original scheme was carried out by Messrs. Wolfe Barry, Brereton & Brunell, some twenty years ago, when the population was only 7,000; now it is over 12,000, and rapidly increasing. During the summer months it is estimated that quite 15,000 visitors spend their holidays in the town.

**Swindon T.C.**—Improvements are to be carried out at the sewage works, at an estimated cost of £1,050.

## WATER, GAS, AND ELECTRICITY.

**Bradford T.C.** It is proposed to accept tenders amounting to £2,353 in connection with the erection of a switch-room and air filtration chamber at the Valley-road works.

**Darlington T.C.**—Extensive alterations are contemplated at the gasworks, and Alderman Barron at the council meeting last week mentioned that, at a meeting of the committee that day, the whole question had been fully considered, but that it was advisable details should not be published at that stage.

**Kirbymoorside (Yorks) R.D.C.**—Plans are being prepared for a water supply scheme for Fadmoor, Gillamoor, and Kirbymoorside.

**Middlesbrough T.C.**—A filtration plant for the water of the swimming bath is to be installed at a cost of £740.

**Okehampton R.D.C.**—A letter has been received from the Local Government Board pressing upon the council the necessity for providing a cover for the North Tawton reservoir. The letter has been forwarded to the North Tawton Parish Council.

**Oldham T.C.**—It is recommended by the Electricity Committee that £19,567 be expended on the provision of additional plant for the electricity station, mains and services.

**Scarborough R.D.C.** A water supply from Givendale Springs is to be provided, at a cost of £2,000.

**Swansea T.C.**—Such is the progress of the corporation electricity undertaking that additions are to be made to the existing building at a cost of £4,500.

## MISCELLANEOUS.

**Aberdeen T.C.**—The Tramways Committee have decided to recommend the council to introduce the trackless trolley system in the Footdee district of the city.

**Felixstowe U.D.C.**—It has been decided to purchase a fire escape from Messrs. Henry Limonis & Co., of London, for £250, a first-aid chemical engine, and a "buzzer" from Messrs. Siemens Bros. & Co. for calling the fire brigade in the day time.

**Hampton Wick U.D.C.**—It has been agreed to take over the scavenging and watering of the Middlesex portion of the existing and of the new Kingston Bridge, at a price of 3d. per square yard for the carriageway and 1d. per square yard for the footpath, all repairs, snow removal and sanding to be paid for extra.

**Wimbledon T.C.**—Extensions of the cemetery have been approved, and application is being made to the Local Government Board as to the loan of £3,000 to meet the necessary cost of fencing. Space for a crematorium will be provided in the added ground, in case it be decided to provide such a building.

## PERSONAL.

Mr. Arthur Race, borough engineer of Barrow-in-Furness has had his salary increased from £500 to £550.

Mr. H. B. Williams, borough surveyor of Workington, has been voted an increase of salary from £250 to £300.

Mr. Thomas Henry Tarbitt, surveyor and sanitary inspector to the Loftus (Yorks) Urban District Council, died, we regret to state, last week.

Mr. M. H. Hettenbach has been appointed assistant surveyor to the Wanstead Urban District Council, at a salary of £100 per annum, rising to £150.

Mr. Percy Horsley, borough engineer's assistant, Scarborough, has been appointed to the position of surveyor for the borough of Hartlepool at a salary of £180 per annum.

Mr. George Wyllie, road surveyor to the Blairgowrie District Committee of the Perthshire County Council, has been voted £70 for special services under the Road Development Act.

The Indian Government has, it is announced, practically decided to employ the services of a town-planning expert from Europe in connection with the alterations at Delhi involved in the change of capital.

Mr. Geo. J. C. Broom, M.INST.C.E., F.G.S., who recently retired from the position of borough engineer of St Helens, after twenty-seven years' service, has commenced practice as a consulting engineer at 24 North John Street, Liverpool.

Mr. E. P. Richards, engineer to the Corporation of Madras, has been elected a member of the Institution of Civil Engineers; Messrs. A. H. Howell, borough surveyor's office, Mansfield, and F. E. Marsh, municipal offices, Singapore, have been elected associate members; and Messrs. A. W. Bradley, council offices, St. Helens, Harley Heckford, borough engineer of Poplar, and Herbert Lapworth, Westminster, have been transferred from the class of associate member to that of member.

Mr. T. Darlington, surveyor to the St. Austell Rural District Council, was among those who gave evidence at the recent inquiry by Mr. Colquhoun Dill, Commissioner of the Privy Council, respecting the application of Fowey for the restoration of their Charter of Incorporation. For the St. Austell Rural District Council, the present governing body, it was contended that at present Fowey is adequately sewered and scavenged. Mr. Darlington admitted, however, that he had to look after the interests of fifteen parishes, and as a rule he visited Fowey only once a week. The commissioner will duly report to the Privy Council.

Mr. W. F. Barrett, we have much pleasure in recording, has received the honour of knighthood with the New Year. A distinguished writer and lecturer on physics, Sir William Barrett is known to water engineers as a careful investigator of the facts of "dowsing," and to students of the sciences his judgment on matters of importance is regarded as a factor to be reckoned with. Equally at home in scrutinising a ghost story or in designing a clock escapement, Sir William is a shining example of intellectual activity and mental balance, coupled with a vigorous social personality, and the honour paid him is one paid to sheer merit and continued efficiency, wholly removed from political considerations.

FOR OTHER ADVERTISEMENTS
See End of Paper.

COUNTY BOROUGH OF MIDDLESBROUGH.
ANNUAL TENDERS.

The Corporation invite Tenders for the Supply of the following Materials, required from the 1st day of April, 1912, to the 31st day of March, 1913:—

SECTION No. 1.

Annealed Scoriæ (Broken) and Annealed Scoriæ Rough Blocks.
Annealed Scoriæ Blocks.
Bricks.
Castings.
Concrete Flags and Kerbs.
Portland Cement.
Pitch and Tar.
Sanitary Pipes, Gulleys, Junctions, &c.
Slag (Broken).
Tarred Whinstone, Limestone, Granite and Slag.
Timber.
Whinstone and Granite (Broken), and Whinstone and Granite Setts and Kerbs.

SECTION No. 2.

Brushes, &c.
Bolts and Nuts, and Hex. Head Set Screws.
Disinfectants, &c.
General Stores.
Glass.
Hardware.
Indiarubber Goods.
Iron and Steel.
Leather Belting.
Oils, Paints and Varnishes.
Packings.
Picks, Shovels and Shafts.
Polishes and Cleansing Materials.
Ropes, &c.

Specification and Schedule may be obtained on application at the Borough Engineer's Office. Sealed Tenders, endorsed "Yearly Contracts," and made out upon the Forms supplied for either one or more of the Contracts, numbered one to twenty-six respectively, are to be sent to Preston Kitchen, Esq., Town Clerk, Municipal Buildings, Middlesbrough, not later than first post Monday, 29th January, 1912.

The Corporation do not bind themselves to accept the lowest or any Tender.

(By order)

S. E. BURGESS, M.INST.C.E.,
Borough Engineer.

Borough Engineer's Office,
Municipal Buildings,
Middlesbrough.
January 10, 1912.

A M.I.C.E. has vacancy for PUPIL. Engineering Contractors, including reinforced concrete construction. London.—Box No. 1,119, Office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

ASSISTANT (22) desires engagement. Three years' articles; nearly six years' experience. Capable Surveyor, Leveller and Draughtsman. Thorough knowledge of general work; good testimonials.—E. W. L., office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

DUST SHOOT, THAMES-SIDE. One of the nearest "Shoots" East of London Bridge outside L.C.C. area; 21¾ acres freehold. Barge Jetty and Plant installed.—Apply Sole Agents, Messrs. Kemsley, Surveyors, 17 Finsbury-circus, E.C.

## PORTHCAWL URBAN DISTRICT COUNCIL.

The above Council invite applications for the appointment of a qualified Assistant in the Surveyor's Department, at a salary of £80 per annum.

Applicants must not be more than 26 years of age, and must have received a municipal training and experience, and be competent to discharge the general duties of a Municipal Engineer's Office.

Applications, endorsed "Assistant Surveyor," in Candidate's own handwriting, stating age and details of experience, accompanied with copies of not more than three recent testimonials, are to be addressed to the undersigned, and delivered at the offices of the said Council not later than 12 noon on Friday, the 26th inst.

Canvassing, directly or indirectly, will disqualify.

WM. CHORLEY,
Clerk.

Council Offices,
Porthcawl.
January 10, 1912.

## HARROW-ON-THE-HILL URBAN DISTRICT COUNCIL.

TO ROAD CONTRACTORS.

The above Council invite Tenders for the Making Up of the following Private Streets:—

Bedford-road.
Rutland-road.
Sussex-road (Part 2).

Drawings may be seen, and Specifications, Quantities and Forms of Tender obtained, from Mr. J. Percy Bennetts, Engineer and Surveyor to the Council, on a deposit of Five Pound Bank of England note, which will be returned on receipt of a *bonâ-fide* Tender and the return of the documents.

Sealed Tenders, on the forms supplied, endorsed "Private Street Works," to reach me on or before Saturday, January 27.

The lowest or any Tender not necessarily accepted.

JOHN STRACHAN,
Clerk to the Council.

January 9, 1912.

## BOROUGH OF SOUTHEND-ON-SEA.

TO ROAD AND SEWER CONTRACTORS.

The Corporation invite Tenders for Sewering in Eastcote-grove, Cumberland-avenue, Lonsdale-road (Section 3), and Central-avenue.

Plans, Sections and Specifications may be seen, and Bills of Quantities and Forms of Tender obtained, on and after Friday next, the 12th inst. (on deposit of a cheque for £1 1s., which will be returned upon receipt of a *bonâ-fide* Tender and the return of all documents), upon application to Mr. Ernest J. Elford, M.I.M.E., Borough Engineer and Surveyor.

Sealed Tenders, endorsed "Eastcote-grove," or otherwise, as the case may be, to be delivered at my office on or before 9 a.m. on Thursday, 18th inst.

No Tender will be considered unless made on the prescribed form.

The Corporation will not be bound to accept the lowest or any Tender.

(By order)

H. J. WORWOOD,
Town Clerk.

Town Clerk's Office,
Southend-on-Sea.
January 10, 1912.

## BOROUGH OF LUTON.

The Council of the Borough of Luton are prepared to receive Tenders for carrying out Works of Private Improvement on Avondale-road and Hazelbury-crescent, in accordance with the Plans, Sections and Specifications prepared by the Borough Engineer, to be seen at his Office, Town Hall, Luton.

Tenders, endorsed "Private Street Works," must reach the undersigned by 4 p.m. on Thursday, 25th January, 1912.

The Council do not undertake to accept the lowest or any Tender.

BRUCE PENNY,
Town Clerk.

Town Hall, Luton.
January 10, 1912.

## FINCHLEY URBAN DISTRICT COUNCIL.

PRIVATE STREET WORKS.

The Council of the above-named District invites Tenders for the Making Up of the following Private Streets, together with all works incidental thereto:—

Etchingham Park-road (Extension)
Argyle-road (2nd and 3rd Portions).
Park-avenue.
Clarence-gardens.
Briarfield-avenue.
Windsor-road (Extension).

Plans, Specification and Conditions of Contract may be seen, and Forms of Tender and Schedules of Quantities obtained, on application to the Council's Engineer and Surveyor, Mr. C. J. Jenkin, M.I.C.E., M.I.M.E., at the under-mentioned address.

A deposit of £3 will be required, which will be returned on receipt of a *bonâ-fide* Tender on the prescribed form, together with fully-priced-in Schedules, and the return of all papers issued.

Sealed Tenders, endorsed "Private Street Works, 11th Batch," to be addressed to the undersigned, and delivered not later than 5 p.m. on the 22nd instant.

The Council does not bind itself to accept the lowest or any Tender.

E. H. LISTER,
Clerk of the Council.

Council Offices,
Church End,
Finchley, N.
January 10, 1912.

## FINCHLEY URBAN DISTRICT COUNCIL.

TAR FOR ROAD SURFACE TREATMENT.

The Council of the above-named District invites Tenders for the Supply in Barrels, at the various Depots within their District, of about 12,000 gallons of Tar, in such quantities as may be directed, between the months of February and October.

Persons tendering shall give the following particulars with respect to the Tar tendered for:—

(*a*) Specific gravity.
(*b*) Percentage of water, ammonia and free carbon.
(*c*) Percentage of tar produced from carbonated water-gas.

Sealed Tenders, endorsed "Tar," to be addressed to the undersigned and delivered not later than 5 p.m. on the 22nd instant.

The Council does not bind itself to accept the lowest or any Tender.

E. H. LISTER,
Clerk of the Council.

Council Offices,
Church End,
Finchley, N.
January 10, 1912.

## COUNTY OF SOUTHAMPTON.

MAIN ROADS.

The County Council invite Tenders for the Hire of Steam Rollers for use on the Main Roads throughout the County during the year ending 31st March, 1913.

Conditions and Forms of Tender may be obtained on application from the undersigned, to whom Tenders are to be delivered on or before Monday, the 12th February, 1912, in sealed envelopes, marked "Main Roads—Tender for Hire of Steam Rollers."

H. BARBER,
Clerk of the County Council.

The Castle,
Winchester.
January 10, 1912.

## COUNTY OF SOUTHAMPTON.

MAIN ROADS.

The County Council invite Tenders for the Supply on Hire of Machines for the Surface-tarring of Main Roads in the County during the year ending 31st March, 1913.

Conditions and Forms of Tender may be obtained on application from the undersigned, to whom Tenders are to be delivered on or before Monday, the 12th February, 1912, in sealed envelopes, marked "Main Roads—Tenders for Surface-tarring."

H. BARBER,
Clerk of the County Council.

The Castle,
Winchester.
January 10, 1912.

# INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President* –Mr. ALBERT D. GREATOREX, M.INST.C.E., Borough Engineer and Surveyor of West Bromwich.

## SPECIAL GENERAL MEETINGS.

I am directed by the president to express regret at the necessity for the summoning of further special meetings in connection with alterations to the memorandum of association.

It will be recollected that special general meetings were recently held at Gidea Park and at Battersea for the purpose of making extensive alterations to the memorandum which were insisted upon by the Board of Trade as a condition precedent to their sanction being given to the alterations desired by the institution.

The board have now admitted that the view taken by the solicitor to the institution—*viz.*, that they exceeded their powers in causing alterations to be made in any but the "objects" clause—is correct, and it is therefore necessary (1) that the alterations made on September 23, 1911, at the board's requirement, in clauses 4, 5, 6, 7 and 8 of the memorandum be rescinded (*i.e.*, that these clauses remain as originally drawn), and (2) that clause 3 (objects) be altered as set out in the notice appended hereto.

To avoid the complication arising from reference to the several special resolutions which have been passed recently as to alterations in the memorandum, the council recommend the rescission of the special resolutions passed in July and September last and the adoption of the resolutions appearing on this notice, which embrace both the alterations desired by the institution and those now insisted upon by the Board of Trade.

With a view to minimising the inconvenience caused to members of the institution in travelling considerable distances to attend practically formal meetings, the council have fixed the first meeting for Saturday, January 13, 1912, when a council meeting is to be held, and when the quorum necessary to constitute a special general meeting will be most easily obtained, and the second meeting for February 9th, when a Metropolitan District meeting is to be held, for the same reason.

(Signed) THOMAS COLE,
*Secretary.*

Notice is hereby given that a special general meeting of this institution will be held at 11 Victoria-street, London, S.W., on Saturday, January 13th, at 2.15 p.m., for the purpose of proposing, and, if approved, of adopting the following resolutions as special resolutions:—

(1) That the special resolutions of the Institution passed on the 5th day of July, 1911, and confirmed on the 29th day of July, 1911, and the special resolutions of the Institution passed on the 23rd day of September, 1911, and confirmed on the 21st day of October, 1911, be rescinded so far (only) as they relate to alterations in the Memorandum of Association of the Institution.

(2) That Clause 3 (the objects clause) of the original Memorandum of Association be altered as shown on pages 3 and 4 hereof.

(3) That the necessary application be made to the Court for the confirmation of the alterations specified in Resolution 2.

Notice is hereby also given that a special general meeting of the institution will be held at Caxton Hall, Westminster, London, S.W., on Friday, February 9th, at 8 p.m., when a report will be presented of the proceedings of the special general meeting of the institution to be held on January 13th, when the above resolutions will, if passed by the requisite majority at that meeting, be proposed and submitted for confirmation as special resolutions, and if the said resolutions be not passed by the requisite majority at the meeting to be held on the said January 13th, due notice will be given to the members that the meeting on February 9th, of which notice is now given, will not be held.

(By order of the Council)

THOMAS COLE,
*Secretary.*

11 Victoria-street,
London, S.W.
January 4, 1912.

## ALTERATIONS TO MEMORANDUM OF ASSOCIATION.

3. The objects for which the Institution is established are:

Delete
(*a*) The promotion of the science and practice of engineering applied to the health and improvement of counties and towns, and rural districts.

Insert
(*a*) The promotion of the science and practice of engineering, surveying and sanitation applied to roads, bridges, tramways, sewerage, drainage, water supply, lighting, town planning and improvement, sea and river improvement and flood prevention, buildings, sanitary work, and public parks, gardens and recreation grounds; and of the science and practice of geodesy and architecture, as applied to the foregoing and to the management, development and improvement of estates; and otherwise to the improvement of health, the conditions of living, housing and locomotion, and to the benefit of counties, cities, towns, and of urban and rural districts.

Delete
(*b*) The promotion of the professional interests, rights, powers and privileges of county, urban and rural engineers, the improvement of their professional status, and the extension and interchange of professional knowledge and practice.

Insert
(*b*) The promotion of the professional interests, rights, powers and privileges of engineers and surveyors of county, city, borough, urban and rural councils or other public authorities of a like nature, the improvement of their professional status, the assertion, enforcement and defence, or the assisting in the assertion, enforcement and defence, of such rights, remedies and interests of any member of the Institution as shall affect the general interests or rights or professional status of such engineers and surveyors as aforesaid as a class, provided that the Institution shall not commit any breach or infringement of the law relating to maintenance or champerty, and the increase, promotion, and extension of professional science, knowledge and practice and the interchange of views thereon.

(*c*) The acceptance of any gift, endowment or bequest made to the Institution, and the carrying out of any trusts attached to any such gift, endowment or bequest.

Delete
(*d*) The examination of persons in engineering, surveying, building construction, sanitary science and works, and in local government, municipal and sanitary law; and the granting of certificates of having passed the examination in the above subjects to candidates. Provided that no such certificate be granted without a note on it stating that "This certificate shows the result of an examination held on behalf of the Association, and is not to be deemed a qualification to discharge the duties of any office or appointment."

Insert
(*d*) The examination of persons in engineering, geodesy, building construction, surveying, sanitary science and works, and the law relating thereto; and the granting of certificates of the passing of the Institution's Examination to persons who have so passed in the subjects above mentioned, or some of them. Provided that no such certificate be granted without a note on it stating that "This certificate shows the result of an examination held on behalf of the Institution and is not issued under any Government authority or under the provisions of any charter or statute." Also the teaching of the above subjects, or any of them, by Professors or Lecturers engaged and paid by the Institution, or the assisting in giving or obtaining such teaching by grants to technical schools, colleges, or institutions, or the payment or the assisting in the payment of the fees or expenses of students of the above subjects or any of them and the providing and giving of scholarships, prizes and other rewards to such students.

Delete
(*e*) The constitution of two classes of Members, *viz.*, Members and Graduates; and, when thought proper, the election of persons distinguished in connection with municipal engineering or in sanitary science, as Honorary Members.

Insert
(*e*) The constitution of various classes of Members; and, when thought proper, the election of persons distinguished in connection with municipal engineering or in sanitary science as Honorary Members.

Delete
(*f*) Subject to the provisions of the 21st section of the Companies Act of 1862, the acquisition and disposal of lands and property for the objects aforesaid.

Insert
(*f*) Subject to the provisions of the 19th section of the Companies (Consolidation) Act of 1908, the acquisition and disposal of lands and property for the objects aforesaid.

(g) The doing all such lawful things as are incidental or conducive to the attainment of the above objects.

Provided always that the objects hereinbefore specified shall be limited by and carried out subject to the following restrictions, namely:—(1) The Institution shall not support with its funds or endeavour to impose on or procure to be observed by its members or others any regulation, restriction or condition which, if an object of the Institution, would make it a trade union. (2) In case the Institution shall take or hold any property subject to the jurisdiction of the Charity Commissioners or Board of Education for England and Wales, the Institution shall not sell, mortgage, charge or lease the same without such authority, approval or consent as may be required by law, and as regards any such property the council or trustees of the Institution shall be chargeable for such property as may come into their hands, and shall be answerable and accountable for their own acts, receipts, neglects and defaults, and for the due administration of such property in the same manner and to the same extent as they would as such council or trustees have been if no incorporation had been effected, and the incorporation of the Institution shall not diminish or impair any control or authority exercisable by the Chancery Division, the Charity Commissioners or the Board of Education over such managers or trustees, but they shall, as regards any such property, be subject jointly and separately to such control or authority as if the Institution were not incorporated. (3) In case the Institution shall take or hold any property which may be subject to any trusts, the Institution shall only deal with the same in such manner as allowed by law having regard to such trusts. (4) Notwithstanding the provisions of Paragraph 4 hereof with regard to the remuneration of officers or servants of the Institution, no member of the council or trustees of the Institution shall be appointed to any salaried office of the Institution, or any office of the Institution paid by fees, and no remuneration or other benefit in money or money's worth shall be given by the Institution to any member of the council, except repayment of out-of-pocket expenses; provided that the provision last aforesaid shall not apply to any payment to any railway, tramway, gas, electric lighting, water, cable or telephone company of which a member of the council may be a member, or any other company in which such member shall not hold more than one-hundredth part of the capital, and such member shall not be bound to account for any share of profits he may receive in respect of any such payment.

Insert

### METROPOLITAN DISTRICT MEETING.

The following is the programme of the Metropolitan District meeting of the Institution which will be held at Caxton Hall, Westminster (Room 13), on Friday, February 9th:

7.30 p.m.—Discussion on the following paper, which will be taken as read:
"The Relation of Modern Road Surfacings to Fish Life," by Mr. W. J. A. Butterfield.

8 p.m.—Adjourn to hold special general meeting (see separate agenda).

8.15 p.m.—Tea and coffee will be served.

8.30 p.m.—Resume discussion on paper.

In order that the necessary arrangements may be made, members must give notice of their intention to be present not later than Saturday, February 3rd, when copies of the paper will be forwarded in due course.

Norman Scorer,
Borough Surveyor, *Hon. District Secretary.*
Hackney, N.E.

### MIDLAND DISTRICT MEETING.

A Midland District meeting will be held at Stourbridge on Saturday, April 13, 1912.

### SCOTTISH MEETING.

A Scottish District meeting will be held in Stirling on June 7th (2.30 p.m.) to 8th.

### EXAMINATION.

An examination will be held on March 28, 29 and 30, 1912, at the Examination Hall, Victoria Embankment, London, S.W.

**Notice is hereby given that, in accordance with by-law 14, each member or associate member of the Institution desiring to nominate one member of the** associate member for the council must send such nomination to reach me not later than February 1, 1912. Each nomination must be accompanied by the written consent of the nominee. No special form is required.

Thomas Cole,
11 Victoria-street, S.W. *Secretary.*

## INSTITUTION OF MUNICIPAL ENGINEERS.

*President*—Mr. E. A. Stickland, Assoc.M.Inst.C.E., Borough Surveyor, Windsor.

### WESTERN DISTRICT MEETING AT BIRMINGHAM.

(Thursday, January 18th.)

Programme.

Assemble at White Horse Hotel, Congreave-street, at one o'clock. Lunch at the invitation of Mr. W. E. Farrer. Immediately after luncheon a district meeting will be held in the assembly room of the hotel, where a paper, "The Institution and its Benefits to Members," will be presented by Mr. Henry Hulse, borough surveyor and engineer, Droitwich, and chairman of the Western District. If time permits, a further paper, "The Proper Disposal of Domestic Wastes in Rural Districts," will be presented by Mr. J. Brook, the district secretary. Both papers will be printed for circulation and will be taken as read. Discussion will follow.

At the conclusion of the meeting a visit will be paid to the Star Sanitary Ware Works of Messrs. W. E. Farrer, Limited, Cambridge-street, where an inspection will be made of the various materials and appliances manufactured by the firm. Return will then be made to the hotel. Tea at the invitation of the district chairman.

Members of North-Western and North-Eastern districts are specially requested to attend.

J. Brook.
6 College-street, *Hon. District Secretary.*
Stratford-on-Avon.

### EXAMINATIONS.

The next examination will be held in May next at dates and centres to be arranged. Full particulars may be obtained of the Secretary, Institution of Municipal Engineers, 39 Victoria-street, London, S.W.

## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those intending it their copy is to be transmitted in time to reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their insertion in the week's list of summaries. Such advertisements may, in cases of emergency only, be telephoned* (**No. 1559 Holborn**), *subject to later confirmation by letter.*

Assistant County Surveyor. January 13th. Cornwall County Council. £150—£175.—Mr. Christopher L. Cowlard, clerk.

Sanitary Sub-Officer. January 13th. Corporation of Londonderry. £1 10s. per week.—Mr. D. Fletcher, Public Health Offices, Queen's Quay.

Sewage Works Engineer.—January 13th.—Radcliffe Urban District Council. £2 per week.—Mr. S. Mills, clerk.

Surveyor. January 15th. Tenbury Rural District Council. £150 per annum.—Mr. G. Kenyon, clerk.

Engineer (Three). January 15th. Irrigation Department, Pretoria. £500, £600, £800. High Commissioner for the Union of South Africa, 32 Victoria-street, S.W.

Borough Surveyor and Engineer. January 15th. Corporation of Southport. £600, £800.—Mr. J. Ernest Jarratt, town clerk.

Assistant Surveyor. January 16th. Chesterfield Rural District Council. £2 2s. per week.—Mr. E. V. Dickinson, clerk.

Clerk of Works. January 17th. Torquay Extension Act, 1911.—Mr. J. S. Hay, town clerk.

Inspector of Nuisances. January 20th. Mold Rural Sanitary Authority. £70 per annum.—Mr. T. L. Jeffs, clerk.

Inspector, Surveyor's Assistant. January 20th. Mold Rural Council. £2 per week.—Mr. H. Hudson, [illegible] and water engineer.

Assistant Engineer. January 24th. Public Works Department, Rangoon, Mergui, etc. 600 rupees per [illegible] Messrs. [illegible] & Co., 67 Cannon-street, London, E.C.

## MUNICIPAL COMPETITIONS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

LONDON.—February 17th, 1912. Sketch designs for new head offices, for the Port of London Authority.—The Clerk.

YORK.—February 17th. Designs are invited for a public elementary school by the Education Committee.—Mr. J. H. Mason, secretary, Education Offices, Clifford-street, York.

HARROW-ON-THE-HILL.—March 16th.—Enlargement of public offices, for the urban district council. Cost not to exceed £4,500. Premiums of 30, 20 and 15 guineas are offered.—Mr. J. P. Bennetts, engineer and surveyor.

HALE.—Schemes invited for laying out the unbuilt-upon portion of the district, by the urban district council. Premiums are offered of £50 and £25.—Mr. J. G. Whyatt, clerk.

## MUNICIPAL CONTRACTS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

### Buildings.

PONTYPRIDD.—January 15th.—For the erection of a girls' school, for the Education Committee.—Mr. D. M. Jones, secretary.

NORTHAMPTON.—January 15th.—For the erection of a public school, for the Education Committee.—Messrs. Gotch & Saunders, Bank Chambers, Kettering.

DURHAM.—January 16th.—For the erection of two schools, for the county council.—Mr. V. J. Dawson, Shire Hall, Durham.

FLINTSHIRE.—January 16th.—For the erection of a school and other works, for the county council.—Mr. S. Evans, county surveyor, Mold.

TOTTENHAM.—January 16th.—For the construction of underground conveniences, for the urban district council.—Mr. W. H. Prescott, engineer.

GLAMORGAN.—January 17th.—For the erection of a school, and alterations to school buildings, for the county council.—County Council Offices, Cardiff.

DORSET.—January 19th.—For the erection of a school, for the county council.—Mr. C. G. Bone, secretary, Education Department, Council Offices, Dorchester.

LUTON.—January 20th—February 6th.—For the erection of a school, for the corporation.—Mr. B. Penny, town clerk.

PERTH.—January 20th.—For the erection of stone walls and iron railings, for the corporation.—Mr. J. Begg, town clerk.

WALLSEND.—January 20th—February 12th.—For the erection of a school and institute, for Northumberland Education Committee.—Mr. C. Williams, secretary, Moothall, Newcastle-on-Tyne.

ILFORD.—January 23rd.—For the erection of an elementary school, for the urban district council.—Mr. Adam Partington, clerk.

CHELTENHAM.—January 23rd.—For the construction of concrete filter tank and filter-house, for the corporation.—Mr. J. S. Pickering, borough engineer.

POPLAR.—January 24th.—For the erection of the superstructure of extension to the main electricity generating station, for the borough council.—Mr Leonard Potts, town clerk.

WEST SUSSEX.—January 29th.—For alterations to the Elmtington school, for the Joint Education Committee.—Secretary, Thunbo House, High-street, Worthing.

LANCASHIRE.—January 31st.—For additions to a school, for the Education Committee.—Mr. H. Littler, 16 Ribbleedale-place, Preston.

MARGATE.—February 5th.—Erection of new lavatories and extension of existing lavatories, for the corporation.—Mr. E. A. Berg, borough surveyor.

LANCASHIRE.—February 12th.—For the completion of the Whalley Asylum, for the Committee of Visitors.—Mr. H. E. Clare, clerk, County Offices, Preston.

DARTFORD.—February 27th.—For the extension of the electricity works, for the urban district council.—Mr. W. Kay, clerk.

BANGKOK.—March 15th.—For the erection of an electric power station, for the municipality.—Mr. F. B. Shaw, engineer-in-charge, Municipal Electric Power Station, Local Sanitary Department, Bangkok.

### Iron and Steel.

RADCLIFFE.—January 13th.—For the supply of electric-driven pump at the sewage disposal works, for the urban district council.—Mr. S. Mills, clerk.

CORNWALL.—January 16th.—For the supply of gates and railings, for the county council.—Mr. W. J. Mock, county architect, Truro.

GLASGOW.—January 17th.—For heating installation and supply of boilers, for the corporation.—Mr. A. W. Miles, town clerk.

THURLES.—January 18th.—For the supply of bored cast-iron pipes, for the urban district council.—Mr. B. Jackman, town clerk.

DUBLIN.—January 18th.—For the supply of sub-station switchboards and accessories, for the Electricity Committee.—City Electrical Engineer.

DARTFORD.—January 23rd.—For the supply of electricity plant, for the urban district council.—Mr. W. Kay, clerk.

LONDON.—January 23rd.—For the supply of steel tramway rails and slot rails, &c., for the county council.—Chief Engineer's Department.

CAIRO.—January 23rd.—For the supply of iron fencing, for the Department of Public Health.—The Clerk.

NUNEATON.—January 24th.—For the supply of 500-kw. mixed-pressure turbo-generator, with condensing plant, &c., for the corporation.—Chairman of the Electricity Committee.

ASHTON-UNDER-LYNE.—January 24th.—For the supply of three Lancashire boilers, for the Electricity Committee.—Mr. J. Neal, borough comptroller.

BRISBANE (Australia).—January 30, 1912.—For designs, detail, specifications, supply, erection, &c., complete under working conditions, including twelve months' maintenance, for alternatively two or three complete units of pumping plant, capable of delivering 6,000,000 British gallons of water delivered at an elevation of 400 ft. per day of twenty-four hours, for the Water and Sewerage Board.—Mr. Geo. Johnston, secretary.

STOURBRIDGE.—January 30th.—For the erection of a pumping engine, for the Water Board.—Mr. J. D. Harward, clerk.

BURNLEY.—January 31st.—For the supply of petrol-driven motor fire engine, for the corporation.—Mr. P. Thomas, town clerk.

### Miscellaneous.

LEEDS.—January 13th.—For the supply of retorts, &c., for the Gas Committee.—Town Clerk.

CROYDON.—January 15th.—For the supply of men, horses, carts and harness, for the corporation.—Borough Road Surveyor.

ADELAIDE.—January 16th.—For the supply of copper tubes, for the Supply and Tender Board.—Mr. S. A. Strickland, 85 Gracechurch-street, E.C.

ROTHERHAM.—January 22nd.—For the supply of retorts and fireclay goods, for the Gasworks Committee.—Town Clerk.

POPLAR.—January 22nd.—For the renewal of road sweepings, and the supply of iron castings, brooms, rotary machine brushes, points, &c., for the borough council.—Mr. H. Heckford, borough surveyor.

BOURNE.—January 27th.—For the supply of road-men's barrows, tools, &c., for the rural district council.—Mr. C. W. Bell, clerk.

### Roads.

BEXLEY.—January 13th.—For the supply of highway materials, tar, pipes, Portland cement, &c., for the urban district council.—Mr. T. G. Baynes, clerk.

CROMPTON.—January 13th.—For completing certain roads, for the urban district council.—Mr. F. F. Gartside, clerk and surveyor.

HITCHIN.—January 15th.—For the supply of broken granite, for the urban district council.—Mr. W. O. Times, clerk.

Aberavon.—January 15th.—For making up certain streets, for the corporation.—Mr. M. Tennant, town clerk.

Wandsworth.—January 15th.—For executing works of repair in three roads, for the borough council.—Mr. Henry George Hills, town clerk.

St. Pancras.—January 15th.—For the supply of road and other materials, removing road sweepings, horsing water vans, and road-sweeping and other machines, &c., for the borough council.—Mr. C. H. F. Barrett, town clerk.

Caerleon.—January 15th.—For works of kerbing and channelling, for the urban district council.—Mr. C. J. Fox, surveyor.

Gloucestershire.—January 15th.—For the supply of stone for roads, for the county council.—Mr. S. E. Sinnott, county surveyor.

Watford.—January 15th.—For the supply of broken granite, for the urban district council.—Mr. W. Hudson, clerk and solicitor.

Farnham.—January 16th.—For treating certain roads with tar, for the urban district council.—Mr. R. W. Cass, surveyor.

Bushey.—January 16th.—For making up a certain road, for the urban district council.—The Surveyor.

Surrey.—January 16th.—For the supply of granites, basalts, tar-macadam, tar, pitch and tar oils, for the county council.—Mr. A. Dryland, county surveyor.

Godstone.—January 16th.—For tar-spraying certain highways, for the rural district council.—Mr. G. E. Crowter, engineer and surveyor.

Glamorgan.—January 17th.—For work on main roads, for the county council.—County Surveyor, Council Offices, Westgate-street, Cardiff.

Uckfield.—January 17th.—For the supply of broken granite, broken Kentish ragstone, broken Sevenoaks stone, broken flints, and compo sand or chippings, for the rural district council.—Mr. Frederick Holman, clerk.

Middlesex.—January 17th.—For the cartage of broken limestone, chippings and gravel, for the county council.—Mr. H. T. Wakelam, county engineer and surveyor.

Middlesex.—January 17th.—For the supply of hand-broken basalt and chippings, for the county council.—Mr. H. T. Wakelam, county engineer and surveyor.

Croydon.—January 18th.—For making up part of a road, for the rural district council.—Mr. E. J. Gowen, clerk.

West Ham.—January 18th.—For the supply of paving materials, broken granite and chippings, road flints, sand, tar and pitch, ironmongery, iron castings, &c., for the corporation.—Mr. Fred. E. Hilleary, town clerk.

Southwell.—January 18th.—For the supply of a tar-sprayer of about 160 gallons capacity, for the rural district council.—Mr. John Ellis, clerk.

Spilsby.—January 19th.—For the supply of broken granite, broken slag and slag chippings, for the rural district council.—Mr. G. Beaumont Walker, clerk.

Durham.—January 19th.—For the supply of road materials, for the rural district council.—Mr. G. Gregson, surveyor.

Ince.—January 20th.—For paving, kerbing, sewering, for the urban district council.—Mr. A. T. Swaine, surveyor.

Norfolk.—January 20th.—For the supply of road-men's tools and implements, for the county council.—Mr. T. H. B. Heslop, county surveyor.

Norfolk.—January 20th.—For the supply of gravel, flints, chalk, and marl, for the county council.—Mr. T. H. B. Heslop, county surveyor.

Norfolk.—January 20th.—For the supply of granite, for the county council.—Mr. T. H. B. Heslop, county surveyor.

Halifax.—January 20th.—For the execution of private street works, for the corporation.—Mr. J. Lord, borough engineer.

Thirsk.—January 22nd.—For the supply of road materials, for the rural district council.—Mr. C. A. Lake, highway surveyor.

Wakefield.—January 22nd.—For the execution of private street works, for the corporation.—Mr. J. P. Walker, city surveyor.

Wednesbury.—January 22nd.—For the purchase of a 10-ton Aveling & Porter steam road-roller, for the borough council.—Mr. P. Dodd, borough engineer and surveyor.

Lewisham.—January 23rd.—For channelling and paving works, for the borough council.—The Surveyor.

Heywood.—January 24th.—For works of draining, levelling, paving, &c., for the corporation.—Mr. G. G. Bouchier, town clerk.

Newport.—January 24th.—For surface tarring 100,000 yds. of roadway, for the corporation.—Mr. H. Tremelling, borough engineer.

Deal.—January 25th.—For the supply of granite, for the corporation.—Mr. T. C. Golder, borough engineer and surveyor.

Birmingham.—January 27th.—For the supply of granite kerbs, setts, wood-paving blocks, ragstone, gravel, &c., for the corporation.—City Surveyor.

Sleaford.—January 27th.—For the supply of granite and slag, for the rural district council.—Mr. E. Clements, clerk.

Bourne.—January 27th.—For the supply of granite and slag, for the rural district council.—Mr. Cecil Bell, clerk.

Essex.—January 27th.—For the supply of Norway granite kerb and setts, for the county council.—Mr. Percy J. Sheldon, county surveyor.

Wangford (Suffolk).—January 29th.—For the supply of road materials, for the rural district council.—Mr. S. W. Rix, clerk, Beccles.

Dorset.—January 29th.—For tar-spraying highways, for the county council.—Mr. W. T. Fletcher, county surveyor.

Dorset.—January 29th.—For the supply of granite, quartzite, limestone, and tarred macadam, for the county council.—Mr. W. T. Fletcher, county surveyor.

Gateshead.—January 30th.—For paving work in several streets, for the corporation.—Mr. N. P. Pattinson, borough engineer.

Buckingham.—February 3rd.—For the supply of granite and slag, for the rural district council.—Mr. Thomas R. Hearn, clerk.

Herts.—February 5th.—For the supply of granite and slag, for the county council.—Mr. Urban A. Smith, county surveyor.

## Sanitary.

Honley.—January 13th.—For the construction of a sewer, for the urban district council.—Mr. T. Smailes, clerk.

Melksham.—January 13th.—For the construction of sewage disposal works, &c., for the urban district council.—Mr. A. G. Smith, solicitor and clerk.

Radcliffe.—January 13th.—For the supply of filtration material, for the urban district council.—Mr. S. Mills, clerk.

Luton.—January 15th.—For the removal of house refuse, &c., for the rural district council.—Mr. W. Austin, clerk.

Salford.—January 16th.—For the supply of clinker for percolating filters, for the corporation.—Borough Engineer.

Chorley.—January 16th.—For scavenging work, for the rural district council.—Mr. R. E. Aspden, clerk.

Carshalton.—January 17th.—For the construction of sewers, manholes, &c., for the urban district council.—Mr. C. P. Lovelock, clerk.

Halifax.—January 18th.—For the extension of the sewage works, for the corporation.—Mr. J. Lord, borough engineer.

Skelton.—January 19th.—For laying a drain, for the rural district council.—Mr. A. Rodwell, surveyor.

Hale.—January 19th.—For the construction of a sewer, for the urban district council.—Mr. J. G. Whyatt, clerk.

Eastwood.—January 20th.—For laying a storm-water sewer, &c., for the rural district council.—The Clerk.

Epping.—January 20th.—For the construction of sewage disposal works at Roydon and Harlow, for the rural district council.—Mr. R. D. Trotter, clerk.

Hendon.—January 20th.—For the construction of downward pipe sewers, for the urban district council.—Mr. T. Robey, clerk.

Hambledon.—January 20th.—For the removal of dust, &c., for the rural district council.—Mr. E. G. Randell, clerk.

MANCHESTER.—January 22nd.—For the construction of main drainage works, for the corporation.—Mr. Thomas Hudson, town clerk.

STANDISH-WITH-LANGTREE.—January 22nd.—For the construction of sewage disposal works, for the urban district council.—Mr. J. H. Richards, clerk.

HATFIELD.—January 22nd.—For the construction of sewers, manholes, pumping station, and suction and settling tanks, for the rural district council. Mr. Ernest J. Dunham, clerk.

WILLESDEN.—January 26th.—For the purchase from the urban district council of pumping and pressing plant.—Mr. O. Claude Robson, engineer.

PADIHAM.—January 27th.—For the supply of filtering material, for the rural district council.—Mr. J. C. Waddington, clerk.

## Stores.

LAMBETH.—January 18th.—For the supply of men, horses, carts, smiths' work, wheelwrights' work, supply of shoot and removal of house refuse, paving setts, tar-paving bricks, Portland cement, &c., for the borough council.—Mr. H. J. Smith, town clerk.

PLYMOUTH.—January 20th.—For the supply of paints, ironwork, petroleum oil, broomheads, brushes, iron and steel, Portland cement, lubricating oils, tar and pitch, disinfectant fluids, road metal, &c., for the corporation.—Mr. James Paton, borough engineer and surveyor.

CAMBERWELL.—January 22nd.—For the supply of harness leather, brass buckles, brooms, brushes, hire of horses, flints, ragstone, removal of house refuse, disinfectants, drain pipes, &c., for the borough council.—Mr. W. Oxtoby, borough engineer.

CHELTENHAM.—January 23rd.—For the supply of road and sanitary materials, ironmongery, tools, files, electric-light fittings, &c., for the corporation.—Mr. J. S. Pickering, borough engineer.

CHELSEA.—January 24th.—For the supply of granite kerbstones and setts, York paving, broken granite, removal of trade refuse, brooms, oilmen's goods, ironmongery, disinfectants, &c., for the borough council.—Mr. T. Holland, town clerk.

BISHOP AUCKLAND.—January 27th.—For the supply of sanitary pipes, spades, picks, kerbs, setts, &c., for the urban district council.—Mr. J. T. Proud, clerk.

CHISLEHURST.—January 30th.—For the supply of materials and labour, for the urban district council.—Mr. H. E. Knight, clerk.

BLACKBURN.—February 3rd.—For the supply of road materials, labour, steel and iron, shovels, pitch, iron castings, oils, chloride of lime, sewerage and private drainage works, &c., for the corporation.—Borough Engineer.

HUDDERSFIELD.—February 7th.—For the supply of granite setts, macadam, furnace slag, granite, flags, pitch and creosote oil, cast-iron materials, bricks, hay, straw, coal, &c., for the corporation.—Mr. J. Henry Field, town clerk.

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**Turbine Pumps.**—The evolution and present development of the turbine pump will be discussed in a paper which is to be read before the Institution of Mechanical Engineers on the 19th inst. by Messrs. Edward Hopkinson, D.SC., and Alan E. L. Chorlton, of Manchester.

**Municipal Engineering** (Edited by Sydney G. Turner, ASSOC.M.INST.C.E. Price 3s. 6d. nett. London: St. Bride's Press, Limited, 24 Bride-lane, E.C.).—This volume consists of model answers to questions set at recent examinations of the Institution of Municipal and County Engineers, and is the second edition. It is practically identical with the first issued. It is not suggested that it should take the place of recognised text-books, but it provides useful summaries of various subjects, as well as indications as to how different types of questions may be answered. Every effort has been made to render the answers as accurate and comprehensive as possible, though they contain more than a candidate would be expected to supply. The answers are founded upon examinations held in Birmingham, London and Manchester. The appendix contains examples of questions on sewerage, sewage disposal, tramway construction, bridges, water supply, road construction, buildings, sanitary science as applied to towns and buildings, drainage, and other matters. It will be seen, therefore, that the book is comprehensive, practical and exhaustive.—*Local Government Journal.*

## TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BARKING.—Accepted for the extension of the electricity works, for the urban district council.—Mr. C. F. Dawson, surveyor:—

Thomas & Edge, Woolwich, £2,285.

BARNT GREEN.—For the construction of sewers, manholes, lamp-holes, ventilating columns, &c., at Barnt Green, for the North Bromsgrove Urban District Council.—Mr. R. Green, engineer:—

| | |
|---|---|
| W. Thorpe, Birmingham | £943 |
| J. White, Junior, Handsworth | 876 |
| J. & A. Brazier, Bromsgrove | 818 |
| A. E. Palmer, Leicester | 789 |
| Tilt Brothers, Bromsgrove | 780 |
| G. Trentham, Aston | 748 |
| T. J. Mason, Stourbridge | 741 |
| G. Holloway, Wolverhampton | 720 |
| G. P. Trentham, Handsworth | 698 |
| Martin & Element, Smethwick * | 679 |

Engineer's estimate, £781.

BILSTON.—Accepted for the supply of a 250-gallon tar-spraying machine, for the urban district council.—Mr. V. Turner, engineer and surveyor:—

Llewellyn & James, Bristol.

BRAINTREE.—For the new water supply scheme, for the rural district council:—

Works in connection with the scheme—Lane Brothers, Mansfield, £4,247.
Supply of pipes, &c.—Stanton Iron Company, £3,556.

BRENTFORD.—For the supply of granite and flints, for the urban district council:—

GRANITE.

Le Maitre, Lambeth, 13s. 2d per cubic yard.
J. Mowlem & Co., Westminster,* 12s. 7d.
Griffiths, Limited, Hamilton House, 14s. 3d.
British Macadam, Limited, 14s. per ton.
A. & F. Manuelle, Gracechurch-street, 13s. 9d. per cubic yard.
Croft Brick and Granite Company, Limited, Leicester, 11s. 11d. per cubic yard, delivered at Brentford Railway Station in trucks.
Fry Brothers, Greenwich, 14s. 5d.
Rowe & Mitchell, London Bridge, 13s. 8d.
Cliffe Hill Granite Company, 12s. 9d. per ton.
United Stone Company, Bristol, 13s. 9d. per ton.

FLINTS.

Fry Brothers, 6s. per cubic yard unloaded at the wharf, or 5s. not unloaded.
Wills & Packham, Limited, 4s. 11d. delivered at wharf.
Horsford & Co., 5s. 10d. unloaded, 4s. 10d. delivered at wharf.
A. S. T. Court, Faversham,* 4s. 8d. delivered at wharf.

BURNLEY.—For road construction purposes, for the corporation.—Mr. G. H. Pickles, borough engineer:—

| | |
|---|---|
| T. Wade, Padiham | £1,241 |
| Clegg Brothers, Burnley | 1,075 |
| Mullen & Durkin, Burnley | 1,053 |
| W. H. Morley, Keighley | 1,047 |
| J. Green & Sons, Burnley | 998 |

DARLINGTON.—Accepted for the supply of 500-kilowatt D.C. dynamo, coupled to a reciprocating steam engine, for the corporation.—Borough electrical engineer:—

Engine.—Browett, Lindley & Co., Limited, Manchester.
Dynamo.—British Westinghouse Company, Manchester.

DOVER.—For supply of about 300 tons of broken Welsh granite, 50 tons of ¾-inch Welsh chippings, 300 tons of Cherbourg quartzite, and 50 tons of Cherbourg chippings, for the corporation:—

Road Maintenance and Stone Supply Company, Limited, Gravesend: Cherbourg quartzite, 11s. 4d. ton; Cherbourg chippings, 10s. 4d. ton.
Enderby and Stoney Stanton Granite Company, Limited, Narborough*: Welsh granite, 9s. 5d. ton; Welsh chippings, 7s. 2d. ton.
Brookes, Limited, Westminster: Broken Welsh granite, 10s. 4d. ton; Welsh chippings, 7s. 10d. ton; Quenast quartzite, 10s 3d. ton; Quenast chippings, 9s. 1d. ton.
A. H. Evans: broken granite, 11s. 6d. ton; Welsh chippings, 10s. 2d. ton.
Giants' Causeway Columnar Basalt Company, Limited: basalt macadam, 11s 6d. ton; basalt chippings, 11s. ton.
British Macadams, Limited: Penmaenmawr granite, 12s. 11d. ton; chippings, 11s. 11d. ton.
Penlee and St. Ives Stone Quarries, Limited: Penlee basalt, 10s. 9d; Penlee chippings, 7s. 3d. ton.
United Stone Firms, Limited: Welsh granite, 9s. 5½d. ton; Welsh chippings, 7s. 5½d. ton and 6s. 8½d. ton.

ESSEX.—For the construction of a school, for the education committee:—

| | |
|---|---|
| Moss & Sons, Hendon | £19,551 |
| W. E. Davey, Southend | 19,043 |
| W. E. Blake, Plymouth | 18,800 |
| C. Roper, Ipswich | 18,694 |
| Sabey & Son, Islington | 18,303 |
| A. E. Symes, Stratford | 18,259 |
| Pethick Brothers, London | 18,189 |
| Hunt & Son, High Wycombe | 17,709 |
| Myall & Upson, Ilford | 17,566 |
| Fairhead & Co., Enfield | 17,466 |
| Hammond & Son, Romford | 17,461 |
| Pattinson & Sons, London | 17,417 |
| S. E. Moss, Southend | 17,344 |

HADLEIGH.—Accepted for supply of road materials and road work, for the urban district council:—

E. H. Woodmancy, 200 tons granite, 12s. 5d. ton.
E. Clarke, carting granite, No. 2 district 3s. ton, general district 1s. ton.
A. Dunningham, paving north end of High Street £14 16s; paving and kerbing Angel Street, £49 14s.
W. Gooding, 2in. wrought-iron rain-water pipes for Angel Street path, 1s. 2d. foot.
A. Dunningham, fixing ditto, 2s. 9d. each.
Doran Brothers, Limited, steam rolling 24s. 6d. day, scarifying ½d. square yard.

HUNTINGDON.—For alterations and additions to the council school, St. Neots.—Mr. H. Leete, county surveyor:—

| | |
|---|---|
| Kidman Brothers | £1,400 |
| W. Wade | 1,399 |
| W. J. Allen & Son | 1,338 |
| H. Rooke & Sons | 1,328 |
| G. Page & Son | 1,307 |
| F. B. Thackray & Co., Limited | 1,228 |
| H. F. Bull | 1,224 |
| G. Wrycroft & Sons, St. Neots* | 1,155 |

LLANTRISANT.—For the erection of a stores, for the rural district council:—

| | |
|---|---|
| D. John, Llantwit Fardre | £324 |
| Hatherly & Co., Penarth | 269 |
| John & West, Llantrisant | 225 |

PAIGNTON.—For the supply and laying of cast-iron pipes, &c, for the urban district council:—

Pollard, Limited, Taunton, £850.

STRETFORD (Lancs).—For the extension of the technical institute, Stretford-road, Old Trafford, Manchester, for the education authority. —Messrs. J. Bowden & Co., architects:—

| | |
|---|---|
| J. W. Wildgoose, Matlock | £5,459 |
| C. H. Normanton & Sons, Ardwick | 5,367 |
| Tinker & Young, Manchester | 5,059 |
| A. Fenton, Manchester | 4,976 |
| J. H. Billings & Co., Manchester | 4,885 |
| J. Gerrard & Sons, Limited, Swinton | 4,885 |
| M. Stone & Sons, Altrincham | 4,850 |
| A. Hodkinson, Greenleys | 4,846 |
| R. Carlyle, Old Trafford | 4,767 |
| J. T. Hollingworth, Patricroft | 4,740 |
| W. Thorpe & Sons, Old Trafford* | 4,674 |

TORQUAY.—For the erection of the Homelands Council School, Torquay, for the education committee.—Messrs. E. Appleton & Son, architects:—

| | |
|---|---|
| Coles Brothers | £7,728 |
| T. Vanstone & Sons | 6,989 |
| A. N. Coles | 6,856 |
| Wilkins & Sons | 6,687 |
| G. Shellabear & Son | 6,656 |
| W. E. Blake, Limited | 6,640 |
| J. E. Fursland | 6,580 |
| Wakeham Brothers | 6,452 |
| R. E. Narracot | 6,436 |
| Bovey & Son | 6,397 |
| G. Pollard | 6,321 |
| H. W. Pollard & Son | 6,300 |
| H. Fittard & Son | 6,249 |
| W. Watson & Son | 6,235 |
| H. C. Jackman, Torquay* | 6,232 |
| R. F. Yeo & Sons | 5,994 |

## MEETINGS.

*Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.*

JANUARY.

13.—Institution of Municipal and County Engineers: Special General Meeting at Institution Offices, 2.15 p.m.

15.—Association of Consulting Engineers: Inaugural Meeting; Institution of Electrical Engineers, 4 p.m.

16.—Institution of Civil Engineers: Papers to be further discussed: "Reinforced Concrete Wharves and Warehouses at Lower Pootung, Shanghai," by S. H. Ellis, M.INST.C.E.; "The Direct Experimental Determination of the Stresses in the Steel and in the Concrete of Reinforced Concrete Columns," by William C. Popplewell, M.Sc., Assoc.M.INST.C.E.; "Composite Columns of Concrete and Steel," by W. H. Burr, M.INST.C.E., 8 p.m.

18.—Institution of Municipal Engineers: Western District Meeting at Birmingham.

19.—Institution of Mechanical Engineers: Messrs. Edward Hopkinson and Alan E. L. Chorlton, of Manchester, on "The Evolution and Present Development of the Turbine Pump," 8 p.m.

24.—Royal Institute of British Architects: President and Council's "At Home." Exhibition of Drawings submitted in Competition

FEBRUARY.

9.—Institution of Municipal and County Engineers: Special General and Metropolitan District Meetings, Caxton Hall, Westminster, 7.30 p.m.

10.—Royal Sanitary Institute: Sessional Meeting at Nottingham.

## APPOINTMENTS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

### BOROUGH OF OSSETT.

Applications are invited for the post of Temporary Assistant in the Borough Surveyor's Department at a salary of £2 per week.

Candidates must possess thorough knowledge of Surveying and levelling, and have a good knowledge of Architectural Work.

Applications, in Candidate's own handwriting, stating age, qualifications and experience, accompanied by copies of recent testimonials, to be delivered to the undersigned on or before the 20th day of January, 1912.

Canvassing will disqualify.

H. HOLMES, M.INST.C.E.I.,
Borough Surveyor and Water Engineer.

Town Hall,
Ossett.

## TENDERS WANTED.

### COUNTY COUNCIL OF MIDDLESEX.
TO QUARRY OWNERS, GRANITE MERCHANTS, AND OTHERS.

Tenders are invited by the above Council for the Supply of about 12,000 tons (more or less) of 2-in. and 1½-in. Hand-broken Basalt for Road Construction, 2,000 tons (more or less) of ¼-in. Chippings, to be delivered free to various Stations in Middlesex.

Particulars, with Specification and Form of Tender, may be obtained at my Offices on and after Wednesday, the 17th day of January, 1912.

Tenders must be sent to the Clerk of the County Council, 63 Victoria-street, Westminster, S.W., not later than 12 (noon) on Wednesday, the 7th day of February, 1912.

The lowest or any Tender will not necessarily be accepted.

H. T. WAKELAM, M.INST.C.E.,
County Engineer and Surveyor.

63 Victoria-street,
Westminster, S.W.
January 9, 1912.

### COUNTY COUNCIL OF MIDDLESEX.
TO CARMEN AND OTHERS.

Tenders are invited for the Cartage of about 12,000 tons (more or less) of Broken Stone, 2,000 tons of Chippings, and about 4,000 tons (more or less) of Gravel from various Railway Stations and Local Pits in the Districts of Barnet, Bedfont, Cowley, Cranford, Edgware, Enfield, Hampton, Harlington, Harmondsworth, Harrow, Hayes, Hillingdon, Potter's Bar, Southall, Stanmore, Wembley, and Wood Green.

Tenders are also invited for Horsing the Council's Slop-carts (including the provision of Shoots), Water Vans, Tarring Machines, Rotary Brooms and Scrapers, and also for the Hire of Horse, Cart and Man per day.

Particulars and Forms of Tender may be obtained at my Offices on and after Wednesday, the 17th day of January, 1912.

Tenders must be sent to the Clerk of the County Council, 63 Victoria-street, Westminster, S.W., not later than 12 (noon) on Wednesday, the 7th day of February, 1912.

The lowest or any Tender will not necessarily be accepted.

H. T. WAKELAM, M.INST.C.E.,
County Engineer and Surveyor.

63 Victoria-street,
Westminster, S.W.
January 9, 1912.

### CITY OF BIRMINGHAM.

The Public Works Committee are prepared to receive Tenders for the Supply of Stores for one year, ending March 31st, 1913 *viz.*: Lias Lime, Portland Cement, Drain Pipes, Gullies, Gully Pans, Brown Bricks, Timber, Drysaltery, Castings, Iron and Steel Ware, Lamps, Glass, Enamelling, Brooms, Hose Pipe, Rubber Goods, Incandescent Mantles, and Miscellaneous Stores.

Samples and Patterns may be seen on application to the Storekeeper at the Lamp Department, Cambridge-street, and the Corporation Wharf, Sheepcote-street. Forms of Tender, Copies of Conditions, and Specifications may be obtained, on and after the 8th inst., at the City Surveyor's Office, Council House, Birmingham, on payment of £1 for each copy, which will be returned on the receipt of a *bonâ-fide* Tender for the whole or any portion of the Stores required. Samples of Goods tendered for must be sent, carriage paid, to the undersigned; the samples of Portland Cement, 4 lb. in weight, to be delivered by the 22nd of January. Tenders must be made out on the Forms provided, and delivered at the undermentioned Offices on the 27th day of January, 1912, endorsed "Tender for Stores," and addressed to the City Surveyor, Council House, Birmingham. The person whose Tender may be accepted will be required to conform with the provisions of the Trade Board's Act, 1909. The Committee do not pledge themselves to accept the lowest or any Tender, and reserve the right to accept portions only of a Tender.

HENRY E. STILGOE.
City Engineer and Surveyor.

The Council House,
Birmingham.
January 8, 1912.

## CITY OF BIRMINGHAM.

The Public Works Committee are prepared to receive Tenders for the Supply of Uniform Clothing for one year ending 31st March, 1913.

Samples and Patterns may be seen on application to the Storekeeper at the Lamp Department, Cambridge-street, and the Corporation Wharf, Sheepcote-street. Forms of Tender, Copies of Conditions, and Specification may be obtained, on and after the 8th inst., at the City Surveyor's Office, Council House, Birmingham, on payment of £1 for each copy, which will be returned on the receipt of a *bonâ-fide* Tender for the whole or any portion of the Clothing required.

Persons tendering must, at the time of tendering, and at all times during the execution of the Works, be paying all their workpeople not less than the Trade Union or standard rate of wages in the districts where such workpeople are actually engaged in the execution of the work, and must be observing the hours and conditions of labour recognised by the Association of Employers and the local organised bodies of workers in the various trades in such district.

The Tender of any person not paying the Trade Union or standard rate of wages, or not observing such hours and conditions of labour in his ordinary business will not be accepted. The Contractor will be held responsible for the observance of these conditions by any Sub-contractor employed by him.

Persons tendering will also be required to comply with the requirements of the Trade Board's Act, 1909, where applicable.

Tenders must be made out on the Forms provided, and delivered at the undermentioned Offices on the 27th day of January, 1912, endorsed "Tenders for Uniform Clothing," and addressed to the City Surveyor, Council House, Birmingham.

The Committee do not pledge themselves to accept the lowest or any Tender, and reserve the right to accept portions only of a Tender.

HENRY E. STILGOE,
City Engineer and Surveyor.

The Council House,
Birmingham.
January 8, 1912.

## CITY OF BIRMINGHAM.

The Public Works Committee are prepared to receive Tenders for the Supply of Materials for one year ending March 31st, 1913—*viz.*: Granite Kerbs, Setts, Crossing Stones, Chippings, Flags, Paving Bricks, Wood-paving Blocks, Ragstone, Gravel, Sand, and Slag.

Forms of Tender, Copies of Conditions, and Specifications may be obtained, on and after the 8th inst., at the City Surveyor's Office, Council House, Birmingham, on payment of £1 for each copy, which will be returned on the receipt of a *bonâ-fide* Tender for the whole or any portion of the Materials required. Samples of Materials tendered for must be sent, carriage paid, to the undersigned. Tenders must be made out on the Forms provided, and delivered at the undermentioned Offices on the 27th day of January, 1912, endorsed "Tender for Stone, &c.," and addressed to the City Surveyor, Council House, Birmingham. The person whose Tender may be accepted will be required to conform with the provisions of the Trade Board's Act, 1909, and to provide approved sureties in sums of £300 each for the due performance of the Contract. The Committee do not pledge themselves to accept the lowest or any Tender, and reserve the right to accept portions only of a Tender.

HENRY E. STILGOE,
City Engineer and Surveyor.

The Council House,
Birmingham.
January 8, 1912.

## RURAL DISTRICT COUNCIL OF BUCKINGHAM.

The above Council invite Tenders for the Supply of Granite and Slag for the year ending March 31st, 1913, delivered at the Stations and Wharves in their District.

Tender Form and Specification may be obtained upon application to Mr. R. Curtis Cordon, Surveyor to the Rural District Council, Buckingham, and must be sent in not later than February 3rd, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

THOMAS R. HEARN,
Clerk to the Council.

West-street, Buckingham.
January 12, 1912.

## THE RURAL DISTRICT COUNCIL OF GODSTONE.

### HIGHWAYS AND BRIDGES DEPARTMENT.

The Council invite Tenders for Tar-spraying certain Highways during the ensuing season. The area of work cannot be guaranteed, but there will be approximately 450,000 superficial yards of surface to be treated.

Tender Forms can be obtained on application to the undersigned upon receipt of a stamped and addressed envelope.

Tenders must be sealed and endorsed "Tender, Tar-spraying," and must be delivered to me not later than 12 noon on Tuesday, the 16th day of January, 1912.

The Council will not bind themselves to accept the lowest or any Tender.

GEO. E. CROWTER,
Engineer and Surveyor.

High-street,
Godstone,
Surrey.
January 1, 1912.

## THE RURAL DISTRICT COUNCIL OF BOURNE.

### TENDERS FOR GRANITE AND SLAG.

The above Council invite Tenders for the Supply of about 6,000 tons of Granite and 2,000 tons of Slag, at per ton, to be delivered to the order of the District Surveyor, carriage free, at any of the Stations specified in the Forms of Contract, at such times and in such quantities as the said Surveyor may from time to time order.

The lowest or any Tender not necessarily accepted.

Tenders (on Forms to be obtained on application to Mr. Thomas Lake, District Surveyor, Bourne), marked "Tenders for Granite and Slag," to be sent to me, the undersigned, not later than Saturday, the 27th day of January, 1912.

(By order of the Council)
CECIL W. BELL,
Clerk.

Council Offices,
Bourne, Lincolnshire.
January 6, 1912.

## COUNTY BOROUGH OF HUDDERSFIELD.

### TO CONTRACTORS.

The Corporation of Huddersfield invite Tenders for the Supply and Delivery of the following Materials for a period of 12 months, ending March 31st, 1913—namely:

| Form No. | Highway Materials. |
|---|---|
| 1. | Granite Setts, Gritstone and Lonkey Setts, and Macadam. |
| 2. | Furnace Slag (Broken and Unbroken) for Highway Purposes. |
| 3. | Granite, Slag and Limestone Tar Macadam. |
| 4. | Flags, Landings, Kerbs, &c. |
| 5. | Pitch and Creosote Oil. |
| 6. | Cast-Iron Materials. |
| 7. | Portland Cement. |
| 8. | Bricks, Lime, and River Sand. |
| 9. | Hay, Straw and Provender. |
| 10. | Scavenging Machine Brushes and Brooms. |
| 11. | Earthenware Pipes, Junctions, Bends, &c. |
| 12. | House Coal for Highways Department. |
| 13. | Team Work (for all Districts). |
| 14. | Shoeing Horses. |
| 15. | Oils (Engine, Cylinder, Gas-engine, Heavy-bearing, and Petroleum). |

The successful tenderer will be required to execute a contract, the draft of which may be inspected at the Town Clerk's Office, Town Hall, between 10 and 4 o'clock (except Saturdays).

Specifications and Forms of Tender may be obtained on application at the offices of Mr. K. F. Campbell, M.INST.C.E., M.I.E.E., Borough Engineer and Surveyor, 1 Peel-street.

Please state the number of Tender Form required.

Sealed Tenders, endorsed "Tender for Granite Setts," or as the case may be, signed in the handwriting of the tenderer or his agent, and addressed Town Clerk, Town Hall, Huddersfield, must reach him not later than Wednesday, 7th February, 1912.

The Corporation do not bind themselves to accept the lowest or any Tender.

J. HENRY FIELD,
Town Clerk.

Town Hall, Huddersfield.
January 9, 1912.

## COUNTY BOROUGH OF WEST HAM.
### TENDERS FOR SUPPLIES, &c.

The Council hereby invite Tenders for the Supply of

Paving Materials.
Broken Granite and Chippings.
Road Flints.
Sand for Tramways.
Tar and Pitch.
Ironmongery, &c.
Iron Castings.
Lime, Plaster, &c.
Portland Cement.
Rope and Tarpaulins, &c.
Hardwood.
Lead, Zinc, and Solder.
Oils and Colours, &c.
Stoneware Pipes, &c.
Brooms and Brushes.
Boots.
Sanitary Articles and Disinfectants.
Domestic Articles.
Clothing.
Soaps.

Forms of Tender and further particulars may be obtained at the Borough Engineer's Office, Town Hall, West Ham, E. (where the Standard Samples may also be seen).

For the Supply of
Newspapers and Periodicals,
New Books, and for
Bookbinding,

for the Public Libraries and Technical Institute.

Forms of Tender and further particulars may be obtained at the Central Public Library, Water-lane, Stratford; or the Public Library, Barking-road, Canning Town, E.

For the Supply of
Meat,
Fish,
Ice,
Bread and Flour,
Druggist's Sundries,
Groceries,
Tea and Coffee,
Linen and Cotton Goods, &c.,

for use in the Council's Hospitals.

Forms of Tender and further particulars may be obtained of the Medical Superintendent, at the Hospital, Sampson-street, Plaistow.

For the Supply of
Engine-room Stores.
Chemicals.
A.C. House Service Wattmeters.

Forms of Tender and further particulars may be obtained of the Electrical Engineer, 84 Romford-road, Stratford, E.

A deposit of £1 will be required in respect of each Form of Tender, which will be returned on receipt of a *bonâ-fide* Tender.

NOTE.—No Tender will be considered unless the same is delivered at the Office of the Town Clerk, Town Hall, West Ham, E., in the envelope supplied, by registered post, not later than 12 o'clock noon on Thursday, January 18th, 1912.

The Tenders will be opened at the Town Hall, West Ham, on Thursday, January 18th, at 6.30 p.m., and persons tendering may be present if they so desire, but no guarantee is given that any information, beyond the names of persons tendering, will be read out.

The Council do not bind themselves to accept the lowest or any Tender. The Contractor will be required to enter into a bond with sureties for the due performance of the Contract, and no Goods, Materials, &c., will be ordered under any Contract until such bond has been duly executed.

The Contractor whose Tender is accepted, and with whom a Contract is entered into, will be required to pay to the whole of his workmen such rate of wages and observe such hours of labour, as are recognised by the Workmen's Trade Unions, and in force at the time of signing the Contract. In the event of any breach of such agreement, the Council will enforce the penalty clause in its entirety.

By order of the Council,

FRED. E. HILLEARY,
Town Clerk.

Town Hall,
West Ham, E.
January 3, 1912.

## THE COUNTY COUNCIL OF DORSET.
### TENDERS FOR ROAD MATERIAL.

Tenders are invited for the Supply of Broken Stone required for the Maintenance of the Main Roads, such as:

Granite,
Quartzite,
Limestone,
Tarred Macadam,

to be delivered at various Railway Stations and Wharves in the County during the year ending 31st March, 1913.

Forms of Tender may be obtained on application to the County Surveyor, County Offices, Dorchester.

Tenders, endorsed "Road Stone," to be delivered to the Clerk of the County Council, County Offices, Dorchester, not later than 29th January, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

W. T. FLETCHER,
County Surveyor.

County Offices, Dorchester.
January 8, 1912.

## THE COUNTY COUNCIL OF DORSET.
### RURAL MAIN ROADS.

Tenders are invited for Tar-spraying certain sections of Highways during the ensuing season.

The area of the work cannot be guaranteed, but there will be approximately 200,000 yards of surface to be treated.

Specification and Forms of Tender may be obtained on application to the County Surveyor, County Offices, Dorchester.

Tenders, endorsed "Tar-spraying," to be delivered to the Clerk of the County Council, Dorchester, not later than Monday, 29th January, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

W. T. FLETCHER,
County Surveyor.

County Offices, Dorchester.
January 8, 1912.

The Trade Mark of the
INVINCIBLE
TALBOT
The Mark of Perfection.

The value of a trade mark lies in what is behind it.

If it is the experience of years, the recommendation of thousands of satisfied owners, the record of continuous invincibility in road trials, then that trade mark becomes a veritable hall mark.

It is because the trade mark of the Invincible Talbot has all these behind it that its value is recognised throughout the motoring world to-day.

The Talbot trade mark on a car is the hall mark of perfection. It indicates to the owner that he possesses a car which in stability, speed, comfort, accessibility and reliability has proved itself to be in every respect invincible.

Specifications and full particulars on request.

CLEMENT TALBOT, LTD.,
Automobile Engineers,
BARLBY ROAD, LADBROKE GROVE, LONDON, W.

Telegrams
"Clemtal, London."

Telephone
3200 Paddington

# The Surveyor

And Municipal and County Engineer.

Vol. XLI. JANUARY 19, 1912. No. 1,044.

## Minutes of Proceedings.

**Housing in Derbyshire and Essex.**

The Housing and Town Planning Act has had the welcome effect of infusing a new spirit of outspokenness as well as activity into the problem of public health, with which municipal surveyors as well as medical officers of health are so closely identified. Backed by the moral support of the law, medical officers in particular are evincing a courageous respect for plainness of language with regard to housing conditions which is bringing home, not a day too soon, some very telling facts to the public conscience, while also forcing upon the minds of members of public bodies a consciousness that the days of *laissez-faire* in these matters must rapidly make room for other and more enlightened ideas of their duty. Among the latest reports which have arrested attention are those by Dr. Barwise, medical officer of health for Derbyshire, and Dr. Thresh, medical officer of health for Essex, and it must be allowed that both of them adduce remarkable evidence of the necessity for the amelioration of the housing conditions of the rural population. Dr. Barwise speaks with respect to the relation between housing conditions and disease in the colliery districts; and Dr. Thresh has for his theme the problem of the agricultural labourer and his family under existing conditions—conditions which he manifestly describes with a detachment from every consideration except that of his official duty. "The characteristic of the houses on the coal measures," writes Dr. Barwise in a striking passage, "is the hideous rows of privy middens within 10 or 20 yds. of the houses, with unpaved yards between, with, in many instances, pigs and fowls kept close to the houses. The death-rate from diarrhœa, and the infantile mortality, will not be reduced to the general level of the county until the district councils responsible for the sanitary administration, supported by the public opinion of the colliers themselves, insist on sweeping all these abominations away. As a temporary expedient during the diarrhœal season, the spraying of the unpaved yards with tar is the best advice I can give."

It is, of course, common knowledge that much that is unlovely on the one hand and insanitary on the other in the housing conditions of colliers is due in no small measure to personal disregard of those precautions which make for cleanliness and health; but it is obvious that not a little may be achieved in bettering their environment by a firm insistence by district councils upon some of the elemental powers which are, so to speak, ready to hand. The evidence of Dr. Thresh is more concerned with the lack of houses in Essex and the consequences that ensue therefrom. Not only is the scarcity of cottages so great that families are forced into the workhouse, but it appears that there is in "every parish a want of cottages with three bedrooms, and in consequence of this overcrowding occasionally occurs, immorality is fostered, and infectious disease spread." These and other equally convincing facts which the reports contain will help us to realise how much there is yet to be accomplished ere we can flatter ourselves that we have done our whole duty to the rural or town dweller. Happily the extended powers conferred upon district councils by the Housing and Town Planning Act point salutarily to the means by which this duty may be discharged without injustice to the individual and with undoubted benefit to the community.

* * *

**The Engineering Standards Committee.**

The Seventh Report on the work accomplished by the Engineering Standards Committee is a document which not only records considerable further progress in connection with standardisation, but also contains much that is of special interest to municipal engineers. It is pointed out that in order to avoid stereotyping practice, which is evidently a danger to be guarded against when reliable standards are fixed, revisions of the standards decided upon will be made from time to time as may be necessary. The work which has been accomplished by the main and sectional committees and the various sub-committees (comprising in all a total membership of 321) will thus be kept constantly up to date and available for practical use. It is most encouraging to observe that the recommendations of the Committee for sizes and for tests of materials continue to find their way gradually but surely into very general use. For example, the use of British Standard tramway rails by tramway undertakings is maintained, the British Standard sections rolled during the year ending March, 1911, amounting to nearly 70 per cent of the total tonnage produced.

The Report states that a proposal has been submitted to the Committee for the re-designing of the Standard Sections of tramway rails, so that they may have a uniform width of head throughout the series. The reason for this suggestion is that in the country lighter rails than those employed in the towns could then be laid, while still preserving the same width of head. At present the widths of the tyres of cars intended for travelling over the heavier and broader sections are rather wide for the lighter and narrower sections. This subject is receiving the careful attention of the Sub-Committee concerned, but, having regard to the very extensive use of the existing standard sections, no alteration should be made unless it is clearly advantageous, and is backed by some evidence of a general desire for a change. Among other matters which have been dealt with by the Committee, and in respect of which specifications or drawings will be issued shortly, are cast-iron pipes for house drainage, water, gas, and sewerage purposes.

Progress is being made with the standardisation of vitrified ware pipes, and in this matter full acknowledgment is made of the assistance which is being afforded by the Institution of Municipal and County Engineers. That body has tabulated the data obtained from its members, and a report has been presented to the Committee. A meeting was held to discuss the lines upon which standardisation should proceed, and the manufacturing members have been asked to consult together and carry out tests with a view of formulating proposals which will be considered in conjunction with those received on the engineering side from the Institution of Municipal and County Engineers.

**Highways in Bulgaria.**

A table showing the lengths of roads in the *kreise* or departments of the kingdom of Bulgaria has been prepared by Mr. P. Karakulahoff, chief of the section of roads and bridges in the Ministry of Works at Sofia, and is published in a recent issue of *Der Strässenbau*. The classification adopted is unusually informative, since, instead of finding the roads classed under nominal heads, they are classed as "good, middling, and bad." There were in being at the end of 1910 2,070 miles of "good" roads, 1,757 miles "middling," and 1,529 miles "bad." Amongst the best of the *kreise* are Varna and Widin, the former having 123 miles of good roads, 26 middling and 51 bad; and the latter, 156, 78 and 71 in these classes respectively. Stara-Zagora, too, makes a good showing with only 59 bad, against 116 middling and 215 miles of good roads. Amongst the worst of the *kreise* is Tirnovo, with 225 miles of good roads and 192 of bad, and the large mileage of 345 under "middling." Worst of all is the *kreise* of Sofia, with no less than 540 miles of bad roads, against 270 middling and 250 good. It should be pointed out, however, that the large total mileage may partly account for the large mileage of roads classed as bad, while the topographical conditions suggest that many mountain and hill roads in this *kreise* would have no counterpart in the rest of the kingdom, which lies between the Balkans and the Danube. In the county or *kreise* of Sofia two important mountain chains meet at right angles, giving this part a character quite different from the rest of the country, which is watered by many rivers of moderate size flowing roughly at right angles to the course of the Danube, of which they are feeders. The expenditures given in the table are those for 1908. For making new roads and improvements the sum spent was nearly £159,000; for regular maintenance, nearly £29,000; and for extraordinary expenditure, about £14,000. The cost of maintenance per mile works out to less than £5 8s., so that the roads classed as "bad" must be little more than "fair-weather roads" or roads on very favourable soils. Probably a considerable proportion of the roads are agricultural roads of a humble class. At the end of 1910 there were more than 2,200 miles of road "im bau," or abuilding, and about 1,300 miles more had been aligned. The position generally seems to be very satisfactory and highly creditable to this young and progressive State.

* * *

**The Johannesburg Sewage Farm Case.**

We have been favoured with a copy of a report of the judgment delivered by Mr. Justice Bristowe in the case of *Combe v. The Municipal Council of Johannesburg*, which was decided recently in the Rand Local Division of the Supreme Court of South Africa. The plaintiff in the action was a nursery gardener, and he claimed damages and a perpetual injunction in respect of an alleged nuisance due to smells created by the Klipspruit sewage farm. This farm is under the joint control of Mr. G. S. Burt Andrews, M.Inst.C.E., the city engineer, and Dr. Charles Porter, the medical officer of health, to both of whom congratulations are due on the success of the council in an action which, on reading the judgment, we have little hesitation in saying ought never to have been brought. The learned judge observed that the law of nuisance is not for the protection of the fastidious and dainty, but for the average plain and simple person; although, therefore, his lordship was quite prepared to hold that a smell existed in the neighbourhood of the farm on occasions, and that it was sometimes disagreeable or offensive, the Court was not prepared to say that it was sufficiently pronounced or sufficiently continuous to amount to a nuisance.

In our humble opinion this is a common-sense view about a matter where opinion is often warped by sentiment. It had been suggested on behalf of the plaintiff that the defendant council had been negligent in not reducing the strength of the sewage by acquiring more land, or by adopting a different method of treatment. As to this the Court held that the problem before the town council was to deal with the sewage as they found it, and without being obliged to buy up the whole countryside or do things which cost a lot of money. If the council put themselves in the hands of competent advisers and honestly and conscientiously carried out their advice, the Court could not say that they had not taken reasonable care and that they had been guilty of any negligence.

* * *

**Extraordinary Traffic: A Scottish Case.**

Two points which should be of some interest to our Scottish readers arose in a case which recently came before the Court of Session. The Deer District Committee of the County of Aberdeen sued Messrs. Shanks and M'Ewan, contractors, of Glasgow, for expenses incurred in repairing roads which had been damaged by extraordinary traffic. The first question raised related to the construction and effect of the 24th Section of the Local Government (Scotland) Act, 1908, as applied to the facts of this case. By the Roads and Bridges Act of 1878 no time limit was attached to the raising of an action of this nature. Section 24 (*b*) of the 1908 Act, however, enacted that proceedings for the recovery of such expenses should be commenced within six months of the contract. The date of the passing of this Act was December 21, 1908. The present action was raised on November 16, 1909. The defenders said that their contract was completed, within the meaning of Section 24 (*b*), at latest by May 14, 1909, being more than six months prior to the raising of the action, and that they were not in any event liable for "expenses incurred" by the pursuers after December 21, 1908. As regarded any expenses incurred by the pursuers before December 21, 1908, the defenders agreed with the pursuers in their view that the time limit did not apply.

After reviewing the evidence and the contentions of the parties, Lord Cullen held that the time limit imposed by the Act of 1908 was applicable, and consequently that expenses could only be recovered in respect of damage done prior to December 21, 1908, the date when that Act was passed. The amount claimed in respect of this period was, however, not recovered in full, as it was proved that there had been other contemporaneous extraordinary traffic, the effect of which had not been taken into consideration. In the result, a sum of £415 was recovered in respect of all the roads in question.

* * *

**The Motor-'Bus and Extraordinary Traffic.**

The spread of the operations of the motor omnibus to districts hitherto innocent of any public vehicular connection with the Metropolis is playing havoc with many a macadamised road. We observe that the Surbiton Urban District Council take the view that the new traffic is "extraordinary traffic" within the meaning of sec. 23 of the Highways and Locomotives Amendment Act, 1878, and they have consequently given notice to the company running motor omnibuses in their district that they will hold them liable for the damage done to the roads. Similar action has been taken by the Urban District Council of Esher and The Dittons. Of course, the notices themselves are of no legal effect, and are merely in the nature of a friendly warning to the company concerned. If the matter is ever fought out, it will be very interesting indeed to learn what view the Court will take of the circumstances, which are quite novel as regards extraordinary traffic cases. The most apposite dictum appears to be that of Mr. Justice Wills in *Hemsworth Rural District Council v. Micklethwaite* (1904) 68 J.P., 345. "Traffic must of necessity, as time goes on, vary in its character, according to the development of the various industries in the neighbourhood: and traffic which in one

year or at one given time may be extraordinary traffic, will, in the course of time—and it may be in the course of a comparatively short time—become ordinary traffic. Therefore, I think that, in considering whether traffic is extraordinary or not, it is not sufficient to take simply the year to which the question relates and compare other traffic on the road during that year with the traffic complained of. That would be a fallacious test. The test is, whether the particular traffic in question has, by the usage of trade and of society, and by the varying circumstances applicable to the case, by that time become such as can fairly be called ordinary traffic."

* * *

**The Science of Illumination.**

In a paper on "Illumination as a Study for Architects," which was read at the last meeting of the Society of Architects by Mr. John Darch, F.S.I., there occurs one sentence which forms at once a trenchant criticism on the prevalent neglect of this important subject and a powerful plea for the necessity of devoting more attention to it in the future. The author of the paper observed in conclusion that "As no one can better know how to light his picture than the artist who painted it, so no one can better appreciate good lighting of an interior than the architect who designed it." Once it is fully realised what an important effect for either good or ill a scheme of lighting has upon any scheme of decoration, it is manifest that the study of illumination is one which ought to be undertaken by every architect. In his exceedingly able and exhaustive paper Mr. Darch dealt with every aspect of the subject, including questions of physics, physiology, æsthetics, and economics. A good scheme of artificial lighting must possess certain characteristics which to the ordinary individual are not easily definable. Probably they are summed up when we say that an illuminant must be sufficient, steady, diffused, and white in colour. In addition there should be no violent contrasts and the direction should be oblique downwards. These and many other matters were considered in detail in the paper, which, apart from its intrinsic merits, is worthy of notice as drawing attention to a subject of vital importance which is all too frequently neglected.

* * *

**The Stanley Surveyorship.**

We feel constrained to revert to this matter owing to further information having come to our knowledge since our previous "Minute" on the subject was written. There were about 200 applicants for this appointment, which was publicly advertised; and in view of this fact, it is, to say the least, significant that of the four candidates selected for an interview three were local men, two of whom were architects and the other *a builder and a member of the council* (who was elected to the office) while there was only one municipal surveyor. It is of course farcical to suggest that such a selection for an appointment worth £250 per annum was made with the *bonâ-fide* intention of picking out the best qualified applicants. We are glad to observe that these scandalous proceedings were not allowed to pass without protest, for we read in the account of the meeting which appears in the *Consett Chronicle* that something of a scene followed upon the formal motion for making the appointment. Further, although the vote had been by ballot, two members expressed a wish to have their names recorded as being against the appointment. We have seldom met with a case in which the whole procedure called for an explanation more than it does from the Stanley Council in the matter of this appointment.

* * *

**The Value of Professional Institutions.**

In addressing the members of the Institution of Municipal Engineers yesterday afternoon on the relation of that body to the municipal engineering profession, Mr. Henry Hulse, the Borough Engineer and Surveyor of Droitwich, said many things which it is to be hoped will be brought to the notice of those who at present remain outside the various professional institutions. He pointed out the many ways in which such bodies can be of real service to their members; and we would venture to reiterate the plea which he made to the younger officers to do their utmost to support them. When the objects for which such institutions are striving, such as improved status and superannuation, are achieved, those who at present occupy subordinate positions will naturally stand to receive a larger share of the resulting benefits than those who are now advancing in years. It is only reasonable therefore to expect that as far as possible those who will inevitably reap the greater part of the reward should do their share in the work which has to be done before any beneficial results can be accomplished.

* * *

**Domestic Waste Disposal.**

The disposal of domestic wastes in rural districts, which was the subject of a paper read yesterday before the Institution of Municipal Engineers at Birmingham by Mr. John Brook, surveyor to the Stratford-on-Avon Rural District Council, is a matter of great public concern which is unfortunately too often neglected. In places where the adoption of the water carriage system is impracticable, the foulest nuisances not infrequently occur owing to the inefficient methods which are in vogue for the frequent and periodical removal of night soil and other garbage. Mr. Brook's paper will be found on another page in this issue, and we would specially direct the attention of our readers to the excellent design which he there illustrates for a combined privy and ashpit. This has been devised by Mr. Brook himself, with back outlet for removal, and it possesses all the requirements of a proper receptacle in cases where the conservancy system is perforce retained.

* * *

**Exchequer Contributions.**

The relationship between services that are purely local and those which are national in character as regards the incidence of the taxation from which their expenses are met is a very debatable question. It is, however, probably generally conceded to-day that with the continued increase in the duties being imposed on local authorities, the tendency should be rather to increase than to diminish the contributions which those bodies receive from the national exchequer. It is somewhat alarming to local authorities and their constituents, therefore, to find that once again the existing exchequer contribution account is insufficient to meet the whole of the charges against it, and that they must perforce be content with payments on account. The matter is one of great urgency, and if the existing fund is not sufficient, we would urge the proper authorities to take steps to increase the amounts that are at present paid into it.

* * *

**The Consistency of Concrete.**

The Reinforced Concrete Practice Standing Committee of the Concrete Institute have recently reported—as stated elsewhere in this issue—in favour of the adoption of a standard specification for the consistency of concrete. We confess that we are not impressed with the specification arrived at by the committee, which appears to us to be too vague to be of much greater practical value than many forms which have been used hitherto. We quite agree with the conclusion of the committee that it is inadvisable to lay down any definite rule as to the percentage of water to be used, owing to the varying conditions which are met with. The only reliable method is to specify "to the satisfaction of the engineer or his representative," and on important works to have an experienced man to act as clerk of works while concreting is in progress. It is difficult to say exactly what is meant by "quivering like a jelly."

# Railless Electric Traction.

## THE "R.E.T." SYSTEM DESCRIBED.

Following Mr. Horace Boot's paper on the subject, which we published recently, we are this week able to give a description of the system which is, so far, the only one which has been adopted in this country, and is known as the "R.E.T." system.

It has been in daily operation in the city of Leeds for some time, and has given complete satisfaction to the corporation authorities.

The Bradford corporation have decided to equip a further 11 miles of route.

The Leeds tramways general manager in October last reported to his committee that the system had proved to be "an unqualified success from an engineering and operating point of view," and the corporation tramways manager at Bradford, in a report which we published in our issue of December 15, stated to a visiting deputation that the system had in three months' working given every satisfaction, the cars had not had five minutes' delay through break-

"R.E.T." Car Rounding Terminal Loop at Upper Moor Top, Leeds.

"R.E.T." Car Passing Loaded Vehicle at Bradford.

downs, and the wear and tear to the roads and to the vehicles were found to be infinitely less than with petrol motor-'buses.

The Light Railway Commissioners carefully inspected the "R.E.T." system in operation at Leeds and Bradford, and expressed their entire satisfaction with its working, and predicted for it a wide development. It is understood that the commissioners will be authorised to deal with railless electric traction schemes so that powers to instal and operate lines on the system will be more cheaply and quickly obtained.

Some of the Colonial Premiers inspected the "R.E.T." system in operation, and expressed their warm admiration of it as being "just what the Colonies want."

The Corporation of Dundee have placed orders with the "R.E.T." Construction Company, Limited, the contractors and sole patentees of the "R.E.T." system, for a number of vehicles similar to those at Leeds and Bradford.

At present it is necessary to obtain Parliamentary powers, and among the Bills for railless electric traction awaiting the coming Session of Parliament are those promoted by the authorities of Sheffield, Birmingham, Keighley, Stockport, Brighton, and West Ham; Halifax, Chiswick, Northampton, and Aberdare obtained their powers last Session, and are now arranging for carrying out the installations when their powers come into force.

As regards the London district, the London County Council are contemplating the use of the system, and we understand that schemes are being formulated at Ealing, Tottenham, Leyton, Ilford, Twickenham, and Uxbridge, which indicates that it is not likely to be long before the trolley-'bus will be a familiar sight to Londoners.

The following general description of the successful "R.E.T." system may be interesting:—

In general appearance the "R.E.T." trolley-'bus resembles an ordinary motor-'bus,but derives its motive power from two overhead wires through a double trolley. It is designed to carry up to twenty-eight passengers on a single-deck bus and up to forty-eight on a double-decker.

The "R.E.T." patented current-collecting device or trolley consists of two under-running trolley heads and poles of standard tramway type, geared and connected to one base, but perfectly free to travel to an angle of 90 deg. over the side of the car.

The great advantage of this type of collector is that it enables the "R.E.T." cars not only to cross existing tramway wires, but when advisable the trolley-'bus is able to run along the tramway route without altering the tramway equipment or interfering with the tramcars. We believe that the "R.E.T." system is the only one which can thus inter-run with a tramway. In order to do this the trolley-'bus lowers the negative pole and drops a flexible skate on one of the tramway rails for the earth return. This enables passengers from outlying districts to get right through to the centre of a town without having to change from the trolley-'bus to the tramcar.

The trolley arms are constructed a sufficient length to enable the vehicle to traverse the whole width of an ordinary roadway in the same manner as a motor-'bus.

The accompanying photographs give a good idea of design and flexibility of the "R.E.T." system.

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**Town Planning Schemes.** It is understood that the Local Government Board have given authority for the preparation of two further town planning schemes under the Housing and Town Planning Act. The schemes are to be prepared by the Urban District Council of Hanwell and the Corporation of Liverpool. In the case of Liverpool the scheme is to apply to about 88 acres of land, comprising Oakhill Park and land adjoining, situate near the eastern boundary of the city, and in the case of Hanwell the scheme will extend to an area of about 198 acres.

**Sewer Sections.**—Economical sewer sections have been the subject of study by Mr. Alberto Schreiner, assistant engineer in charge of design for the Bureau of Sewers, Borough of Queens, New York City. The experience in that office has led to the general conclusion that it is desirable, from the standpoint of low cost and ease of construction, to use vitrified pipe on all lines up to 24 in. in diameter. For sewers having diameters between 24 in. and 4 ft. plain concrete is believed to be the most economical type of construction, but for diameters greater than 4ft. it has been found that reinforced concrete may be used to best advantage.—*Contract Record* (Toronto).

## LEEDS AND ITS TRAMWAY MANAGER.

### AN INVESTIGATION AND A REPORT.

Mr. J. B. Hamilton, the general manager of the Leeds tramways, has our congratulations at the vote of confidence passed by a large majority of the council after a lively discussion upon the report of a special committee appointed to investigate into a number of charges which had been formulated by Alderman Badley.

At the enquiry both parties had legal assistance.

Among the matters which formed the subject of investigation were:—

(1) Whether it was permissible under the terms of Mr. Hamilton's appointment for him to undertake work for outside parties?

As to this, the committee reported that as no written agreement was entered into with Mr. Hamilton when he was appointed in 1902, at a salary of £900 a year, there is no stipulation prohibiting him accepting engagements outside the corporation.

(2) Whether a limit, and, if so, what, should be placed upon the number of articled pupils in Mr. Hamilton's department?

Upon this point the committee recommended that not more than two pupils should be permitted to any official of the corporation.

(3) Whether it was permissible for Mr. Hamilton to receive a retainer from, or be a director of, companies supplying goods to or doing work for the corporation?

As to this, it was acknowledged that Mr. Hamilton had received annually, since 1904, a retainer of 100 guineas from the Thermit (Welding) Company, and that such company had had considerable business transactions (stated to aggregate about £10,000) with his department: it was likewise acknowledged that Mr. Hamilton had been a director of the Electro Mechanical Brake Company during a period it had supplied goods to the corporation; but the committee, while expressing strong disapproval of corporation officials receiving retainers from, or being directors of, firms with whom the corporation have business transactions, say they are bound to exonerate Mr. Hamilton from blame, as they are satisfied that he had disclosed to his committee, and received their sanction to, his connection with both the firms mentioned. Moreover, Mr. Hamilton has resigned his directorship of the brake company, though still remaining a shareholder, to which, of course, no exception could be taken, and that, inasmuch as the Leeds Corporation have found it necessary to seek the advice of expert officers of other corporations, it is not desirable that Leeds officials be precluded from rendering assistance to other local authorities.

At the same time they expressed disapproval of outside work being undertaken by officials without prior sanction of a committee and full disclosure to the council, and recommended that in no case should any official be permitted to assist in opposing other local authorities, except on behalf of the Leeds Council.

The latter proviso, which, in our view, embodies a very desirable principle, and one that should become an acknowledged custom among corporation officials, was, in the main, an outcome of a protest made by the Halifax Corporation, that Mr. Hamilton had assisted a tramway company against that council.

The committee added a recommendation that in all future appointments of principal officials the exact terms and conditions of such appointments should be made fully known to the council and embodied in legal agreements.

We feel constrained to make the comment that it is to us surprising that in such an important corporation as Leeds there should have been this omission to make proper arrangements and stipulations as to its officials' duties.

The remaining complaints enquired into were of a minor character, and with regard to these the committee reported that the evidence adduced did not justify the insinuations launched at Mr. Hamilton.

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**Snow Removal at Liverpool.**—It is reported that it cost the Corporation of Liverpool £2,000 to clear away the snow that fell in that city on Wednesday. The regular staff of 900 men was doubled, and at night a further 900 casual labourers were added. The tramway officials had large gangs of extra hands at work.

F.

## ASPHALTING.

### MR. H. D. BLAKE'S BOOK.

We have before us a little book on "Asphalting," written by Mr. H. D. Blake, M.R.S.I., the managing director of the Limmer Asphalte Paving Company, Limited, Caxton House, Westminster, S.W., which contains a complete account of the manufacture and applications of that material. There could not be a better equipped author on such a subject than Mr. Blake, for the reputation of the company which he directs is very high, both for its materials and skilled workmanship. It is sometimes scarcely realised how popular for use in city streets which have to bear constant and heavy traffic. It is impervious to moisture and non-absorbent, and being jointless nothing can get into crevices and decay. It has a smooth and even surface, is durable and economical, quickly laid, and, being easily repaired, affords a minimum of inconvenience to traffic. It neither absorbs nor radiates heat, is easy of traction, easily cleansed by systematic washing, and quickly becomes dry; consequently the surface is perfectly clean, leaving no trace of any organic matter behind.

So great is the present use of the material that Mr. Blake's book, which embodies the result of forty years' experience in asphalting in all its departments,

ADMIRALTY BUILDINGS, THE MALL.
(Roofs, floors, and vertical work executed by the Limmer Asphalte Paving Company.)

MEMBERS OF THE INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS AT LIMMER COMPANY'S PREMISES, LEAMOUTH WHARF, BLACKWALL.

many useful materials improperly designated as "asphalte" are on the market and it is consequently very necessary that specifications should refer to a material of well-known source and quality. Asphalte was only discovered in 1712 and was not commercially adopted as a paving material until 1852 in Paris and 1872 in London. Lately it is becoming increasingly will be widely welcomed by engineers, surveyors and architects who are in search of thoroughly modern and reliable information on the subject. The book deals with the latest forms of asphalte pavings, such as the Limmer Company's well-known Lithostalt paving blocks, and "Lithocrete." The blocks are made in five thicknesses to suit different conditions of traffic.

and are rapidly increasing in popularity. They form a sanitary, impervious paving, and possess most of the advantages of asphalte itself. The advantages of Lithomac as a modern substitute for the old water-bound macadam road are already well known. The section laid at Sidcup on the London to Folkestone road has been subjected to the closest inspection, and has emerged successfully from every test.

Mr. Blake's book, the price of which is 2s. 6d., is profusely illustrated with views of the company's factories, mines, works, and so forth, and is excellently got up. It should be thoroughly perused by every municipal engineer before he undertakes works of the kind with which it deals.

## CORRESPONDENCE.

"*All truth is precious, if not all divine.*"—COWPER.

### THE ROAD BOARD'S GENERAL DIRECTIONS AND SPECIFICATION (No. 7).

*To the Editor of* THE SURVEYOR.

SIR,—Your mention of the above so excited my curiosity that I sent my 6d. for a copy.

If the conditions as set out in paragraph 1 exist, and that is what the whole thing presupposes, why trot out paragraphs 2, 3, 4? In a suburban district there are plenty of opportunities to see the subcrust exposed, and if in a rural district, it is almost criminal to "trench" it needlessly. A two or three years' knowledge of any district should and would enable any man worth his salt to ascertain the strength of his "crust," or, better still, its ability to carry the traffic, without "trenching," with its inevitable depression even after rolling.

(3) Why twelve months' wear only on "bottoming"? If sound, hard "bottoming" be placed so near the finished surface as is indicated in the paragraph—and nothing but the best would be so placed by a surveyor who knows his work—"financial reasons" would urge me, if possible, to delay for from two to four or more years the spending of further money on the spot.*

(4) [Total thickness on a good natural foundation not less than 4 in.] Even with the full 9 in. as recommended, I have seen the wheels of a heavily loaded trolley simply crush through the crust, allowing the under side of the axle to rest on the road surface.

During the late abnormal summer, in addition to the "faggots, heather and dry ashes" recommended, it would have been necessary to insert under the crust a 2-in. sheet of compressed rubber to take up the shrinkage of a peaty subsoil.

But see last two lines of Appendix 10, which are worth all the money.

(5) 2-in. to 3-in. coats! Wonderful, if read in conjunction with (7), with its 70 per cent of 2½-in. [1¼ in. to 2¼ in.]! This approximates closely with our old saw "one good stone thick."

(6) ¾ in. to the foot is perhaps all right on a level stretch, but I should be very sorry indeed to put that in writing for the use of my foreman.

It is generally admitted, I think, that one-third of an old lifted road is "muck." The two last lines actually give permission to re-use it as "dressing." My men call it "blinding." But see what (10) says! But why fix on ½-in. maximum in (6) and allow ¾-in. in (7) and (10)?

(7) No wonder granite companies' shares are "jumping," when ordinary bulk "should contain" 70 per cent 2½-in. to 1¼-in., and 20 per cent down to ¾-in.!

Road Board or no Road Board, this "sample" would never find a place on my roads. Imagine one or two of the smaller pieces, say 2-in. by 1-in. by ¾-in., or the ¾-in. gravel, falling or being squeezed between two full-sized cubes. Half at least of what remained on top would be crushed. "Good old blinding" or "dressing," we should want every bit of you. Personally I like the cubes to touch each other.

(8) This is an old "relic," and no longer applicable to users of "even bulk," now procurable from every good quarry.

NOTE 2.—Corrugations are soon obliterated while the road is really wet.

(9) "Dry rolling" to the extent advocated on an unscarified road would soon ruin all but the very best macadam, especially thin coats. "Frequently checking" the cross-section appears to me *perfectly absurd*.

(10) The first line adds to the value of the brochure, but I kick at ¾-in. gravel and less for binding.

Weathered road sidings and sand are quite good enough for me having regard to cost (we are speaking of water-bound roads).

I am skating on thin ice, but my roads are always open for inspection, notwithstanding the tirade against this class of work by those estimable gentlemen who are attempting to guide us. Quite recently have I seen main road men manipulating a load of siding and sand with a similar quantity of water in the gutter, throwing out the tufts of grass as they float upwards, and there was no need to emulate Smeaton's Eddystone mortar makers—it is wonderful how quickly it is all done; and, besides, perhaps the men have never even heard of their master's dictum.

I cannot think the publication will alter in any degree the present practice of applying water-bound macadam.

The above was penned during a leisure evening prior to the appearance of this precious specification in the current number of THE SURVEYOR. Hurriedly reading our good Editor's comments, I felt a little sore that he blessed it so generously, but on a second perusal one can read into it a qualified curse also, and he is to be heartily congratulated on his grasp of the subject.—Yours, &c.,

T. H. NEGUS.

Castle Bromwich.
January 15, 1912.

*To the Editor of* THE SURVEYOR.

SIR,—I have read with feelings of amusement and surprise the "General Directions and Specification (No. 7)" prepared for the Road Board by their Advisory Engineering Committee, and published in last week's issue of your valuable paper.

One wonders if the eminent gentlemen comprising the above committee seriously thought when they drew up this specification that the surveyors in charge of roads in the country were so ignorant that the information set forth would teach them how to make a water-bound macadam road.

When these gentlemen issue an advertisement for assistants or divisional surveyors, they particularly state that they must have "practical experience of road making." It would seem in the face of this "specification" that if these assistants know the difference between a steam roller and a horse and cart, or a piece of stone and a lump of clay, they would be well qualified with "practical experience."

I have no wish to ridicule the administrative work of the Road Board, but surely the Advisory Engineering Committee, composed as it is of practical men in responsible positions, and dealing with many miles of roads, can draw up a paper giving their less fortunate brethren the advantage of their experience in dealing with different classes of roads and materials, and not omitting the most important factor—cost.—Yours, &c.,

RURAL SURVEYOR.

January 16, 1912.

### NON-PROFESSIONAL COMPETITION.

*To the Editor of* THE SURVEYOR.

SIR,—Your correspondent will find that professional institutions have no power to prevent the manufacturer of sanitary appliances, the local plumber, or the sewerman's mate from styling themselves sanitary experts. He must not permit himself to be discouraged by this, as, when he has studied hard and obtained a diploma from a well-established professional institution (incorporated), Tom, Dick and Harry also obtain diplomas from a similar named body (not incorporated). Notwithstanding, I advise him to persevere and aim at the highest societies and Institutions. Better be a minor light among really luminous bodies than follow the steps of the bird described by Æsop. The jackdaw said "I will be a peacock," and stuck an invented agnomen and a few conundrums to his tail; but the fowls in the yard were not impressed thereby and laughed him to scorn.—Yours, &c.,

BEE.

January 12, 1912.

**Archbishop on Sanitation.**—Speaking at a meeting held last week at York for the purpose of making the preliminary arrangements in connection with the forthcoming congress and health exhibition of the Royal Sanitary Institute, the Archbishop of York said it was far better, even at the cost of much expenditure, to put everything in town and village in a thoroughly sanitary condition than to go on spending money where it could do almost nothing in maintaining lives that had been permanently impaired by the want of proper precautions in days gone by.

E*

* Presumably for a road with light traffic.—Ed. SURVEYOR.

## A DECADE OF PROGRESS IN EALING.

### BOROUGH ENGINEER'S REVIEW.

The story of Ealing's rise from a modest village to the dignity of a full-fledged corporate town has already been told by its borough engineer in a volume which made its appearance a few years ago, and there are doubtless many friends and neighbours of the author who will be interested to learn that the remarkable progress since made by the district has been placed on record in a second volume.* For nearly fifty years the borough's devoted servant, there is, without question, but no one better qualified than Mr. Jones to look back and gather up the lessons of the past, and that he has undertaken the task which he set himself will readily be acknowledged by all who secure a copy of his admirable little work.

In the eighty or so pages of the book Mr. Jones outlines in a plain and simple manner the details which have gone to make up a register of work carried out during the past ten years. The first noteworthy statement has reference to the subject of highways. As compared with the year 1901, when there were about 34 miles, the length of roads repairable by the council at the present time exceeds 52 miles, and it is indicative of the class of property which has been erected in various parts of the borough that while the increase in mileage is only about 30 per cent, that in the erection of houses is 100 per cent, and that in population approaches 90 per cent. The character of the roads in the town has undergone considerable changes, owing to the new conditions of traffic. With the introduction of tramways wood paving has been laid down in the main road, a large proportion of flint roads have been relined with macadam, and on the routes of motor-car traffic macadam has been gradually superseded by slag tar-macadam—with, it should be noted, the hap-

WORKMEN'S DWELLINGS, EALING.

EALING SEWAGE WORKS: PAVING STONE PLANT AND SHOPS.

* "Ealing, 1901-11: A Decade of Progress." By Charles Jones, A.I.C.E. Price 1s.

piest results. In particular, Mr. Jones comments on the rapidity with which rain water passes away from the road surfaces constructed with the last-mentioned material; at the same time he observes that the sewers are as a consequence tested to the fullest extent, bringing about an entirely different mode of estimating capacity to that which was in practice up to the commencement of the decade under consideration.

In dealing with such a rapidly-growing district, the town council have very wisely seized opportunities as they arose of carrying out works of street improvement, and this foresight on their part has, we are pleased to see, been fully justified by the development of the adjoining estates.

Some interesting particulars with regard to the manufacture of the product known as "Ealing stone" find a place in the book. The material is largely used in footpath paving in the borough, and, judging by the figures given, there would seem to be no question as to its economy. The installation of slab-making machinery was the outcome of two problems, which occupied the attention of the council in 1901—namely, the utilisation of the clinker from the destructors, and the necessity for providing a more lasting pavement than the tar-paving which previous to that date, had been generally laid throughout the borough. The stone, it appears, is charged to the highways department at the rate of 2s. 6d. per super. yard, this representing a small profit on the cost of manufacture, varying according to the price of cement.

Ealing Small-pox Hospital.

Ealing has advanced with other progressive towns in the matter of street lighting, and the effect of the changes which have taken place in this connection during the past ten years is strikingly demonstrated. The number of lamps has increased by no less than 67 per cent, but at the same time the cost of lighting has grown by only some 13 per cent.

The disposal of sewage and house refuse are touched upon by Mr. Jones. In matters affecting the treatment of sewage, Ealing claims to be the pioneer in the South of England, and nothing is neglected to enable it to retain that position. The past decade has been one of unusual progress; the old system of treatment which had previously met all requirements has been reorganised, and the present method of chemical precipitation, subsiding tanks, bacteria beds for effluent filtration, followed by sludge pressing for resultant sludge, inaugurated. The borough is admirably equipped as regards hospital accommodation, and as the same high efficiency is aimed at in the numerous other branches of the council's organisation, it is not surprising to read that, notwithstanding an immense growth of population, the death-rate, instead of increasing, shows a substantial decrease. In this respect, in fact, Ealing challenges comparison with any other district in Middlesex, and with all other "great towns" of the kingdom.

**Institute of Sanitary Engineers.**—A sessional meeting will be held at Caxton Hall, Westminster, on Monday next at 8 p.m., when a lecture on Smoke Abatement" will be given by Mr. Lawrence W. Chubb (secretary Coal Smoke Abatement Society).

## THE CONSISTENCY OF CONCRETE.

### CONCRETE INSTITUTE REPORT.

At the last meeting of the Concrete Institute an interim report of the Reinforced Concrete Practice Standing Committee on the Consistency of Concrete was submitted. A circular letter of inquiry on the subject was recently addressed to the members of the institute, suggesting that a specification as drafted would be of service, pending experiments and tests that ought to be made to determine the exact proportion of water to be used in concrete in order to obtain the best mixture. This specification, as now slightly modified by the committee, is as follows:—

Consistency of Concrete.—For mass concrete the quantity of water added to the other constituents shall be sufficient to make a plastic mixture which, after thorough ramming, will quiver like a jelly. For reinforced concrete the quantity of water added to the other constituents shall be such that the plastic mixture is capable of being rammed into all parts of the moulds and between the bars of the reinforcement. Note.—In dry or hot weather the quantity of water shall be increased in order to allow for evaporation.

The fifty-eight replies received have been carefully considered by the Reinforced Concrete Practice Standing Committee, who have come to the following conclusions:—

(1) It is inadvisable to lay down any definite rule as to the percentage of water to be used in mixing concrete, owing to the varying conditions which obtain. The proposed specification is difficult to improve upon, and seems to meet with general agreement.

(2) The strength of concrete, apart from any reinforcement, increases as the amount of water used in mixing is decreased, this being more particularly the case during the earlier stages of the maturing of the concrete. Eventually the wetter of two mixtures will approach more nearly to the drier in strength.

(3) In reinforced concrete, particularly in such portions as may contain a large amount of reinforcing bars or the like placed closely together, it is essential that the concrete should be sufficiently wet to pass between the reinforcing bars, and thoroughly to surround every portion of the steel. This should be ensured even at the expense of having the concrete wetter than would otherwise be desirable. Where the reinforcement is not very closely spaced it is unnecessary for the concrete to be so wet.

(4) Other conditions being the same, the drier the concrete the more quickly will it set and mature. This is of importance when there is any danger of green concrete being attacked by frost.

(5) The wetter the concrete the greater is the tendency to contract during the process of setting and maturing. Appreciable contraction may sometimes continue for a period of several years.

(6) The committee is divided as to the advisability of determining by some means of mechanical test the exact degree of "wetness" or consistency of concrete after mixing. If some scale of consistency were adopted, it would be possible to specify that concrete for any particular portion of the work should be of such-and-such a consistency after mixing. This would not, of course, be at all the same as specifying that any particular amount of water should be used in mixing such concrete, owing to differences of atmospheric temperature, aggregate, &c.

The advocates of the institution of some such scale of consistency are of opinion that the Concrete Institute should carry out tests on the subject.

**Business Announcement.**—Messrs. Willcox, Raikes & Reed inform us that arrangements have been made by mutual agreement under which Mr. H. A. Reed will relinquish his partnership with them in order to accept the appointment of chief engineer to the Manchester Ship Canal. The firm will in future be known as Messrs. Willcox & Raikes, and will continue to practise at 63 Temple-row, Birmingham, and 15 Victoria-street, Westminster.

# Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

This week answers are invited to the following questions:—

## QUESTIONS.

**219. Tram Rails.**—Describe an accurate, practical method of measuring the wear of a steel-girder tram rail. (T. R.)

**223. Reinforced Concrete Bridge.**—Design a reinforced concrete bridge to carry a 36-ft. main road over a river (at right-angles), single span 60 ft. between abutments, 36 ft. wide, 20 ft. from mean surface of water to the crown of arch. Banks 5 ft. above mean water level; foundations 15 ft. clay, then hard red sandstone. Allow for usual main road traffic, and show calculations. (A. P., *Liverpool.*)

**224. Town Planning.**—What are the chief points to be considered in laying out a new town?

**225. Road Construction.**—Specify the construction of a new stone-pitched road to bear heavy town traffic, and draw a section of same. (T. R.)

**226. Sewage Pumping.**—Show calculations arriving at the diameter of a sewage pumping main sufficiently large to meet the requirements of the Local Government Board for a population of 4,500 upon the partially separate system, the velocity through the main being at the rate of 4 ft. per second, the water supply of the district being at the rate of 16 gallons per head, the population being distributed in 11,000 houses scattered over about 4 miles of roads, the pump well being so situated that an overflow, if allowed by the Local Government Board, could be arranged so as to discharge into a brook near to. ("Student.")

**227. Refuse Disposal.**—Describe, with illustrations, the most efficient and economical form of refuse destructor for a village of 500 inhabitants. (M.Inst.Mun. and C.E., *Secondee.*)

## REPLIES TO QUESTIONS.

**218. Aqueduct.** What are the maximum centres at which the supports may be placed to carry a steel tube 2 ft. in diameter, full of running water, for a distance of 180 ft. at a height of 60 ft. above ground? (E. M. D., *Wood Green.*)

Taking the pipe as a continuous beam, and thickness as ¼ in., the load to be carried equals dead load due to weight of metal in pipe, plus live load of running water. The weight of a 24-in. steel pipe, ¼ in. thick, is 65 lb. per foot run, but, allowing for lap, rivets and flanges, and flange connections to the pipe to be double riveted, the weight of the pipe can be taken as 83 lb. The weight of water per foot run is 196 lb., and it will be sufficient in this case to take the live load as 1·5 instead of twice the dead load.

We then have

$83+196\times1{\cdot}5=83+294=377$ lb. per foot run.

Let the safe tensile stress on solid plates be 6·5 tons per square inch, and efficiency of joints as ·66.

$$\text{Section modulus} = Z = \frac{\pi}{32}\left(\frac{D^4-d^4}{D}\right).$$

where D and d are the external and internal diameters of the pipe respectively.

$$\therefore Z = \frac{3{\cdot}1416}{32}\left(\frac{24{\cdot}5^4-24^4}{24{\cdot}5}\right) = 114$$

Now the conditions of stability of a beam are given by the equation

Bending moment = moment of resistance

For a continuous beam with distributed load

$$\text{B. M} = \frac{wl^2}{12}$$

where w = load in lbs. per foot run and l = span in feet, and M R = $fZ$

where $f$ = safe working tensile strength = 6·5 tons per square inch stress,

$$\frac{wl^2}{12} = fZ$$

$$\therefore l = \sqrt{\frac{12fZ}{w}} = \sqrt{\frac{12\times6{\cdot}5\times\cdot66\times114\times2240}{377}}$$

$$= 180 \text{ in.} = 15{\cdot}6 \text{ ft.} = \text{say, } 15 \text{ ft. maximum safe span.}$$

$$\therefore \text{number of supports} = \frac{180}{15} = 12.$$

The wind will also have a tendency to bend the pipe horizontally between the points of support, and the effect of this is calculated as follows:—

Taking wind pressure as 50 lb. per square foot on a flat surface, and = (⅗ × 50) lb. on a cylindrical surface,

$$f = \frac{wl^2}{12Z}$$

$$\therefore f = \frac{wl^2}{12Z} = \frac{2\times50\times(15\times12)^2}{3\times12\times114\times2{,}240} = \cdot35 \text{ tons per square inch,}$$

which is within safe limits.

The above calculations show the maximum distance which the pipe can span when the resistance to bending is taken up by the pipe only. As, however, the pipe is to be carried at a considerable height above the ground—*viz.*, 60 ft.—supports at each 15 ft. will be somewhat expensive. It will be

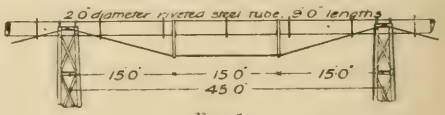


FIG. 1.

cheaper to increase the length of the spans and support the pipe by a trussed girder.

Let the number of spans be four, so that the length of each = 45 ft., and let the pipe be trussed as shown in Fig. 1.

Taking the beam as a continuous beam and weight of pipe and water = 377 lb. per foot run

Weight over span = (377 × 45) = 16,965 lb.

Weight over each portion between braces = (377 × 15) = 5,655 lb.

It can easily be proved by Clapeyron's Theorem of Three Moments that

the pressures at each end $= \frac{4\,wl}{10} - \frac{4\times5{,}655}{10} = 2{,}262$ lb. = 1·01 tons,

the pressures on each strut $= \frac{11\,wl}{10} - \frac{11\times5{,}655}{10} = 6{,}220$ lb = 2·77 tons,

the reaction at each end $= \frac{W}{2} - \frac{16{,}965}{2} = 8482{\cdot}5$ lb. = 3·78 tons.

Construct frame diagram (Fig. 2) and stress diagram (Fig. 3), and scale off stresses in various members.

FIG. 2.

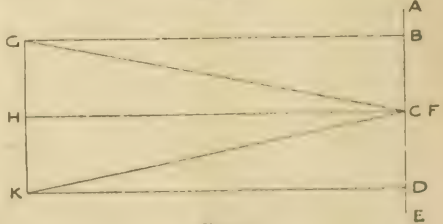


FIG. 3.

The bending moments on the pipe are shown in Fig. 4.

B. M. at ends is zero

B. M. at each strut $= \frac{wl^2}{12} = \frac{377\times15^2}{12\times2{,}240} = 3{\cdot}15$ ton feet,

B. M. at middle of end spans $= \frac{wl^2}{8} - \frac{wl^2}{24} = \frac{wl^2}{12} = 3{\cdot}15$ ton ft.,

and B. M. at middle of centre span $= \frac{wl^2}{24} = 1{\cdot}57$ ton ft.

In calculating the stresses only two-thirds of the area of the steel may be taken into account to allow for loss of strength of riveting.

Then maximum stresses $= \frac{W}{A} \pm \frac{M}{Z}$

where W = stress in pipe in ton inches,
A = area of metal in pipe in square inches,
M = maximum bending moment in ton inches,

$$Z = \text{section modulus} = \frac{\pi}{32}\left(\frac{D^4 - d^4}{D}\right).$$

$$\text{Maximum stress} = \frac{13{\cdot}87}{19} \pm \frac{3{\cdot}15 \times 12}{114}$$
$$= {\cdot}73 \pm {\cdot}33$$
$$= 1{\cdot}06 \text{ tons per square inch maximum compression}$$
$$= {\cdot}40 \text{ tons per square inch minimum compression,}$$

which will be amply on the safe side.

Allowing 6·5 tons per square inch as safe stress in tension, the rods will require an area of $\frac{13{\cdot}87}{6{\cdot}5}$ =2·13 sq. in., say 2-in.—1¼-in. diameter rods, or 2-in.—1⅛-in. square rods, with large ends welded on. The struts supporting the pipe should be curved to fit the pipe, so as to give as full support as possible.

FIG. 4.

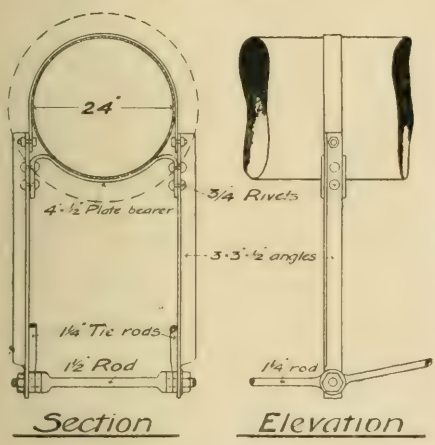


FIG. 5.

Fig. 5 shows a detail of the short strut.

By adopting this method, there will only be three intermediate supports, instead of twelve in the first method. The intermediate supports will have to carry the dead weight of the pipe and water and the stress caused in the pipe by the wind pressure. Therefore the supports in the second method will have to be made larger and stronger than those in the first, as they will have a greater stress to bear. Those in Case 1 might be made of two channel irons braced together by angle-irons at the sides, the sizes of same being calculated by the Rankine-Gordon formulæ. In Case 2, light, braced towers could be adopted.

Three spans of 60 ft. may be used, the stresses and strengths of rods, struts and supports being obtained as above. (W. H. P., *Lytham.*)

NOTES.

**212. Outfall Sewer Extension.**—An 18-in. diameter cast-iron pipe outfall sewer at present laid across the foreshore to low-water ordinary spring tides has to be extended to a point below low water 300 yds. The formation of the shore consists of magnesium limestone. Explain the method you would adopt for the construction of such an extension and give a detail estimate of the cost. The difference in level between high and low tide may be assumed at 18 ft. ("Theodolite.")

The reply signed "W. H. P." prompts me to make the following suggestion as to laying a sea outfall in the manner and of the material suggested.

Firstly, as to manner, I think it might be impossible to get flanges to fit so as to bolt home twelve bolts in each flange. The bottom of the sea is a poor sort of workshop at the best of times, and in the position shown, with only 12 ft. of water at L.W.O.S.T., wave action makes nice work almost impossible. The question as to whether two or three lugs with bolts is the best is a moot one, as is also the question of a turned and bored joint, as against a joint caulked with lead wool. I prefer the latter as giving more play.

In any case, however carefully the work is done, slight irregularities of invert will be bound to exist, irregularities which are of little moment in a sea outfall, but which might be quite sufficient to render the method of construction suggested by your correspondent impossible.

Then, as to material, experience shows that steel and wrought iron corrode to an alarming degree in salt water, while cast iron—though it softens slightly—only corrodes to an infinitesimal degree.

Within my experience, ¼-in. plates of steel have entirely corroded in sixteen years, and bolts of wrought iron have proved the weak spot in pier construction.

I agree that wrought-iron bolts are necessary, but these, should be at least 1¼ in. in diameter, and better still if 2-in. diameter are used. (F. P. D., *Bournemouth.*)

## SOME RECENT PUBLICATIONS.*

WHO'S WHO, 1912. Price 10s. nett. London: A. & C. Black.

The latest issue of this well-known work again shows an increase in size over its predecessor, the number of entries being larger than ever. It is one of the standard works of reference to-day, and its excellence is so generally recognised that few words are needed in introducing the new edition. It would be easy to point out some instances where the information is rather more meagre than one would have wished, but the degree of merit which is sufficient to claim more than a little of the crowded space is, of course, a matter entirely of opinion. The book is very carefully compiled, and the issue for 1912 is a worthy successor of those which have preceded it.

WHO'S WHO YEAR BOOK, 1912-13. Price 1s. nett. London: A. & C. Black.

This useful annual consists of a series of tables which formed the original nucleus of "Who's Who," and will be found a most useful companion to the larger work. For example, if biographical details of the M.P. for a division be required, the name can be ascertained from the table in the "Year Book," and then reference may be made to "Who's Who" for the fuller information. Everyone who habitually refers to "Who's Who" would do well to invest an extra shilling in its small companion volume.

The seventy-sixth annual issue of "The Tithe Rent-charge Table," by Percy William Millard, LL.B., F.S.S., has been published by Messrs. Shaw & Sons, price 1s. The booklet shows at a glance the yearly and half-yearly values of any tithe rent-charge for the year, and includes tables of the official fees payable on the redemption and merger of tithe rent-charge, income-tax tables, and a useful summary of the law relating to the collection, redemption and merger of tithe rent-charge.

DIARIES AND CALENDARS.

The Woolwhich Cement Company, Limited, of 35 Great St. Helens, London, E.C., have favoured us with their wall calendar for the current year. It is made up of tear-off daily dates, of a size and boldness which quite dwarf other productions of the kind that have reached us. It is not surprising that the company's "Red-Cross" cement has now become a household word among users, seeing that the output of it from the company's Lion Works, at Grays, is now no less than 4,000 tons weekly, or the stupendous quantity of 200,000 tons per annum.

Messrs. James Potts & Son, of Milburn House, Newcastle-on-Tyne, issue a most useful "tear-off" daily calendar for 1912, with bold figures in red for the dates. Messrs. Potts have for over sixty years made a speciality of Caithness natural-faced pavement, which is specified as "Spittal Quarry"; and they supply also, among other things, Norwegian or British granites and Scotch hard blue whinstone for kerbs and channels, and setts and cubes of "Truegrey" granite or "Hardblue" whinstone.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price

# Institution of Municipal and County Engineers.

## ALTERATIONS TO MEMORANDUM OF ASSOCIATION: THE "OBJECTS" CLAUSE.

As intimated by Mr. Thomas Cole, the secretary, in a communication which appeared in our issue of last week, further special meetings became necessary recently in connection with the alterations to the Memorandum of Association of the Institution of Municipal and County Engineers. The Board of Trade had admitted that the view taken by the solicitor to the institution—namely, that they exceeded their powers in causing alterations to be made in any but the "objects" clause—was correct, and it therefore became necessary that the alterations made on September 23rd last, at the board's requirement, in Clauses 4-8 of the memorandum should be rescinded—that was to say, that these clauses should remain as originally drawn—and that Clause 3—"objects"—should be altered as proposed in the following resolutions:—

(1) That the special resolutions of the Institution passed on the 5th day of July, 1911, and confirmed on the 29th day of July, 1911, and the special resolutions of the Institution passed on the 23rd day of September, 1911, and confirmed on the 21st day of October, 1911, be rescinded so far (only) as they relate to alterations in the Memorandum of Association of the Institution.

(2) That Clause 3 (the "objects" clause) of the original Memorandum of Association be altered as shown.*

(3) That the necessary application be made to the Court for the confirmation of the alterations specified in Resolution 2.

The special general meeting at which the resolutions were proposed for adoption was held on Saturday afternoon last at the institution offices, the president, Mr. A. D. Greatorex, occupying the chair, and others present including Messrs. J. Patten Barber (Islington), W. Nisbet Blair (St. Pancras), H. Percy Boulnois (Westminster), J. A. Brodie (Liverpool), G. F. Carter (Croydon), S. H. Chambers (Hampton), J. W. Cockrill (Great Yarmouth), T. Cole (Westminster), secretary, W. J. Dresden (Battersea), E. J. Elford (Southend), H. A. Giles (Westminster), assistant secretary, A. Gladwell (Eton Rural), T. W. A. Hayward (Battersea), C. J. Jenkin (Finchley), H. P. Maybury (Kent), E. B. B. Newton (Paddington), J. S. Pickering (Cheltenham), G. Sturgess (Chelsea), C. Chambers Smith (Westminster), Norman Scorgie (Hackney), H. E. Silgoe (Birmingham), R. J. Thomas (Aylesbury), C. Vawser (New Barnet), H. A. White (Battersea), C. F. Wike (Sheffield), E. Willis (Chiswick), J. Willmot (Birmingham), and T. H. Yabbicom (Bristol).

The President, in opening the proceedings, briefly reviewed the events which had led to the necessity for the gathering, and intimated that if the resolutions were passed they would be submitted for confirmation on February 9th at a further special general meeting at Caxton Hall, Westminster, when there would also be held a Metropolitan District Meeting, at which a paper of particular interest to engineers concerned with road making would be presented to the members for discussion. That meeting was originally arranged to have been held in the Midlands, but in order to give those attending the special meeting something in return for the trouble to which they would be put the arrangement had only just been decided upon, and it was hoped to have a large number present. He believed the letter sent out by the secretary with the notice of the meeting gave all the information with regard to that day's proceedings that was necessary, but if any members were desirous of seeing documents they would be put before them. He formally moved the adoption of Resolution (1).

Mr. A. Gladwell (Eton Rural) seconded.

Mr. Norman Scorgie (Hackney) asked whether they were not in the resolution covering everything that was passed before? They were rescinding the resolutions so far as referred to the Memorandum of Association. He had not seen them to find after they had rescinded this how they had rescinded something which could not have been altered. They only wanted to rescind parts of them, and not the whole of them.

Mr. H. A. Giles, the assistant secretary, stated that the only clause in the Memorandum of Association which could be interfered with was Clause 3—the "objects" clause. Therefore the whole of the alterations made in the other clauses fell to the ground as being invalid. In Clause 3 the alteration of their name was set forth, and the Board of Trade had made all the alterations that were necessary, and put them in Clause 3.

Mr. Scorgie agreed that that was the intention, but not what was in the resolution, and the result would be that they would have only what was passed that day.

Mr. T. W. A. Hayward (Battersea) said he considered that if the resolution had the approval of their solicitor they ought to be satisfied.

Mr. J. Patten Barber (Islington) urged that they were only going to rescind alterations they ought not to have made in the memorandum.

The President said he thought it was best to trust to the institution's solicitor.

Mr. G. F. Carter (Croydon) asked whether the resolutions were not identical with what they first agreed to?

The President: They are.

Mr. C. Vawser (New Barnet) said he did not wish to prolong the discussion, but if this resolution were to be carried it would do away with an obstacle of the past. The resolution, as he understood it, was intended specifically to comply with certain requirements of the Board of Trade, and the meeting had been called with the object of complying with those requirements. They must place themselves in the hands of the council whom they appointed annually in their interests, and whom they should heartily support for the carrying out of anything for their general benefit. He thought nothing good could come from continuing the discussion, and he asked them to pass the resolution.

The resolution on being put to the meeting was carried unanimously.

The second resolution was then put by the president, seconded by Mr. E. Willis (Chiswick), and also carried. The president afterwards proposed, and Mr. Gladwell seconded, the adoption of the third resolution, which was likewise agreed to.

The President thanked the members of the institution, who, at the sacrifice of time and pleasure, had attended to support the council in the matter and form the requisite quorum.

The proceedings then terminated.

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**The Surveyors' Institution.**—At a meeting of the Surveyors' Institution to be held on Monday evening next at Great George-street, Westminster, Mr. Julian C. Rogers will present a paper entitled "An Evening in the Institution Library." The chair will be taken at eight o'clock.

**Rugby Surveyor and an Unfounded Charge.**—An animated discussion took place at the meeting last week of the Rugby Rural District Council as the result of a report from a committee recommending the purchase of a steam roller for use in the district. Mr. T. W. Willard, the surveyor, said he received a letter on Saturday from the contractor (Mr. Walton, of Bilton), who said he had found out that the secret of the motive why the council wished to purchase a roller was that he (Mr. Willard) was interested in the roller, and that the contractor's name was only used as a blind. Mr. Walton had since told him that the statement referred to was made by a member of that council. He asked that member to make the same statement in public which had been made behind his back. Speaking with warmth, he added that he hardly thought, after the years he had served the council, it was necessary for him to state that the charge was absolutely untrue, and if any member believed otherwise it was his duty to have him expelled from office. Mr. J. Hicken asked if the surveyor would name the member referred to, but Mr. Willard did not do this. The vice-chairman said it was a very serious statement, and Mr. T. S. Ewen said he was sure Mr. Willard was above suspicion. Mr. Ewen and others endorsed this, and Mr. Willard said such an expression of opinion was all he wished for.

# The Institution of Municipal Engineers.

## ITS RELATION TO THE MUNICIPAL ENGINEERING PROFESSION.*

By HENRY HULSE, Borough Surveyor and Engineer, Droitwich.

To speak of history in connection with the youngest of the municipal service institutions may appear to be somewhat premature, but even now it will be of interest to look back and take note of what has been accomplished and what opportunities lie in the lap of the future for further usefulness.

It was in May, 1908, that the institution was inaugurated, but for some years previous to that an idea had taken root among many members of the profession, and a feeling had been growing, that there was room for an institution animated with a more democratic spirit, if I may be allowed to use this term, than was at that time being shown by the then existing service institutions. It was seen that there was a large number of members of the municipal engineering service fully qualified and equipped in all ways for the service they were in, but who from some cause were outside the then existing associations, and that there was no valid reason why these officials should not be brought together in an institution which should be founded for and carried on in the interests of that service—an institution which, while able and willing to act fraternally with other kindred institutions, should shape a distinct course for itself.

The institution thus started had immediate success, and this success has undoubtedly, to some extent, reacted upon and been the cause of greater virility being shown by other kindred institutions.

Our good friend Mr. Wyand did perhaps as much as anyone by way of crystallising the idea and inaugurating the institution, which, when formed, wisely selected him as its secretary. Anyone at all intimate with the working of the institution knows that Mr. Wyand has done excellent service therein, and to know him personally is to realise that he is devoted heart and soul to its interest and to making it of service to its members and the profession.

The institution has been honoured by having for its presidents Mr. John T. Pegge (city engineer, Durham) and Mr. A. Ernest Prescott (borough engineer, Eastbourne), each of whom in their respective terms of office, by their intimate knowledge of the profession, proved most capable leaders, and helped materially in building up and strengthening its position and usefulness. In Mr. E. A. Stickland (borough engineer of Windsor) the institution has a president for this year who has already shown that he intends to add to its prestige.

### MEMBERSHIP.

The membership is spread over all quarters of the globe, and now numbers 712 fully accredited members, 80 associate members, and 95 students. Ten districts have already been set up in the British Isles, and these, through their executives, are doing good work in bringing together their members to discuss matters of interest to the profession and for the consideration of papers dealing with the varied and numerous phases of municipal engineering practice.

### EXAMINATIONS.

Examinations have been commenced upon lines which, while being a distinct innovation upon what has been the usual practice, are considered, by those well qualified to express an opinion, to be best suited to present-day requirements, and will undoubtedly be followed by other bodies in the future. These examinations, while making no special call for the crammer, do call for individual initiative, while sound knowledge gained in the ordinary curriculum of the schools, with thorough practical training such as may be gained under an experienced official, will be found to be of more service than the mental gymnastics that have hitherto been necessary in so many examination halls. Let not the slack student think that he will benefit under such a scheme, as it is just the co-relating of theory with practical work in its varied problems in the questions set that will leave him plucked, and discover the student who has made up his mind to understand and grasp the work of the profession in all its many details.

A lending library has been established at the London office which includes many of the latest publications upon the technical details of all branches of municipal engineering, and to this members of the institution have access, subject to the few regulations necessary to the working of a library.

### VALUE OF MEETINGS.

Year by year the number of meetings held in connection with the institution is increasing, and many exceedingly interesting papers have been read and discussed, and by publication in the *Journal* are now available for members generally. While not myself believing that the reading of papers should be the sole business of these meetings, there is no doubt that they do serve a most useful purpose that cannot be attained by any other method.

The institution has made wonderful progress since its inception, and it is now for the members to widen its usefulness by contributing some personal service in the way of papers, or, failing that, by attendance at its meetings; not to rest content with paying their annual subscription, important as that is, but to get a hold on to some part of the harness and help on the good work that is being done. Institutions, like nations or other communities, cannot for long exist upon past achievements, and we have now to consider how this institution may benefit the profession and how the members can help to widen and increase the scope and influence of the institution.

Everyone surely recognises the advantage of meeting together for the reading and discussion of papers and the inspection of works illustrative of matters that we, as municipal officials, are continually dealing with in routine work. Such works as sewerage, sewage disposal, waterworks, highways, sanitation, public buildings, tramways, street lighting, parks, recreation grounds, and street cleansing are all of such vital importance to the comfort and well-being of the public at large that those whose duty it is to carry them out year by year cannot afford to lose any opportunity of comparing notes and of inspecting works in course of construction or in operation, and no better means have yet been devised for this purpose than the meetings organised and carried out under the auspices of the various professional associations. These same meetings serve also to increase the *esprit de corps* among the members attending them. This in itself is no little gain, widening, as it certainly does, our circle of friends and professional outlook which otherwise tend to get confined to our own immediate district, borough, or city boundary. Our members in the British Isles are located perhaps a score in some of the large centres of population, by dozens in others, and in lessening numbers in the smaller towns or rural districts, and it is to the general good that there should be a bond of fellowship for such a body of officials.

### PROFESSIONAL QUALIFICATIONS.

With Parliament laying so many exacting duties upon local authorities, and the manifest socialistic tendency of the age quickening the activities and increasing the responsibilities of these authorities, it behoves the officials of the latter not to let pass any opportunity of increasing their knowledge, and consequent ability to cope with whatever duty falls to their charge. The busy official, be he chief or assistant, cannot always devote the time he would like to reading the current literature that he may have at hand on subjects cognate to his duties, and the more reason, then, why he should, in association with his fellows, have opportunities to see what others have done or are doing, and by comparison and discussion at these meetings give of his experience to others, and at the same time learn something of what others are doing. Our institution is at one with other institutions in consolidating the municipal engineering profession, and giving its members reason to think and work along national as well as local lines for the benefit of the entire service, and while this is being done individual members can strengthen the institution by personal interest in its work, and at the same time fit themselves for coping with the ever-growing calls and duties entailed in ministering singly in their personal capacity to the comfort and well-being

* Paper read yesterday at a meeting of the Institution of Municipal Engineers at Birmingham.

of their particular district, and jointly in helping to build up the nation.

I would like, if possible, to address now those members of the municipal engineering service who are unattached to any of the professional institutions, and ask them to consider the advisability of qualifying for and joining such one of the institutions as may be in existence for the members of their particular branch of the service, and thus assist in the good work being done by way of collective action in matters wherein individual action is useless.

The young men now training for the profession, pupils, and junior officials will naturally, by the efflux of time and successful development of the various schemes now being put forward on behalf of the service, stand to receive a larger share of the benefits to be derived therefrom, such as improved status of the profession and superannuation, than the older members, and it should be their aim also to qualify for and join one of the professional associations, and so continue the good work now being done by their seniors. Such aims are not to be classed as selfish, or as for the benefit of a class alone, for no official can increase his knowledge or widen his experience without at the same time improving his capability for good service to his employers, the public, through the various municipal bodies.

Here let me say that membership of this or any other professional institution should not be looked upon as an end, but should rather be a means to an end, and that end improved status, individually and collectively, for the profession. With the increased knowledge, ability, and confidence that will follow, the hard-worked official can reasonably look forward to improved conditions of service. This attainment may not always be realised so soon as it might be, as, unfortunately, there is the possibility that always faces municipal officials, and surveyors and sanitary inspectors especially, of creating unfriendly critics, if not downright enemies, by the very carrying out of the duties for the efficient discharge of which the official is responsible to his council.

There is, nevertheless, even now good reason for saying that, taken all round, a good officer properly equipped for his post, and with a sufficient modicum of tact to carry him round, if there is no way through, the difficulties he encounters, is more secure of permanency now than ever before, due to the increase of public spirit and the lessening of personal and private interests that is generally acknowledged to have taken place in local governing bodies in recent years.

SUPERANNUATION.

Such a matter as that of superannuation, again, is one upon which the institution can bring to bear influence that will have more effect than individual effort. As you are aware, we are affiliated with the National Association of Local Government Officers, and this body has prepared the draft of a Bill which will undoubtedly before long get before Parliament. Those responsible for this Bill are wisely developing it along national lines.

This is at it should be, seeing that, although municipal officers are individually local officials, they are as a body in charge of matters that are of national interest, that affect the nation's well-being and improve the nation's health and comfort. This cannot be too clearly stated, and the more it is understood by the public the higher will be the status of the municipal service.

The duties and work of municipal bodies have in recent years grown rapidly, and so long as they carry out the work deputed to them by Parliament in the same honest and public-spirited way that the majority of them have done in the past, so long will their activities be widened and become of greater importance still. As the people realise in years to come the power they hold to improve their own surroundings and amenities, the local councils will develop broader views than they at present have of what is their duty to the electors, and municipal engineers must, and doubtless will, be prepared to carry out the execution of such new duties as the future may hold in store for them.

Recently a letter to a paper of a town not a hundred miles away gave it to columns an extract from a report of fifty years ago, being a report of a member of a municipal body speaking at a public meeting, and explaining that he had determined to resign from the council owing to the reason that he considered his time was wasted in attending it, seeing that it did so very little in the way of carrying out the duties for which it was in existence, that practically nothing but police and lighting matters were dealt with.

Compared with that state of affairs, in the same paper, was reported a remark—more in jest than in earnest perhaps—of a present-day member of the same governing body, to the effect that he was being summoned to attend meetings of council and committees at the council offices so frequently that he had serious thoughts of engaging rooms at or near the town hall so as to ensure his ability to attend them all. This well illustrates the difference of spirit and method in which local bodies even now engage upon their duties, as compared with what was previously the case.

I hope that there will be free discussion of this paper and its subject-matter, and I can promise that any suggestions that members can give as to the working of the institution will be welcomed and have every consideration, while Mr. Wyand and Mr. Brook will be glad to receive offers from members to give papers or to assist in organising meetings. Several papers are already promised, but others are needed, so that, if possible, fixtures may be made for future meetings.

The choice of subjects upon which papers may be given is as wide as the multifarious duties each member is engaged upon, and may therefore range from such an apparently insignificant, but really important, subject as patching potholes on highways, through all the varied subjects of roadmaking, sewerage, sewage disposal, sanitation, administration, building construction, street lighting, gasworks, waterworks, parks, artisans' dwellings, and so on, to the apex of our activities—shall I say in the construction of the civic centre or town hall? No one need hesitate if he has any work or department in which he is specially interested in bringing it forward, and so help his fellow-members, and himself likewise, by having it considered and discussed.

In conclusion, let me say a few words as to the relation of the institution to those of its members who are located in the Overseas Dominions. We can understand these members, with their smaller opportunities for meetings and discussions than we have at home, looking upon the institution *Journal* with all the greater interest, seeing that by it they are kept acquainted with the latest developments of municipal activities in a country whose reputation in these matters is second to none. Our overseas colleagues may well, therefore, look to the institution and its home members to make the *Journal* interesting and fully representative of all that is being done to keep up the well-merited reputation of the Old Country in all that concerns the affairs of our profession.

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**The Town Planning Act and Impecunious Owners.**—The Strood (Kent) Rural District Council have consulted the Local Government Board with reference to cases in which the owners of dilapidated cottage property are in such impecunious circumstances that they are unable to comply with the council's order to put the dwellings into repair. The board have declined to express an opinion upon the merits of the cases, as appeals have to come before them, but they add that they cannot sanction expenditure of further money in giving assistance to owners.

**A Would-be Street Inspector.**—A recent vacancy at Wood Green for a street inspector, at a salary of £75 a year, prompted an application from an individual who submitted the following list of his qualifications: He has visited four prisons in London out of five, but he has never been in a lunatic establishment, he speaks two languages in addition to his mother tongue; he was educated under the same roof as Lord Nelson, received his education—and breathed the same kind of air; he does not drink the poison sold under the name of intoxicants; he neither eats meat, gambles, nor goes to church; he does not believe in women having the vote; he lifts his hat to women, and regards them as decorations, and bows his head to genius only. He adds: "All these virtues were inculcated upon my mother's knee, who looked upon the Bible as a lighthouse—the light of her love. In this respect her wandering boy has not grown up under his parents' shadows, having found rest in Secularism. I am one of the unemployed, and want work—being a rank outsider, modest in my pretensions, a virtue not at all successful in these days of buy 'em cheap and sell 'em dear." It has been unkindly suggested that a man who takes himself and society in that spirit is likely to have a job at inspecting streets for the rest of his life, at a salary of nothing a year.

# The Proper Disposal of Domestic Wastes in Rural Districts.*

By JOHN BROOK, Sanitary Surveyor and Waterworks Manager, Stratford-on-Avon Rural District Council.

The proper storage, collection and disposal of domestic wastes in rural districts is perhaps one of the most difficult problems a surveyor has to deal with. In examining plans for new buildings he has to satisfy himself that arrangements made for the deposit and storage of wastes are the best possible under the circumstances, and as most rural by-laws are mainly sanitary in their operation, it is very essential that these points should be carefully watched. A good system of drainage, with proper means of disposal, proper closet or privy accommo-

MR. JOHN BROOK.

dation, ample dry storage for garbage and other solid wastes, proper light and ventilation, and an efficient and wholesome water supply are the most important requirements in a dwelling. I am afraid that in the preparation of plans the outbuildings are often looked upon as unimportant details, over which no time should be wasted; indeed, it is no uncommon thing to get plans with the old form of vault privy shown thereon, and marked E.C.

If there is a proper system of sewerage matters are made easy, as the drains can be connected with the council's sewer, and a properly constructed water-closet and a receptacle for the storage of garbage and other solid wastes provided. Given these, with a system of scavenging and a public water supply, the house has nearly all the advantages of a town residence. Unfortunately this convenient state of things exists only in the semi-urban districts. In many rural parishes they have no public sewers or public water supplies, and it is to these I particularly wish to direct attention.

In making provision for the storage of wastes, we have to take into consideration that the cleansing of the convenience will probably have to be performed by the occupier; it is therefore essential to make the performance of this duty as easy and convenient as possible, or the work is sure to be neglected. It is also important that the form of convenience should be so constructed that there will be no nuisance or conditions likely to be dangerous or injurious to health, or any chance of pollution of the water supply.

There are many forms of privies and so-called earth-closets in existence, some of which are of a very insanitary type. Perhaps one of the worst is that known as the vault privy, which has a deep vault under the seat, even in some cases extending also under the floor, and the latter has often to be removed for cleansing operations. This important event occurs about once a year, or sometimes at longer periods, the work being usually delayed as long as possible, owing to its unpleasant nature. As these vaults are never watertight, the liquids soak away into the soil, and any gases arising are liberated through the hole in the seat, whereby both the earth and the atmosphere are being polluted.

Then there is the form of privy having a small hole in the back wall which acts as an outlet for the excrement. A hole in the outside soil is formed for its reception, and into this ashes and garbage also are thrown. There being no protection from the weather, these holes are frequently filled with surface water, which increases decomposition and pollution of the soil. Sometimes these outer pits are enclosed and covered.

I will next mention the pail-closet. This is a closet having a metal pail (or, what is often substituted, an old bucket), which has to be emptied at frequent periods. These receptacles are generally too small for the purpose, often leaky, and seldom properly fitted.

Next there is the earth-closet, fitted with a hopper for storage of dry earth, and a mechanical arrangement for applying it; but it is frequently an earth-closet only by name, as, owing to the difficulty of obtaining dry earth and the amount of trouble involved in its preparation, it is rare to find a closet in working order.

As I previously pointed out, the work of cleansing is carried out by the occupier, but how is it done? He usually selects a spot in his garden not under cultivation, digs a hole, and the contents of the bucket, vault or midden are thrown in and covered over, or possibly they are left on the surface of the soil to allow the liquids to drain away previous to being spread over the surface and dug in. The by-laws usually specify the distances the closet must be from both the dwelling and water supply, but there is no mention of how the contents are to be disposed of, and it is no uncommon thing to find that the night-soil has been deposited very much within this specified distance. I have known it buried within a few feet of the well, and the precautions as to position of building are of little value under these conditions.

Sanitary laws regulating the disposal of filth are by no means new, as the Law-giver of Israel enjoined that a place should be provided without the camp for the deposit of foecal matter, which had to be forthwith covered with earth. (See Deuteronomy xxiii. 12-13.)

When excreta is mixed with urine and allowed to stand in its wet condition it gives off a foetid odour, and the unwholesome state of wet pits is one of the most dangerous evils existing. Deodorants should be applied wherever these conditions exist. One of the best, cheapest and easily procured deodorants is a mixture of soot and salt, or lime and soot. In many country districts wood is largely used as fuel, and the wood ash is useful as an absorbent. Owing to the introduction of cheap oil stoves for cooking purposes, it is difficult to obtain sufficient ashes during the summer months, but an excellent substitute is garden soil, peat moss or road dust.

Other forms of domestic wastes consist of kitchen garbage, broken earthenware and glass, old boots and clothing, abandoned culinary utensils, and empty packages. Owing to the prevailing practice among producers of packing their products in tins and bottles, and the short life of the cheap tinware now sold, this form of waste is much increased, and if no recognised dumping ground exists they are usually thrown into the nearest stream or strewn in the hedge bottoms, to the disfigurement of our pretty country lanes.

Finding there was no satisfactory form of privy, having a fixed receptacle, to be met with, I designed a

* Paper read yesterday at a Western District Meeting of the Institution of Municipal Engineers at Birmingham.

combined privy and ashpit, and introduced it among land agents and builders, and wherever the plan has been adopted it has given general satisfaction. The diagram herewith shows the details of construction. It is important when selecting a site to arrange the building with the ashpit facing north. It will be found a good plan to lay the floor of the ashpit with blue brick on a bed of concrete, the joints to be filled with a mixture of boiling pitch and tar, dry, hot sand to be freely sprinkled into the joints in the course of filling. A floor so treated is impervious to moisture and unaffected by urine. This form of receptacle is easy to cleanse, as the scavenger can stand outside and remove the whole of the contents. The seat being hinged its entire length, it is easily lifted for the purpose of applying deodorants or for cleansing.

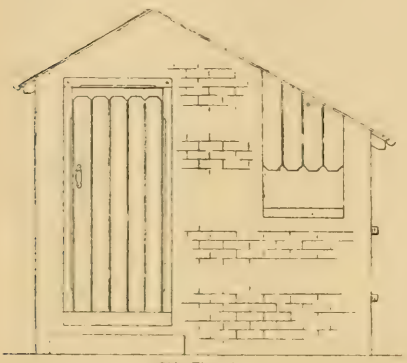
PUBLIC SCAVENGING.

I would strongly urge the advisability of adopting a system of public scavenging in all villages and hamlets or wherever several dwellings are grouped together, as the regular and systematic removal of all waste effects a general improvement in their sanitary condition. I find opposition is very strong when the matter is first introduced, but when in operation this soon wears off, and it has never been my experience to find that the inhabitants were desirous to return to the old methods, not even where the work has been imperfectly performed. I find farmers prove the best scavengers as they have not only plenty of space on which to dispose of the collected wastes, but they carry out the work more systematically than the general hauliers who are usually their opponents.

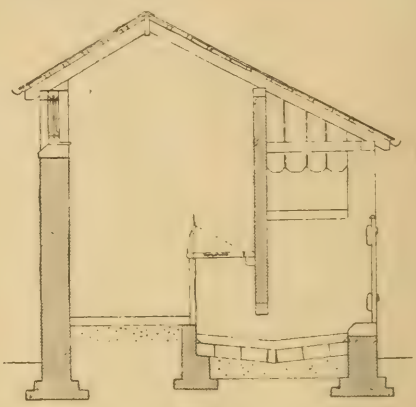
In the large villages having a system of sewerage and a public water supply water-closets should be ordered in all places where the dwellings are closely grouped and space is limited, and under such conditions galvanized iron bins fitted with covers should be provided for the storage of garbage and ashes. These should be placed outside the premises by the householder and removed weekly by the scavenger.

This system prevails in most towns of any importance, but I do not consider the work is efficiently performed, as the contents of the receptacle are emptied into the cart and the uncleansed bin is left for the next week's deposit. The receptacles used often consist of open boxes, such as can be purchased from the grocer for a few pence. These soon become saturated with filth and give off an offensive odour; also, when placed in the street on a windy day, paper, dust and other light matter among the contents are quickly strewn broadcast. The emptying of the receptacle into the collecting cart is also open to objection as the dust is frequently blown into the shops (depositing itself upon meat, butter and other provisions) and into the faces of passers-by.

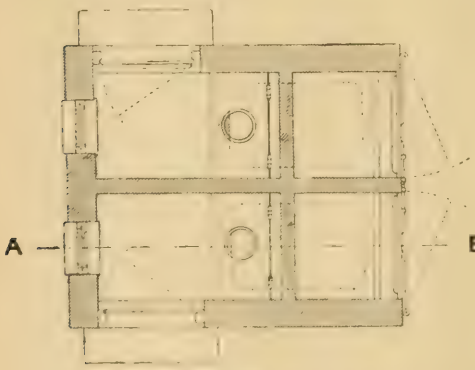
Various designs of covered carts have been introduced, but even with these it is quite impossible when emptying receptacles to avoid the escape of some dust. Undoubtedly the only satisfactory method of garbage storage and collection is to have covered iron bins, and in removals the full bin is to be taken away and a clean bin left. The cost of the provision of the extra bins and the cleansing would not add very materially to the total cost, and the work would be performed on a good sanitary system.



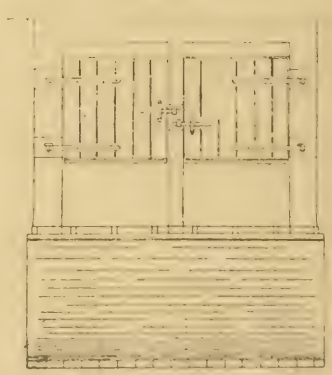
Side Elevation.



Section A B.




Ground Plan.



End Elevation.

PLAN, SECTION AND ELEVATION OF A PAIR OF PRIVIES AND ASHPITS.

(Scale 4 ft. to 1 in.)

LIQUID WASTES.

These consist of bath water, urine, and slop water from scullery and laundry. Many people consider these wastes do not come under the heading of sewage, whereas it is the foulest sewage produced.

Drains are in most cases provided to carry off these wastes, but they are often of an imperfect form, being composed of brick, butt-jointed pipes, or saddle tiles. The point of discharge, too, is often unsatisfactory, while the drain sometimes terminates in a roughly-constructed, improperly covered cesspool, or is turned over the surface of an adjoining field, or into a roadside ditch. The latter is a very favourite outlet, and it is often noticed that when one drain has been so connected, others copy, and the open ditch eventually

# The Surveyor

And Municipal and County Engineer.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becomes a public sewer, maintainable by the sanitary authority.

I contend that a man has no more right to discharge sewage into roadside ditches than he has to make a dumping ground of the highway. I would also point out that when the highways were under the management of the old highway boards owners of property were permitted to connect their house drains with the board's surface-water drains, whereby these drains became sewers. They were altogether unsuited for the conveyance of sewage, as they were generally found to be constructed of rough stone, brick on edge on tile, or common butt-jointed pipes; it was quite rare to find a glazed pipe drain. These drains were usually laid with no regard to levels or true gradients, consequently stoppages were of frequent occurrence. The worst features of the case were that these road drains usually terminated in a neighbouring stream and polluted it, and the sanitary authority were, through no fault of their own, contravening an Act of Parliament which it was their duty to administer. It is doubtless due to the laxity of the old highway authorities and their officers that many expensive sewerage schemes have been forced upon poor, low-rated parishes.

It is difficult to adopt any particular system of drainage for houses in rural districts, as, owing to varying circumstances, what is suitable for one is not applicable to another. I hope we all agree that the poorest cottages should have an efficient drain, and, where no sewer exists, a properly constructed cesspool. As most districts have a code of by-laws regulating the mode of construction, it is unnecessary for me to go into details. For houses of the better class it is advisable for owners to consult a sanitary specialist and put down a small installation for the purification of the sewage. It is also important to exclude surface-water from the foul drainage.

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**Portsmouth Town Planning.**—The Town Planning Committee of the Portsmouth Corporation have instructed the borough engineer, Mr. P. Murch, to prepare a preliminary "town plan," but it is understood that the scheme at this stage will not go beyond the outlining of roads, &c., and the marking out of sites for public buildings. The preliminary plan will be submitted to a conference of owners. A statement that gained currency, to the effect that the War Office declined to allow its land to be incorporated in a scheme, had its origin in the purely formal (and customary) caveat entered by them as a preliminary to the consideration of the details of the scheme.

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Aberayron U.D.C.** (January 11th. Mr. W. O. E. Meade-King).— £5,000 for the purposes of a water supply.—Mr. A. J. Hughes, Aberystwyth, who appeared for the council, said that while there were only four houses 100 years ago, now there were 401 inhabited houses, and their present water supply was obtained principally from pumps.

**Harrogate T.C.** (January 3rd. Mr. F. H. Tulloch).—£1,765 for the widening and improving of East Parade, Harrogate; £1,200 for the provision of a stone-breaking and tar-macadam plant at the Wetherby-road depot; and £400 for a road roller.—The town clerk (Mr. J. Turner Taylor) stated that it was proposed to purchase 2,013 sq. yds. of ground at 8s. per yard. Mr. J. Symington, a ratepayer, while admitting the price was very reasonable, objected on the ground that the cost should be borne out of the revenue and not capital, and that the road was sufficiently wide enough.

**Malvern U.D.C.** (January 10th. Mr. R. G. Hetherington).—£6,700 for the reconstruction of certain sewers.—The scheme, which was explained by Mr. W. Osborne Thorp (surveyor), was supported by Dr. Fosbroke (medical officer of health to the Worcestershire County Council). No opposition was offered.

**Orsett R.D.C.** (January 4th. Mr. R. G. Hetherington).—This was an inquiry into the application for a Provisional Order for the forming of the urban district of Grays Thurrock and part of the rural district of Orsett—viz., the parishes of Chadwell St. Mary, Little Thurrock, Stifford, and West Thurrock—into an united district for the purposes of the construction and maintenance of a main sewer or sewers and works of sewage disposal.—After evidence had been taken the inspector held a consultation with counsel in private, and it was announced that an agreement had been come to providing (1) that a Provisional Order should be issued by agreement; (2) that the basis of contribution should be assessable value, that was on the general district rate in urban areas and on the special expenses rate in the rural district; (3) that representation should be according, as nearly as possible, to the contributions made; and (4) that the works to be constructed be a disposal works and a trunk sewer from the Royal Hotel, Purfleet, through West Thurrock, Stifford, Grays, Little Thurrock, and Chadwell St. Mary. The board will be named the Thurrock, Grays, and Tilbury Joint Sewerage Board.

**St. Ives (Hunts) T.C.** (January 4th. Mr. A. G. Drury). £300 for the provision of a bathing place. It was stated that a scheme was formulated for acquiring a portion of the osier holt opposite the parish church. The plans were drawn up by Mr. H. J. Softley (borough surveyor), showing what could be done by an inlet from the main river, with the outlet at the backwater, and putting the cost at about £300, to include bathing place, dressing sheds, and a rustic bridge. The surveyor produced the plans and estimates, and, replying to a question, said there would be a continuous supply of water through the bathing place. He explained why it was decided to alter the bottom from concrete to shingle, but admitted that the latter would be trodden into the clay and cause some future expense. The depth of the bathing place varied from 2 ft. to 6 ft. The alteration of the bottom was decided after an inspection of a natural bathing place at Bedford. The loan was asked for a term of fifteen years.

**Spalding R.D.C.** (January 12th. Mr. Edward Leonard).—£750 for the purpose of erecting four houses suitable for working men at Donington.—A number of witnesses were strongly of the opinion that the cost of houses should be met by each parish itself, and not spread over the whole of the area, but the inspector said that the Housing Act did not favour this method, and very strong reasons would have to be submitted before the expenses would be allowed to be borne by each parish. The reason advanced for a parish to pay for its own cottages was that it would be unfair, because one parish might only build four cottages and another might erect twenty.

**Tredegar U.D.C.** (January 9th. Mr. R. G. Hetherington).—£31,000 to carry out the subsidiary sewerage scheme.—There was no opposition to the application. The surveyor (Mr. W. Lloyd Roach) explained the scheme, which comprises the complete sewering of the district into the main trunk of the Western Valleys

main sewer instead of as at present into the Howy River.

**Whitley and Monkseaton U.D.C.** (January 8th. Major Stewart).—£5,000 for the erection of a chapel, mortuary, entrance lodge, and boundary walls in connection with the new cemetery in the township of Hartley.—The clerk stated that the new cemetery was outside the urban district, and the plans had been approved by the Tynemouth Rural District Council. The work was to be done by contract, but no tender had been accepted. The council were obliged to buy land outside their district owing to the enormous prices that were asked by landowners in the district. The cheapest they were offered was £350 an acre, and in one case as much as £1,200 an acre was asked.

**York T.C.** (January 10th. Mr. Edward Leonard).—£8,977 for a housing scheme.—Mr. H. Craven (town clerk) explained that the scheme was necessary owing to the construction of a new street from Pavement to Piccadilly, in which a number of houses were demolished. It was proposed to erect thirty houses, on a site of 6,444 sq. yds., in Alma-terrace, Fulford-road, to face into a square, round the edges of which would be planted trees. It was estimated that the rent required, inclusive of rates, would be 7s. per week. The corporation did not expect that the people dispossessed would be able to afford the rent of the new houses, but there would be a general "moving up" and improvement in the housing conditions of the city. After further evidence the inspector said he considered the cost excessive, and he would go through the estimates with a view to reduction.

### APPLICATIONS FOR LOANS.

**Aberavon T.C.**—£500 for private street works.

**Birmingham T.C.**—£9,515 for the erection of a sub-station.

**Harwich T.C.**—£750 for the purchase of a school site.

**Manchester T.C.**—£800 for a road improvement at Withington.

**Oldham T.C.**—£19,500 in connection with the electricity works.

**Rhyl U.D.C.**—£5,300 for a river improvement, and £2,700 for additional pumping machinery.

**Saltash T.C.**—£750 for street improvements.

**Southampton T.C.**—£9,600 for additional electricity plant.

**Southgate U.D.C.**—£1,050 for construction of footpaths, and £1,750 for drainage of the new park.

**Southport T.C.**—£50,000 for the Ainsdale and Birkdale sewerage scheme.

**Tiverton T.C.**—£3,350 for road improvements and bridge widening.

### LOANS SANCTIONED.

**Barnet U.D.C.** £4,800 for the erection of working-class dwellings.

**Barnsley T.C.**—£4,620, making £17,100 in all for electricity extensions.

**Brighton T.C.**—£25,000 for the new grammar school near Dyke-road, and £5,061 for the extension of the enclosures of the Western Esplanade.

**Denton (Lancs) U.D.C.**—£19,246 for the extension of the sewage disposal works.

**Doncaster R.D.C.** £1,985 for sewage disposal works at Askern.

**East Grinstead U.D.C.** £965 and £729 for the purchase of land at Mount Noddy for a cemetery and recreation ground respectively.

**Ellesmere U.D.C.**—£555 for improvements at the market.

**Hinckley R.D.C.** £5,200 for the Barwell and Earl Shilton water supply scheme.

**Hindley (Lancs) U.D.C.** £1,900 for sewerage works.

**Llanelly U.D.C.** £2,750 [illegible]

**Maesteg U.D.C.** £400 [illegible]

**Salcombe (Devon) U.D.C.**—£670 for private street works.

**Spilsby R.D.C.** £6,175 for the Spilsby sewerage scheme.

**Swansea R.D.C.** £6,400 for the construction of a new road.

**Warrington T.C.** £21,992 for street improvement works, and £1,271 for the purchase of [illegible]

### LOAN REFUSED.

**Rochford (Essex) R.D.C.**—£10,000 for works of water supply for Hadleigh and five contributory places.—The Local Government Board write that, from the information obtained by their inspector, they are confirmed in the opinion expressed in their letter of May 30, 1907, that if the existing pumps were maintained in proper working order the present supply would be sufficient to meet the requirements of the district for many years to come without constructing any additional works.

### FORTHCOMING INQUIRIES.

| JANUARY. | £ |
|---|---|
| 22.—**Billericay.** For the provision of working-class dwellings (Mr. Edward Leonard) | 1,375 |
| 23.—**Cheltenham.** For the provision of a sand filter (Mr. W. O. E. Meade-King) ... | 1,750 |
| 23.—**Ebbw Vale.** For the purpose of the water undertaking (Mr. P. M. Crosthwaite) ... | 43,658 |
| 24.—**Bath.** For the improvement of the cattle market (Mr. W. O. E. Meade-King) ... | 1,350 |
| 25.—**Lichfield.** For the provision of a refuse destructor and tar-macadam plant (Major J. Stewart) ... ... ... ... ... | 2,000 |
| 25.—**Llantrisant.** For the provision of a water filter (Mr. W. O. E. Meade-King) ... ... | 760 |
| 26.—**Llanelly.** For the purchase of waterworks (Mr. W. O. E. Meade-King) ... ... | — |
| 26.—**Oldbury.** For the purchase of two houses (Major J. Stewart) ... ... ... ... | 650 |

## THE CONTROL OF MAIN ROADS.

### "WITHDRAWAL FROM LOCAL AUTHORITIES."

The London correspondent of the *Liverpool Post* understands that the Government views with sympathy the suggestion that the control of the main roads should be withdrawn from the local authorities, and placed in the hands of a State department. The correspondent adds: "The increase of motor traffic and the large grants made by the Development Commissioners towards the improvement and maintenance of these roads have led the Government to look with favour on a policy which has proved highly successful in France."

**Kelso Water Supply Contracts.**—The contracts for the carrying out of the scheme for providing a new supply of water for Kelso by gravitation from Heatherhope Burn, which rises in the Cheviot Hills above the village of Hownam, have now been let. The first section, extending from Heatherhope to the Morebattle and Yetholm-road, has been awarded to Mr. James Miller, Kirkintilloch, at £16,150. The second section, which extends from the Yetholm-road to Kelso, has been let to Messrs. Casey & Darragh, Stirling, at £10,581. Mr. John D. Parker, Glasgow, is engineer for the work, which will be commenced at an early date. Some 13 miles of piping and the construction of two large reservoirs are involved in the scheme.

**Public Health Law** (By Sydney G. Turner. St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, E.C. Price 10s. 6d. nett).—A manual for municipal and county engineers and surveyors, town clerks, clerks to district councils, and other officers, and to members of local authorities. The book is designed to be specially useful to officials in the preparation of reports and in the administration of the law, and to members of local authorities in the discharge of their public duties. It is also of value to students preparing for examinations as municipal engineers and in public health law. The subjects treated of from a legal point of view include the meaning of "sewer" and "drain," sewage disposal, sanitary fittings, river pollution, infectious diseases and hospitals, new streets and buildings, private streets, highways, open spaces, markets, slaughter-houses, housing, &c. This is, we believe, the first time these matters have been dealt with each in a separate chapter, which makes the book easy for reference. There are no reprints of Acts *in extenso*, but under each topic are given the Acts and clauses which refer to it . . . We should say the work ought to occupy a place in every sanitary authority's office.—*Local Government Journal*

# Municipal Work in Progress and Projected.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Glasgow £127,000, Largs £1,750, Middlesbrough, Twickenham, £6,000, refuse collection and disposal—Weston-super-Mare; roads and materials—Holland £10,200, Richmond (Surrey) £5,600, Ventnor £3,700; sewerage and sewage disposal—Eastbourne, Manchester £4,000, Rhyl £5,300, Southport £50,000; water, gas and electricity—Frome £2,000, Plymouth, York.—Particulars of other works projected will be found on our "Local Government Board Inquiries" page.

## ADMINISTRATION.

**Maldens and Coombe U.D.C.**—At last week's meeting the Labour Committee submitted a report on the question of wages. It contained recommendations that no workman shall be appointed on the permanent staff in the works departments of the council over forty years of age; that any workman hereafter taken into the employment of the council, whose age is above forty, shall be regarded as on the list of casual labourers; and that all casual labour workmen be paid a maximum rate of 3s. 6d. per day. The committee consider it would be an incentive to duty and encouraging to the men if a sliding scale of wages were made operative in the district, and therefore recommend as follows: Sewerage works labourers and sweepers, one to five years' service, be paid 23s. per week; five to ten years, 24s.; ten years and upwards, 25s. Carters, one to five years, 25s.; five to ten years, 26s.; ten years and upwards, 27s. General workmen on roads and sewers and dustmen, one to five years, 24s.; five to ten years, 25s.; ten years and upwards, 26s. Contact bedmen, &c., one to five years, as now fixed; five to ten years, 4s. 6d. per day and 5s. 6d. per night. Engine drivers at sewage works, one to five years, as now fixed; five to ten years, 5s. per day and 6s. per night. Steam roller driver, one to five years, as now fixed; five to ten years, 34s. It was moved as an amendment: "That casual workmen be paid at the rate of 4s. a day, and that the word maximum be deleted; that the schedule be revised in the first class of workmen to read 23s. to 24s. for the first year, 25s. for the second, and 26s. for six years and upwards; that in regard to general workmen the scale should be 25s., 26s. and 27s. instead of 24s., 25s. and 26s." The amendment, however, was negatived, but as other amendments are to be proposed the decision on the recommendations was deferred to the next meeting.

**Twickenham U.D.C.**—It has been decided to increase the wages of the lamplighters from 22s. to 25s. per week, that they be required to clean the whole of the lamps in their respective districts regularly each week, and that they be not allowed to undertake any work other than that for which they are employed by the council. The surveyor, Mr. F. W. Pearce, stated that the average time per week occupied by the men in the work was twenty-eight hours.

**Winchester R.D.C.**—The council at their last meeting had before them a report from the General Purposes Committee on the position of the surveyor, Mr. G. E. Carter, after the county council had taken over the main roads of the district, in accordance with their recent decision. The committee recommended the council to make no alteration in the surveyor's salary or the terms of his appointment. In moving the adoption of the report, the chairman (Mr. J. A. Pearson) said the appointment would be for one year, in order to see what happened with reference to the county council's decision, and it could be reconsidered at the end of the year. The council unanimously agreed to reappoint the surveyor on the same terms as before.

## BUILDINGS.

**Belford (Northumberland) R.D.C.**—The surveyor, Mr. T. W. Dodd, at the last meeting submitted tenders for the erection of a footbridge and the repairing of another on the path between North Sunderland and Beadnell. There were three tenders, and the lowest, that of Mr. M. E. Summers, North Sunderland, was accepted.

**Failsworth (Lancs) U.D.C.**—The sub-committee which has been deputed to consider the question of sites have been instructed to report as to the probable capital outlay and estimated cost of the maintenance of public baths for the requirements of the district.

**Glasgow T.C.**—With reference to the proposed extension of the city chambers, a sub-committee recommended last week that the corporation invite competitive plans for the new buildings proposed to be erected at a cost not exceeding £127,000 and that the competition be open to all architects, that it be remitted to the chairman (Baillie Mason), Councillor Gardiner, and the city engineer (Mr. A. B. McDonald), to prepare and submit a draft of the terms and conditions of the competition. Eventually, however, it was agreed that the new plans of the buildings prepared by the city engineer be further considered by the committee.

**Grimsby T.C.**—A school with a roofed playground, the only one, it is stated, in the Eastern counties, has recently been opened. It was built at a cost of some £10,000 in the most densely-populated area of the town, and provides accommodation for nearly a thousand children.

**Hove T.C.**—The borough surveyor, Mr. H. H. Scott, has presented a report in reference to a proposal to construct a pier south of the King's-esplanade, opposite Vallance Gardens, in which several suggestions are made for the protection of the corporation's interests. The General Purposes Committee, after considering these suggestions, has advised the council to oppose the Provisional Order.

**Largs T.C.**—The erection of burgh chambers for the council is to be proceeded with at once. The plans adopted show a two-storey building, having on the ground floor offices for the town clerk and a gas office, while the council chamber, committee-rooms, cloakroom, and so forth, for the council are above. The architect's estimate of the cost of erection is £800, and it is estimated that the whole of the expense in connection with the new chambers will come well within £1,750.

**Middlesbrough T.C.**—It has been decided to instal a water-filtration plant at the public swimming baths.

**Newcastle-on-Tyne T.C.**—The tender of Messrs. W. Macfarlane & Co., at £197, for the erection of a bandstand in Hodgkin Park, has been accepted.—The council have affirmed the principle of the provision of baths at Benwell and Walker.

**Rothesay T.C.**—A proposal has been submitted from the Burgh Lands Committee providing for some improvements at the bathing place on the West Bay, including a reconstruction of the present buildings and the erection of a swimming pond, and the council have agreed to proceed with the alterations (omitting the swimming pond), at an estimated cost of £1,000.

**Salcombe U.D.C.**—The surveyor, Mr. F. Swinburne, has prepared a plan for bridging over the Cliff-road beyond Woodville, which has fallen away by the action of the sea. He estimates the cost at £300, exclusive of abutments and making good the base of the cliff.

**Twickenham U.D.C.**—Sketches of three plans for a bridge to the Surrey shore have been submitted to the Bridge Committee by the surveyor, Mr. F. W. Pearce, and the committee favour the erection of a footbridge in reinforced concrete, estimated to cost about £6,000, exclusive of any outlay for the purchase of land and other contingencies. The matter has been referred to the Town Planning Committee.

**Wick T.C.**—It has been agreed, on the recommendation of the committee appointed to consider as to rival slaughter-house sites, to abandon the site in Ackergill-street and to erect a slaughter-house in Green-road.

## HOUSING AND TOWN PLANNING.

**Edinburgh T.C.**—The Streets and Buildings Committee have agreed to recommend the council to give notice of a town planning scheme for the area of open ground in the Bellevue and M'Donald-road district.

**Greenock T.C.**—A deputation has been appointed to visit Glasgow and Edinburgh to study the housing conditions obtaining in those cities with a view to the provision in Greenock of houses of the working-class type to take the place of those closed by the operations of the Housing and Town Planning Act.

**Maldens and Coombe U.D.C.**—It has been decided to submit to the Local Government Board amended Model Bye-laws, on a town planning basis, in which

are now incorporated the amendments of the Building Committee, as well as the recommendations of the Local Government Board. In asking that they be forwarded to the Board, Mr. H. Bailey, the chairman of the committee, said the by-laws were entirely new by comparison with anything they had had, and he believed there were few districts in the country which had tackled the question. The clauses had been most difficult and complicated to formulate, and had it not been for the great help of the clerk, Mr. J. W. Johnson, and the surveyor, Mr. R. H. Jeffes, they could not have brought them to their present favourable stage.

**Southwold T.C.**—The Public Health Committee has been instructed to consider the question of providing further workmen's dwellings.

## PARKS AND OPEN SPACES.

**Devonport T.C.**—The borough surveyor, Mr. J. F. Burns, has received instructions to submit a plan and amended estimate for laying out a bowling green in Devonport Park.

**Manchester T.C.**—The Parks Committee have been asked to give attention to the question of buying a portion of the Burnage Hall estate for park purposes, while also going on with the arrangements for the purchase of land in Errwood-road, Levenshulme.

**Yarmouth T.C.**—Inquiry is to be made into the desirability of promoting municipal golf links.

## REFUSE COLLECTION AND DISPOSAL.

**Weston-super-Mare U.D.C.**—The surveyor, Mr. H. A. Brown, has been instructed to prepare a report upon the whole question of refuse collection and disposal, and the comparative cost of the various systems in vogue.

## ROADS AND MATERIALS.

**Ashbourne U.D.C.**—Clifton-road is to be widened, at a cost of £377.

**Ayrshire C.C.**—The sum of £3,747 has been received on account of the road improvement grant.

**Esher and the Dittons U.D.C.**—Imber Park-road is to be made up under the Private Street Works Act.—The council, as well as the Surbiton Urban District Council, have decided to notify the company which has recently instituted a motor-'bus service that they will hold it responsible for damage to the roads for extraordinary traffic.

**Frome R.D.C.**—The council have referred to a committee the reports by the surveyors in favour of the haulage of stone by motor power instead of by horses. Mr. E. R. Swanton said the surveyors believed that if the council did their hauling by motor traction it would result in a saving of some hundreds of pounds.

**Holland (Lincs) C.C.**—The estimate of the North Holland surveyor as to expenditure on main roads for the coming year shows a total of £10,200. This is stated to be due to the fact that the roads in this portion of the county have been neglected of late years, there being no foundation to them whatever. An amended estimate for an expenditure of £7,260 has, however, been accepted by the Roads and Bridges Committee. The total estimate of the South Holland surveyor, where the roads are held to be in a much better condition, is for £6,251.

**Leith T.C.**—It has been referred to a sub-committee to report as to the practicability of forming a roadway from Lochend-road, in the vicinity of Hermitage Park, to Albion-road.

**Manchester T.C.**—The council have agreed to the purchase of a piece of land in Barlow Moor-road, West Didsbury, for the purposes of road improvement and works in connection therewith, at an estimated cost of £600.

**Pembrokeshire C.C.**—At a meeting of the Main Roads Committee it was stated that the probable amount of grant from the Road Board towards the work of road improvement to be carried out in Pembrokeshire would not exceed £2,400.

**Poole T.C.**—The plans of the surveyor, Mr. S. J. Newman, have been approved for making up Layton-road and Sandbanks-road and for making up and sewering Gwynne-road, Francis-road, Douglas-road and Abbott-road. The surveyor has also been instructed to prepare plans for making up Florence-road.

**Richmond (Surrey) T.C.**—It has been decided to lay wood pavement in Hill-road and Petersham-road, at an estimated cost of £4,000.

**Saltash T.C.**—At a meeting last week a discussion took place on the relative merits of Dean stone and brick for paving. An amendment, that where brick was mentioned Dean stone should be substiuted, was carried by six votes to five; and the question of brick paving was referred back to the committee.

**Sedgefield (Durham) R.D.C.**—Complaint having been made by the surveyor, Mr. W. R. Plews, of damage caused to the highways by narrow-tyred vehicles, the clerk looked up the legal aspect of the question, and said he found that there were county by-laws which stated the width of tyres and the corresponding tonnage. The council thereupon instructed the surveyor and the clerk to go into the matter, and draw up notices to contractors and others in the district, informing them as to the maximum weights to be carried on the different widths of tyres.

**Sunbury U.D.C.**—The Middlesex County Council having reduced the allowance for the repair of Staines-road from about £200 to £141, the surveyor, Mr. H. F. Coales, explained last week that the deduction was consequent on the decision of the county council to decline payment for tar-painting any subsidised roads.

**Tiverton T.C.**—The county council have decided to grant £1,250 towards the widening of Gold-street, and £200 towards the widening of Loman Bridge.

**Troon T.C.**—It has been agreed to proceed with the widening of Lochgreen-road and bridges, which give access to the town from the south end. The estimated cost of the undertaking is estimated at £2,000, and of this amount the Duke of Portland has promised to contribute about £1,400. As it is the intention to have the road and bridges widened by the early spring, the work will be commenced at once.

**Ventnor U.D.C.**—It has been agreed to expend the sum of £3,700 in extending the esplanade to the eastward and to carry out improvements at the park.

**Worthing T.C.**—That portion of the Brighton to Portsmouth road within the borough is to be repaired preparatory to being taken over as a main road by the county council.

**Yarmouth T.C.**—Subject to a grant in aid being obtained from the Road Board, it has been agreed to spend £300 in tar-spraying certain roads.

## SEWERAGE AND SEWAGE DISPOSAL.

**Eastbourne T.C.**—With respect to the newly-annexed area of Hampden Park, a resolution has been carried in favour of treating the sewage bacteriologically instead of constructing a sewer to the sea, which would entail an estimated expenditure of nearly £50,000.—It has been decided to carry out at once the drainage extension at the extreme east end of the town, at a cost of about £11,000.

**Maidstone T.C.**—An inspector of the Local Government Board has visited the sewage works and made suggestions as to the methods of dealing with the sewage at the outfall works with a view of preventing any possible nuisance to the surrounding neighbourhood. A report has also been presented by the borough surveyor, Mr. T. F. Bunting, stating that three sluice valves in the effluent channel will be necessary to keep the septic tanks empty when not in use; there will also be required certain pumps and pipes, and engines for driving in lime mixed or other chemical plant, &c. The council have decided to carry out these proposed works, at an estimated cost of £955.

**Manchester T.C.**—A supplemental estimate of £4,000 has been approved on behalf of the Sanitary Committee for the purpose of carrying out drainage and sanitary alterations during the remainder of the financial year.

**Middleton T.C.**—Messrs. James Diggle & Son have been engaged to prepare and carry out a scheme for the extensions at the sewage works to meet the requirements of the Local Government Board and the Mersey and Irwell Joint Committee on the terms submitted by them.

**Rhyl U.D.C.**—It has been agreed to construct a new sewer outfall and to divert a new river channel at a cost of £6,300, under the supervision of Mr. Baldwin Latham, who carried out the elaborate main drainage scheme eighteen years ago. The present work is to a considerable extent rendered necessary by the alteration which has taken place in the course of the Clwyd estuary. It has also been decided to enquire whether Mr. Baldwin Latham would carry out as well the enlarging of the sewage pumping station.

**Rothesay T.C.**—Mr. J. B. Brodie, consulting engineer, has been requested to confer with the Police Committee in connection with the proposed sewerage scheme for the burgh.

**Southport T.C.**—The Parliamentary Committee have decided to recommend to the council that application should be at once made to the Local Government Board for sanction to borrow £50,000 for sewage disposal purposes, including Birkdale and Ainsdale schemes, and that Mr. Midgley Taylor should be retained to give evidence at the inquiry.

**Willenhall (Staffs) U.D.C.**—Public conveniences have been provided at the corner of New-road and Walsall road, the former at a cost of £83 and the latter at a cost of £110.

## WATER, GAS, AND ELECTRICITY.

**Brighton T.C.**—It is proposed by the Electricity Committee to revive a scheme, originally suggested in 1909, by which facilities will be given for the wiring of houses for inhabitants desirous of using electricity. The work is to be carried out by private firms on the basis of an agreement by which the owner pays one penny per unit above the ordinary charge until the expense of wiring has been defrayed, the corporation collecting the money by means of prepayment meters.

**Dingwall T.C.**—A letter has been received from the Local Government Board, in which they inform the council that as the present water supply is of proved insufficiency and of doubtful quality, they cannot approve of any scheme that proposes to augment it, and that they hope to be informed shortly that the local authority has decided to go in for a scheme that will ensure for the burgh a supply of water not only ample in quantity but of first-class quality as well.

**Frome R.D.C.**—A scheme for a water supply to the village of Road, at an estimated cost of £2,000, has been referred to the Road Water Supply Committee for consideration.

**Leek U.D.C.**—The surveyor, Mr. W. E. Beacham, has been instructed to prepare plans and estimates for providing new offices at the gasworks, and an extension of the coal store.

**Norwich T.C.**—The Electricity Committee recommend that the tender of Messrs. Babcock & Wilcox for overhead coal bunkers, conveyor, induced-draught fan, crane, grab, provision for dampers, and sundries, for £3,495, and for two new boilers, with superheaters and mechanical stokers, for £3,450, and old boilers, be accepted, subject to the following terms of payment—*i.e.*, £2,315 on completion, £2,315 for one year after completion, and the balance two years after completion.

**Rhyl U.D.C.**—The profits on the various undertakings during the year were as follow: Electricity, £1,091; gas undertaking, £4,970; water, £5,683. Of these profits, £2,845 was taken in repayment for loans and interest in connection with the gas undertaking, and £2,125 to the credit of the district fund; but, as regards the electric light, £922 was transferred to the district fund as a deficit after paying capital and charges and interest, and the water concern left a deficit of £84, which had to be taken out of the general rates.

**Teignmouth U.D.C.**—A sum of £563 is to be spent on improving the gas lighting of the town by the provision of new lanterns, standards, &c.—The question of obtaining a Provisional Order for supplying electricity has been referred to a committee for consideration.

## MISCELLANEOUS.

**Leicester T.C.**—The Willow and Willington brooks are to be deepened and widened, at the cost of £2,858 and £2,200 respectively.

**Plymouth T.C.**—The tramway manager has been instructed to report on the estimated cost and probable financial results of running trackless-trolley cars to Laira and Crownhill.—It has been agreed to provide for scholars and young children a bathing pool similar to the one now in use by ladies, and improvements are also to be carried out in the bathing facilities at Tinside, at a cost of £2,000.

**Sheffield T.C.**—The available profits of the tramway undertaking last year were £23,334.

**Twickenham U.D.C.**—It has been decided to prepare a petition against the construction of the Southall, Hounslow and Twickenham railless traction system, for the installation of which a company is to be formed. The petition will be withdrawn if clauses to the satisfaction of the council are agreed to.

## PERSONAL.

Mr. J. H. Lawrence, surveyor to the Neath Rural District Council, died, we regret to state, last week.

Mr. A. Mackie, burgh surveyor and sanitary inspector of Alloa, has had his salary increased by £30 per annum.

Mr. J. R. Lamacroft, eastern highway surveyor of Williton (Somerset), has had his salary raised to £150 per annum.

Mr. J. B. Nuttall, of the borough surveyor's office, Bury, has been appointed borough surveyor of Heywood at a salary of £175 a year.

Mr. J. L. Roberts, of Walton-le-Dale, has been appointed temporary assistant inspector of nuisances to the East Dereham Urban District Council.

Mr. Rees Jeffreys, the secretary of the Road Board, has, it is reported, acquired the lease of "The Hollies," Compton, where he intends to reside permanently.

Mr. E. T. Quilton, county surveyor of Carlow, has been granted a retiring allowance of £290 a year, subject to the sanction of the Local Government Board.

Mr. F. B. Meyrick, highway surveyor and sanitary inspector to the Claypole (Lincs) Rural District Council, has been voted an increase of salary of £20 per annum.

M. Raymond Poincaré, the new Prime Minister and Foreign Secretary of France, is the son of a former inspector of the Bridges and Road Department of the public service.

Mr. John Chisolm, of the Airdrie Water Trust, has been appointed to report on the whole water system and sources of supply for Buckie, with a view to augmenting the supply.

Messrs. Peter B. Jagger, Westminster, S.W., James M. Kesson, Alwen Reservoir, near Corwen, North Wales, and L. S. Rudman, Goadly Marwood, near Melton Mowbray, have been elected members of the Concrete Institute.

Mr. H. W. Smith, borough engineer of Scarborough, has had his salary increased from £475 to £600 per annum. The increase was voted in order to retain Mr. Smith's services and prevent his becoming a candidate for a similar position under the Corporation of Southport, where the commencing salary is £600 a year, with annual rises up to £800.

Mr. Joseph Stanley, who has held the position of surveyor to the Thorne (Yorks) Rural District Council for thirty years, has resigned. Mr. Stanley is over eighty years of age. The inspector of nuisances, Mr. Plews, having obtained another post, it has been decided to combine the offices of surveyor and inspector, and offer a salary of £150 a year.

Mr. Robert Forster has been appointed surveyor to the Alston Division of the Cumberland County Council in succession to Mr. W. A. Rogerson, who secured an appointment under the Norfolk County Council. Mr. Forster, on leaving the Grosvenor College, Carlisle, went as a pupil under Mr. Murray, Longtown divisional surveyor to the Cumberland County Council, and afterwards to the late Mr. George Bell, under whose tuition he acquired a thorough practical knowledge of road and bridge construction. His friends wish him every success in his new sphere of labour.

Hampshire County Council recently decided, but not without some opposition from the minor authorities concerned, to assume control on March 31st next of the main roads, which have hitherto been placed under the supervision of the rural and urban district councils in the county. For the purpose of supervising the roads the county council sanctioned the appointment of four divisional road surveyors, and it is understood the following appointments have been made: South-Eastern Division—Mr. Joseph S. Hall, assistant surveyor, Worcester Council. South-Western Division—Mr. G. H. C. Mottershed, inspector of main roads, Warwickshire County Council. North-Eastern Division—Mr. J. A. Manning, assistant county surveyor, Cornwall. North-Western Division—Mr. W. J. Potter, surveyor to the South Stoneham District Council.

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**Sewage Distributors.**—The Linthwaite and Golcar Joint Sewerage Committee have just placed an order for four Adams' Patent "Cresset" revolving distributors, each 102 ft. diameter, complete with all fittings. The engineers for the scheme are Messrs. Abbey & Hanson, of Huddersfield.

## THE ASSOCIATION OF CONSULTING ENGINEERS.

### QUALIFICATIONS FOR MEMBERSHIP.

At the meeting which was held last Monday in the lecture hall of the Institution of Electrical Engineers a further stage was reached in the formation of the new Association of Consulting Engineers, it being decided that in the first instance the committee should elect members as well as select candidates. As soon as a nucleus is thus formed the members themselves will elect additional members after selection by the committee. Membership will, it seems, be in the first instance confined almost entirely to corporate members of the Institution of Civil Engineers, but it remains to be seen whether this qualification will be insisted upon after the first meeting of elected members.

Whatever may be the primary qualification decided upon, there remains the somewhat difficult question of the manner in which the association will interpret Rule 4, Part (c), which reads: "He shall be a full member of the institution, representing the particular branch of the profession in which he practises." A full member of the Institution of Civil Engineers might claim the right to practise in almost any branch. On the other hand, an associate member, with high qualifications and wide experience, might reasonably point to the fact that "full" membership of the institution is not a qualification, but is an arbitrary label. It is a fact that it would be easy to find, say, fifty corporate members of the institution, twenty-five associate members and twenty-five full members—the former of whom surpass the latter in real qualifications as regards knowledge, competence, experience, and even seniority. One of the objects of the new association would be defeated at the outset if the larger label of Great George-street were accepted as an indication of better qualifications than those implied by the smaller label. We all know, for one thing, that either label may be attached to a person who is not a qualified engineer. Probably the association will decide to recognise corporate members of the institution without distinction of grades. Sometimes, it may be pointed out, full membership is a distinction which follows, rather than a recognition which precedes, the selection of an engineer for an important post, or the inclusion of a comparatively junior man as a partner in a firm of consulting engineers. If, however, the association takes the course at present suggested by the draft rules the situation will be full of difficulties. They may recognise corporate membership of the Civils as a primary qualification, and full membership as an effective qualification in several branches; but what other associations will they recognise? The Electricals, of course, perhaps the Waterworks Engineers; and what about the Concrete Institute and the Illuminating Engineering Society? In the case of a retired county or municipal engineer recognition of his associations would look all right on paper, but it would not, for instance, enable a man with purely inland experience to advise on sea defence works for the council of a coast town; nor, generally, would it be fair to let this qualification cover a multitude of civil engineering works if other well-qualified men were debarred. The word "branch" might indicate the natural circumstances, the nature of the materials or methods used, or even the class of persons for whom the work was done. If the association recognises a number of bodies which will tend to become satellites, what about the Civils? Is that to be a "ring"?

We cannot see how these difficulties can be got over except by the policy of the "clean slate." Whatever provisional principles may be determined we do not see any plain course before the association in the matter of effective qualifications, except the plain one of leaving it to the committee to decide as to whether a man is qualified in any particular branch, or generally qualified. Probably the best course of all would be to disregard "branches" altogether, leaving the matter to the individual, at any rate as regards the senior men, whose experience qualifies them to act as consulting engineers over a wide field. The whole matter is rather one of morality than of qualifications and it is really the negative rather than the positive qualifications that are important; the matter is more professional than technical. At the same time, the idea that members should be encouraged to work in various branches is not without merit, provided that a man does not pose as competent and experienced engineer in matters of practice. Many specialists, we believe, would welcome such a check on the pretensions of their particular spheres, notably electrical engineers.

## YIELD POINT AND ELASTIC LIMIT.

### BRITISH STANDARD DEFINITIONS.

The Main Committee of the Engineering Standards Committee having been approached with the request that standard definitions for the terms "yield point" and "elastic limit" should be drawn up, remitted the matter to those sectional committees which had prepared standard specifications for steel and wrought iron, with the result that the following definitions have been unanimously agreed upon:—

Elastic Limit.—The elastic limit is the point at which the extensions cease to be proportional to the loads. In a stress-strain diagram plotted to a large scale it is the point where the diagram ceases to be a straight line and becomes curved. Note.—The elastic limit can only be determined by the skilful use of very delicate instruments and by the measurement of the extensions for small successive increments of load. It is impossible to determine it in ordinary commercial testing.

Yield Point.—The yield point is the point where the extension of the bar increases without increase of load.

Practical Definition of Yield Point.—The yield point is the load per square inch at which a distinctly visible increase occurs in the distance between gauge points on the test piece, observed by using dividers; or at which when the load is increased at a moderately fast rate there is a distinct drop of the testing machine lever, or, in hydraulic machines, of the gauge finger. Note.—A steel test piece at the yield point takes rapidly a large increase of extension amounting to more than 1/200th of the gauge length. The point is strongly marked in a stress-strain diagram.

**Turbine Pumps.**—The evolution and present development of the turbine pump will be discussed this evening by the Institution of Mechanical Engineers.


## FOR OTHER ADVERTISEMENTS

See End of Paper.

TO BUILDERS AND CONTRACTORS.

THE WANDSWORTH BOROUGH COUNCIL is prepared to receive Tenders for the Erection of a Sanitary Convenience at High-street, Putney, and Works in connection therewith.

The Specification, Drawings, Form of Contract, and other particulars may be seen, and Form of Tender and copy of Bills of Quantities obtained, at the Borough Engineer and Surveyor's Office, No. 215 Balham High-road, S.W., between the hours of ten and four Saturdays ten till one), on payment of One Guinea, which will be returned on receipt of a *bona-fide* Tender.

The Contractor will be required in the case of all workmen employed by him on and about the execution of the Contract to pay wages at not less, and observe hours of labour not greater, than the rates and hours recognised by the Associations of Employers and Employees, and in practice obtained in the district where the work is to be executed, and to pay to all earners a wage of not less than four shillings and sixpence per day.

Tenders, enclosed in sealed envelopes, endorsed "Tender for Sanitary Convenience," must be delivered at the Council House, East-hill, Wandsworth, S.W., and may be placed by the persons tendering in the tender box provided for the purpose, not later than ten o'clock in the forenoon of Tuesday, 13th February next.

No Tender will be received unless it is made upon one of the printed Forms issued for the purpose.

The Council does not bind itself to accept the lowest or any Tender.

HENRY GEORGE HILLS
Town Clerk.

Council House,
Wandsworth, S.W.
January 16, 1912.

TO ENGINEERS, ARCHITECTS, AND CONTRACTORS.—Representative (Surveyor and Engineer) for good firm requires an engagement; large connection. Brick or Iron.—Write "M. E.," c/o J. W. Vickers & Co., Limited, 5 Nicholas-lane, E.C.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President*—Mr. ALBERT D. GREATOREX, M.INST.C.E., Borough Engineer and Surveyor of West Bromwich.

### METROPOLITAN DISTRICT MEETING.

The following is the programme of the Metropolitan District meeting of the institution which will be held at Caxton Hall, Westminster (Room 13), on Friday, February 9th:—

7.30 p.m.—Discussion on the following paper, which will be taken as read:—
"The Relation of Modern Road Surfacings to Fish Life," by Mr. W. J. A. Butterfield.

8 p.m.—Adjourn to hold special general meeting [see separate agenda published in last week's issue of THE SURVEYOR.]

8.15 p.m.—Tea and coffee will be served.

8.30 p.m.—Resume discussion on paper.

In order that the necessary arrangements may be made, members must give notice of their intention to be present not later than Saturday, February 3rd, when copies of the paper will be forwarded in due course.

NORMAN SCORGIE,
Borough Surveyor, *Hon. District Secretary*,
Hackney, N.E.

## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned* (*No.* 1359 *Holborn*), *subject to later confirmation by letter.*

QUANTITY SURVEYOR.—January 20th.—Cardiff Education Committee.—Mr. John J. Jackson, director, City Hall, Cardiff.

SURVEYOR'S ASSISTANT.—January 20th.—Ossett Town Council. £2 per week.—Mr. H. Holmes, borough surveyor and water engineer.

BUILDING INSPECTOR. January 22nd.—Portsmouth Town Council. £130—£150 per annum.—Mr. G. Hammond Etherton, town clerk.

CLERK OF WORKS.—January 23rd.—Stockport Town Council. £3 10s. per week.—Mr. Robert Hyde, town clerk.

SURVEYOR'S ASSISTANT. January 26th.—Porthcawl Urban District Council. £80 per annum.—Mr. W. Chorley, clerk.

SEWAGE WORKS MANAGER.—January 27th.—Corporation of Tiverton. £100 per annum.—Mr. C. M. Hole, town clerk.

FOREMAN OF HIGHWAYS. January 27th.—Corporation of Tiverton. £100 per annum. Mr. C. M. Hole, town clerk.

INSPECTOR OF NUISANCES. February 1st.—Nailsworth Urban District Council. £100 per annum.—Mr. A. E. Smith, clerk.

ENGINEER'S TEMPORARY ASSISTANT. February 3rd.—Corporation of Plymouth. £3 3s. per week.—Mr. James Paton, borough engineer and surveyor.

ASSISTANT ENGINEERS. Federated Malay States. £100 per annum. Messrs. Gregory, Eyles & Waring, 12 Dean's-yard, Westminster, S.W.

CLERK OF WORKS. Great Ouseburn Rural District Council.—Mr. J. T. Hyams, engineer, Burton Leonard, Leeds.

## MUNICIPAL COMPETITIONS OPEN.

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LONDON.—February 17th.—Sketch designs for new head offices, for the Port of London Authority.—The Clerk.

YORK.—February 17th.—Designs are invited for a public elementary school by the Education Committee.—Mr. J. H. Mason, secretary, Education Offices, Clifford-street, York.

## MUNICIPAL CONTRACTS OPEN.

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### Buildings.

LUTON.—January 20th—February 6th.—For the erection of a school, for the corporation.—Mr. B. Penny, town clerk.

PERTH.—January 20th.—For the erection of stone walls and iron railings, for the corporation.—Mr. J. Begg, town clerk.

WALLSEND.—January 20th—February 12th.—For the erection of a school and institute, for Northumberland Education Committee.—Mr. C. Williams, secretary, Moothall, Newcastle-on-Tyne.

ILFORD.—January 23rd.—For the erection of an elementary school, for the urban district council.—Mr. Adam Partington, clerk.

CHELTENHAM.—January 23rd.—For the construction of concrete filter tank and filter-house, for the corporation.—Mr. J. S. Pickering, borough engineer.

BARKING.—January 23rd.—For the erection of four cottages, for the urban district council.—Mr. H. Hargreaves, clerk.

POPLAR.—January 24th.—For the erection of the superstructure of extension to the main electricity generating station, for the borough council.—Mr. Leonard Potts, town clerk.

HEMEL HEMPSTEAD.—January 29th.—For the erection of seven cottages, for the rural district council.—Mr. T. H. Lighbody, 20 Marlowes, Hemel Hempstead.

LEEDS.—January 30th.—For the erection of two houses, for the corporation.—Town Clerk.

LANCASHIRE. January 31st.—For additions to a school, for the Education Committee.—Mr. H. Littler, 16 Ribblesdale-place, Preston.

SHEFFIELD.—February 1st.—For the erection of a stabling shed, for the corporation.—City Architect.

CARDIGAN.—February 2nd.—For the erection of a culvert bridge and wing walls, for the rural district council.—Mr. D. Davies, clerk.

MARGATE.—February 5th.—Erection of new lavatories and extension of existing lavatories, for the corporation.—Mr. E. A. Borg, borough surveyor.

### Iron and Steel.

DARTFORD.—January 23rd.—For the supply of electricity plant, for the urban district council.—Mr. W. Kay, clerk.

LONDON.—January 23rd.—For the supply of steel tramway rails and slot rails, &c., for the county council.—Chief Engineer's Department.

CAIRO. January 23rd. For the supply of iron fencing, for the Department of Public Health. The Clerk.

NUNEATON. January 24th.—For the supply of 500-kw. mixed-pressure turbo-generator, with condensing plant, &c., for the corporation. Chairman of the Electricity Committee.

ASHTON-UNDER-LYNE. January 24th. For the supply of three Lancashire boilers, for the Electricity Committee.—Mr. J. Neal, borough comptroller.

BRADFORD. January 27th. For the supply of tram rails, for the corporation.—Town Clerk.

BURTON-UPON-TRENT. January 27th. For the supply of electricity plant, for the corporation.—Mr. T. Hall, borough electrical engineer.

STEPNEY. January 29th. For the erection of converting plant and switch gear, for the borough council.—Mr. W. C. P. Tapper, borough electrical engineer.

WIMBLEDON.—January 29th.—For the supply of two motor fire engines, for the corporation. Mr. A. S. Sheldon, town clerk.

### Miscellaneous.

CROYDON.—January 22nd.—For the supply of men, horses and carts, for the corporation.—Mr. F. C. Lloyd, town clerk.

POPLAR.—January 22nd.—For the renewal of road sweepings, and the supply of iron castings, brooms, rotary machine brushes, points, &c., for the borough council.—Mr. H. Heckford, borough surveyor.

Bourne.—January 27th.—For the supply of roadmen's barrows, tools, &c., for the rural district council. —Mr. C. W. Bell, clerk.

Durham.—February 3rd.—For the supply of stone, disinfectants, cartage, &c., for the urban district council.—The Surveyor, Langley Moor, Durham.

## Roads.

Ince.—January 20th.—For paving, kerbing, sewering, for the urban district council.—Mr. A. T. Swaine, surveyor.

Norfolk.—January 20th.—For the supply of roadmen's tools and implements, for the county council. —Mr. T. H. B. Heslop, county surveyor.

Norfolk.—January 20th.—For the supply of gravel, flints, chalk, and marl, for the county council.—Mr. T. H. B. Heslop, county surveyor.

Norfolk.—January 20th.—For the supply of granite, for the county council.—Mr. T. H. B. Heslop, county surveyor.

Halifax.—January 20th.—For the execution of private street works, for the corporation.—Mr. J. Lord, borough engineer.

Thirsk.—January 22nd.—For the supply of road materials, for the rural district council.—Mr. C. A. Lake, highway surveyor.

Finchley.—January 22nd.—For making up six private streets, for the urban district council.—Mr. E. H. Lister, clerk.

Wakefield.—January 22nd.—For the execution of private street works, for the corporation.—Mr. J. P. Wakeford, city surveyor.

Finchley.—January 22nd.—For the supply of 12,000 gallons of tar for road-surface treatment, for the urban district council.—Mr. E. H. Lister, clerk.

Wandsworth.—January 22nd.—For the purchase of a 10-ton Aveling & Porter steam road-roller, for the borough council.—Mr. P. Dodd, borough engineer and surveyor.

Lewisham.—January 23rd.—For channelling and paving works, for the borough council.—The Surveyor.

Armagh.—January 23rd.—For the supply of road tools, &c., for the rural district council.—Mr. W. Calvert, clerk.

Heywood.—January 24th.—For works of draining, levelling, paving, &c., for the corporation.—Mr. G. G. Bouchier, town clerk.

Newport.—January 24th. — For surface tarring 100,000 yds. of roadway, for the corporation.—Mr. H. Tremelling, borough engineer.

Luton.—January 25th.—For works of private street improvement, for the corporation.—Mr. Bruce Penny, town clerk.

Deal.—January 25th.—For the supply of granite, for the corporation.—Mr. T. C. Golder, borough engineer and surveyor.

East Suffolk.—January 26th.—For work of steam rolling, for the county council.—Mr. A. Townshend Cobbold, County Hall, Ipswich.

Sleaford.—January 27th.—For the supply of granite and slag, for the rural district council. — Mr. E. Clements, clerk.

Harrow-on-the-Hill.—January 27th.—For the making up of three streets, for the urban district council.—Mr. John Strachan, clerk.

Bourne.—January 27th.—For the supply of granite and slag, for the rural district council.—Mr. Cecil Bell, clerk.

Birmingham.—January 27th.—For the supply of granite kerbs, setts, crossing stones, chippings, flags, paving bricks, wood paving blocks, tagstones, gravel, sand and slag, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

Essex.—January 27th.—For the supply of Norway granite kerb and setts, for the county council.—Mr. Percy J. Sheldon, county surveyor.

Kettering.—January 29th.—For work of tar paving and the supply of granite, for the rural district council. —Mr. E. R. Lees, deputy clerk.

Wangford (Suffolk).—January 29th.—For the supply of road materials, for the rural district council.— Mr. S. W. Rix, clerk, Beccles.

Dorset.—January 29th.—For tar-spraying highways, for the county council.—Mr. W. T. Fletcher, county surveyor.

Dorset.—January 29th.—For the supply of granite, quartzite, limestone, and tarred macadam, for the county council.—Mr. W. T. Fletcher, county surveyor.

Ealing.—January 30th.—For making up certain roads, for the corporation.—Mr. G. E. Brydges, town clerk.

Northamptonshire.—January 30th.—For the supply of broken granite, for the county council.—Mr. C. S. Norris, county surveyor.

Gateshead.—January 30th.—For paving work in several streets, for the corporation.—Mr. N. P. Pattinson, borough engineer.

Lydd.—January 31st.—For the supply of tar, for the corporation.—Mr. Thomas Kettle, borough surveyor.

Worcester.—January 31st.—For the supply of road materials, including tar-macadam, for the county council.—Mr. C. F. Gettings, county road surveyor.

Heaton Norris.—February 1st.—For the execution of street works, for the urban district council.—Mr. F. W. Brooke, clerk.

Lancashire.—February 1st.—For the supply of granite macadam, limestone macadam, rubble, chippings, copper slag and gravel, for the county council. —Mr. Harcourt E. Clare, clerk.

Buckingham.—February 3rd.—For the supply of granite and slag, for the rural district council.—Mr. R. C. Gordon, surveyor.

## Sanitary.

Manchester.—January 22nd.—For the construction of main drainage works, for the corporation.—Mr. Thomas Hudson, town clerk.

Standish-with-Langtree.—January 22nd.—For the construction of sewage disposal works, for the urban district council.—Mr. J. H. Richards, clerk.

Whiston.—January 25th.—For the removal of house refuse, &c., for the rural district council.—Mr. A. F. Mann, clerk.

Willesden.—January 26th.—For the purchase from the urban district council of pumping and pressing plant.—Mr. O. Claude Robson, engineer.

Nelson.—January 27th.—For the construction of earthenware pipe sewer, for the corporation.—Mr. W. Shackleton, borough engineer and surveyor.

Padiham.—January 27th.—For the supply of filtering material, for the rural district council.—Mr. J. C. Waddington, clerk.

Keighley.—January 29th.—For laying of earthenware pipes, construction of manholes, &c., for the rural district council.—Mr. T. Burton, surveyor.

Hetton.—February 2nd.—For scavenging work, for the urban district council.—Mr. G. Young, clerk.

Evesham.—February 7th.—For the construction of additional sewage disposal works, for the corporation. —Mr. Thos. A. Cox, town clerk.

## Stores.

Chelsea.—January 24th.—For the supply of granite kerbstones and setts, York paving, broken granite, removal of trade refuse, brooms, oilmen's goods, ironmongery, disinfectants, &c., for the borough council. —Mr. T. Holland, town clerk.

Birmingham.—January 27th.—For the supply of lias lime, Portland cement, drain pipes, gullies, gully pans, brown bricks, timber, drysaltery, castings, iron and steel ware, lamps, glass, enamelling, brooms, &c., for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

Middlesbrough.—January 29th.—For the supply of annealed scoriæ (broken) and rough blocks, bricks, castings, concrete flags and kerbs, Portland cement, pitch and tar, sanitary pipes, broken slag, tarred whinstone, timber, broken whinstone and granite, setts, kerbs, brushes, bolts and nuts, disinfectants, general stores, &c., for the corporation.—Mr. S. E. Burgess, borough engineer.

Grimsby.—February 2nd.—For the supply of calcined basalt macadam, drainage pipes, flags, kerbs, granite setts, pitch, tar, Portland cement, slag, bottles and corks, carbolic acid, disinfectant fluid, brushes, &c., for the corporation.—Mr. H. Gilbert Whyatt, borough engineer and surveyor.

Bermondsey.—February 5th.—For the supply of materials and work, for the borough council. Town Clerk.

Chesham.—February 6th.—For the supply of coal and coke, granite macadam, flints, gravel, sand, Portland cement, stoneware pipes, &c., for the urban district council.—Mr. J. E. Sharpe, engineer and surveyor.

# TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

ALDERSHOT.—For the supply of flints, for the urban district council:—

| | Per ton. s. d. |
|---|---|
| M. Wells & Co., Aldershot | 4 8 |
| T. Lamport & Sons, Farnham | 4 6 |

BATLEY.—Accepted for additions to a public school, for the Education Committee:—
Mason's and Joiner's Work.—J. Akeroyd & Son, Birstall, £2,333.
Plumber's Work.—Walshaw & Wood, Batley, £275.
Heating and Engineering Work.—Walshaw & Wood, Batley, £160.
Plasterer's Work.—G. Crossley & Son, Birstall, £347.
Slater's Work.—W. H. Thompson, Batley, £136.
Painter's Work.—G. Tomlinson & Son, Batley, £103.
Mr. Brixey.

BEDFORD.—The council have accepted the lowest tender for the main drainage works viz., that of G. Bell & Sons, Tottenham, at £2,967, and the lowest tender for the ejector plant—viz., that received from Manlove, Alliott & Co., Nottingham, at £873.

BIRKDALE.—Accepted for the erection of a caretaker's lodge, for the urban district council:—
Fairbridge Brothers, Birkdale, £999.

DARTFORD.—Accepted for making-up work, for the urban district council:—
Somerset-road.—A. E. J. Price, £589.
Highfield-road-passage.—A. E. J. Price, £41.

EASTBOURNE.—For private improvement works, for the corporation.—Mr. A. E. Prescott, borough surveyor:—

| | |
|---|---|
| J. M. Vine, Eastbourne | £83 |
| A. J. Bessant, Eastbourne* | 62 |

FAREHAM.—For paving work on the Quay and in High-street, for the urban district council:—

| | |
|---|---|
| Chance Brothers | £172 |
| H. Plummer | 145 |
| E. Fry | 67 |

FRIMLEY.—For the Camberley and Frimley Green Sewerage Scheme, for the urban district council:—

| | |
|---|---|
| A. Wells, Aldershot | £8,272 |
| Reid Brothers, London | 7,960 |
| E. Iles, Surrey | 7,892 |
| G. A. Franks, Sunningdale | 7,346 |
| T. Wood & Sons, Swanley | 6,999 |
| H. M. Baker, Leatherhead | 6,698 |
| A. G. Osenton, Surrey | 6,161 |
| R. W. Swaker, Hounslow | 6,080 |
| J. Stone, London | 6,078 |
| G. Bell & Sons, Manchester | 5,997 |
| F. Osman & Co., Southampton | 5,798 |
| T. Pedrette, London | 5,490 |
| Hardy & Co., Woking* | 5,192 |
| J. Budge & Co., Pigmouth | 4,816 |

Engineer's estimate for works and contingencies, £5,813.

HADHAM.—Accepted for the erection of four cottages, for the rural district council.—Mr. E. T. Watts, surveyor:—
Markwell & Sons, Bishops Stortford, £493.
Sicking well at Braughing.—Mr. H. G. Featherby, Bishops Stortford, £35.

HINCKLEY.—For the making-up of certain streets, for the urban district council.—Mr. E. H. Crump, surveyor:—

| | |
|---|---|
| Martin and Element, Smethwick | £369 |
| A. Palmer, Leicester | 342 |
| G. Greaves, Hinckley‡ | 328 |

‡ Provisionally accepted.

LEIGH-ON-SEA.—The following tenders have been accepted by the urban district council:—
Making-up of Leigh Hall-road.—W. Iles, £2,629.
Making-up Oakleigh Park-drive (tar macadam).—W. Iles, £1,550.
Making-up Leigham Court-drive (tar macadam).—W. J. Jackson, £1,410.
Making-up Queen's-avenue (tar macadam).—W. Iles, £380.
Harley-street, sewering.—W. J. Jackson, £132.
Alterations at the Junction of Leigh Park and Hadleigh roads.—W. J. Jackson, £90.

LEWISHAM.—For the supply of the undermentioned articles, for the borough council:—
Sand Bins.—F. Bird & Co., £3 19s. each.
Machine Scrapers.—W. Smith & Sons, £18 10s. each.
Two Hand Rollers.—Ginman & Co., £14 15s. each.

MACCLESFIELD.—For alterations and additions to a school, for the Education Committee:

| | |
|---|---|
| J. Hudson & Sons, New Mills | £4,849 |
| Wellerman Brothers, Hyde | 4,837 |
| J. Hamilton & Son, Altrincham | 4,815 |
| J. K. Coates, Wilmslow | 4,645 |
| I. Massey & Sons, Alderley Edge* | 4,160 |
| L. Brown & Sons, Wilmslow | 4,158 |
| J. Gerrard & Sons, Limited, Swinton | 4,157 |

MERTHYR.—For the erection of forty-eight workmen's dwellings, for the corporation:—
Jones Brothers, Treharris, South Wales.—Street works, £386; 16 houses (Design A), £2,880; 32 houses (Design B), £6,024; total £8,790
N. Moss, Merthyr Tydfil.—Street works, £346; Design A, £3,113; Design B, £5,812; total £9,271.
A. J. Colborne, Swindon.—Street works, £829; Design A, £3,030, Design B, £4,920; total £8,779.
J. Rees & Sons, Pontygwaith, S. Wales. Street works, £1,256; Design A, £3 720; Design B, £6,090; total £10,066.

PONTYPRIDD.—For the erection of New School at Wood-road, Treforest, for 400 infants, for the Pontypridd Education Committee.—W. E. Lowe, architect to the council. Quantities by G. H. Davies, Deputy-Surveyor:—

| | |
|---|---|
| G. Harris, Abercynon | £8 093 |
| Jones Brothers, Treharris | 6,347 |
| Smith, Jones & Sons, Pontypridd | 6,218 |
| Knox & Wells, Cardiff | 6,001 |
| W. Williams, Cardiff | 5,999 |
| D. Davies & Sons, Cardiff | 5,977 |
| Williams & James, Pontypridd | 5,874 |
| R. Jones, Caerphilly | 5,801 |
| S. Shaul, Llandaff | 5,725 |
| T. F. Howells | 5 692 |
| E. R. Evans & Brothers, Cardiff | 5,594 |
| F. Bond, Cardiff* | 5,531 |

Architect's estimate, £5,600.

POOLE.—For private street works in Library, Davis and Shillito Roads, Branksome, the tender of G. Maidment at £1,622 13s. 3d. has been accepted. The borough surveyor's estimate was £1,612. Other tenders were from H. C. Brixey, £1,676; and G. T. Budden, £1,769.
For similar works in Cheltenham-road, the surveyor's estimate was £454, and the tender has been accepted of G. Maidment at £416; other quotations being: Mr. Brixey, £453, and Mr. Budden, £460.
For Ardmore-road, Parkstone, Mr. Maidment's tender has been accepted, the amount being £219, as compared with the surveyor's estimate of £209; other tenders being: Mr. Brixey, £223 12s. 9d.; and Mr. Budden £244 15s. 9d.

PORTSMOUTH.—For the building of a house, &c., for the corporation.—Mr. P. Murch, borough engineer:—

| | |
|---|---|
| E. & A. Springings | £623 |
| H. C. Sweetland | 618 |
| J. Crockerell | 598 |
| W. W. Evans | 593 |
| J. Durrant | 588 |
| H. Jones & Son | 569 |
| J. Tanner | 565 |
| F. J. Privett | 547 |
| Woods & Company, Southsea* | 545 |

SPILSBY.—For laying water main, for the rural district council, at Wainfleet.—Mr. J. E. Bolt, sanitary surveyor:—

| | |
|---|---|
| Rimington & Son (Spilsby), Spilsby | £637 |
| J. T. Turner & Sons, Wainfleet | 620 |

Sanitary surveyor's estimate, £649.

WALTON-UPON-THAMES.—For making-up a certain street, for the urban district council:—

| | |
|---|---|
| R. W. Swaker, Hounslow | £1,350 |
| E. Free & Sons, Maidenhead | 1,224 |
| C. Horsell, Weybridge | 1,210 |
| J. C. Trueman, Limited, Swanley Junction, Kent | 1,204 |
| A. W. Tibert, Clapham Common | 1,202 |
| S. Kavanach & Co., Surbiton-hill | 1,150 |
| E. Potterton & Co., East Molesey | 1,134 |
| J. Mowlem & Co., Limited, Westminster* | 1,099 |
| J. May & Son, Ashtead (tender incorrect) | 1,046 |

Surveyor's estimate, £1,208.

WEST SUSSEX.—For alterations to Storrington Council School, for the Joint Education Committee:—

| | |
|---|---|
| A. Peskett & Co., Crawley | £605 |
| F. Sandell & Sons, Worthing | 590 |
| G. Gillam, Southwick | 540 |
| H. Baker & Son, Horsham | 530 |
| Elkington & Co., Storrington | 510 |
| H. Richardson, Findon | 486 |
| H. Tier, Worthing | 485 |
| W. Wicker, Storrington* | 485 |
| E. Hill, Littlehampton | 497 |

WEST SUSSEX.—For alterations and additions to Horsham Grammar School, for the Joint Education Committee:—

| | |
|---|---|
| H. Lindfield & Son, Horsham | £2,780 |
| Hillman & Murrell, Horsham | 2,687 |
| W. J. Fryer & Co., Paddington | 2,686 |
| J. Langley & Co., Crawley | 2,678 |
| A. Peskett & Co., Crawley | 2,668 |
| S. Ellis, Guildford | 2,635 |
| Norman & Burt, Burgess-hill | 2,600 |
| Rowland Brothers, Horsham | 2,599 |
| G. Potter, Horsham | 2,500 |
| F. Sandell & Sons, Worthing* | 2,478 |

# MEETINGS.

*Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.*

JANUARY.

19.—Institution of Mechanical Engineers: Messrs. Edward Hopkinson and Alan E. L. Chorlton, of Manchester, on "The Evolution and Present Development of the Turbine Pump." 8 p.m.
22.—Institute of Sanitary Engineers: Mr. Lawrence W. Chubb on "Smoke Abatement." 8 p.m.
22.—Surveyor's Institution: Mr. Julian C. Rogers on "An Evening in the Institution Library." 8 p.m.
23.—Institution of Civil Engineers: Papers to be further discussed: "Reinforced Concrete Wharves and Warehouses at Lower Pootung, Shanghai," by S. H. Ellis, M.INST.C.E.; "The Direct Experimental Determination of the Stresses in the Steel and in the Concrete of Reinforced Concrete Columns," by William C. Popplewell, M.SC., ASSOC.M.INST.C.E.; "Composite Columns of Concrete and Steel," by W. H. Burr, M.INST.C.E. 8 p.m.
24.—Institution of Civil Engineers: Students' Visit to L.C.C. Southern Low-level Sewer Works, New Cross and Camberwell.
24.—Royal Institute of British Architects: President and Council's "At Home." Exhibition of Drawings submitted in Competition.

FEBRUARY.

5. Royal Institute of British Architects: President's Address to Students; Presentation of Prizes; Nomination of Royal Gold Medallist.
9. Institution of Municipal and County Engineers: Special General and Metropolitan District Meetings, Caxton Hall, Westminster, 7.30 p.m.
10.—Royal Sanitary Institute: Sessional Meeting at Nottingham.
16.—Edinburgh Architectural Association: Associates' Annual Dinner. 7.30 p.m.
16.—Royal Institution. Sir John H. A. Macdonald on "The Road: Past, Present, and Future." 9 p.m.

## APPOINTMENTS OPEN.

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### BOROUGH OF PLYMOUTH.

APPOINTMENT OF TEMPORARY ASSISTANT.

Applications are invited for the post of Temporary Assistant in the Borough Engineer's Office.

The wages will be £3 3s. per week.

Applicants must be neat and expeditious draughtsmen, expert surveyors and levellers, and accustomed to contouring.

Preference will be given to Candidates who have a knowledge of Town Planning and the laying out of Building Estates.

Applications, in own handwriting, stating age, experience, qualifications, and present occupation, to be forwarded to me not later than Saturday, the 3rd day of February, accompanied by copies of not more than three recent testimonials. Original testimonials must on no account be sent.

Envelopes to be endorsed "Temporary Assistant."

JAMES PATON,
Borough Engineer and Surveyor.

Municipal Offices.
January 12, 1912.

### BOROUGH OF TIVERTON.

Wanted, a competent Outdoor Foreman of Streets and Highways. Salary £100 per annum, to include travelling expenses. A knowledge of sanitary work desirable.

Full particulars as to duties may be obtained from the undersigned, to whom applications, endorsed "Foreman," are to be sent, accompanied by copies of three recent testimonials, on or before the 27th instant.

Canvassing is strictly prohibited.

C. M. HOLE,
Town Clerk.

Tiverton.
January 10, 1912.

### BOROUGH OF TIVERTON.

Wanted, a Manager of the Sewage Disposal Works (Lime and Chloride Treatment). Must be qualified in Chemistry and Bacteriology. Salary £100 per annum.

Applications, stating age and qualifications, with copies of three recent testimonials, endorsed "Sewage Manager," to be sent to the undersigned not later than Saturday, the 27th instant.

C. M. HOLE,
Town Clerk.

Tiverton.
January 13, 1912.

**A.** M.I.C.E. has vacancy for PUPIL. Engineering Contractors, including reinforced concrete construction. London.—Box No. 1,119, Office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

## TENDERS WANTED.

### HEATON NORRIS URBAN DISTRICT COUNCIL.

*STREET WORKS.*

TAR-MACADAMISING OF CARRIAGEWAYS AND ASPHALTING OF FOOTPATHS.

The above-mentioned Council invite Tenders for the Execution of Street Works within their District as follows:—

(1) The Supply and Laying with Tar-Macadam the Carriageway of Gibson-road, together with contingent works.

(2) The Excavating, Concreting and Asphalting the Footpaths in Gibson-road, together with contingent works.

Plans of the works required may be inspected, and a copy of the Specification, Form of Tender, in either case, and any further particulars obtained, upon application to Mr. Walter Banks, A.M.INST.C.E., Surveyor to the Council, at his office here, on any day (except Saturdays) between the hours of 10 and 5, on payment of the sum of One Guinea, which will be returned upon the receipt of a *bonâ-fide* Tender.

The tenderer whose Tender may be accepted will be required to enter into a contract which will, among other things, provide for the payment by the Contractor of the rates of wages, and the observance of the hours of labour, recognised or prevailing in the District in relation to work where such work is actually executed; the responsibility for the observance of these conditions by any sub-contractor, and the furnishing of approved sureties for the due performance thereof.

Sealed Tenders, on the form supplied, endorsed "Tender for Tar-Macadam," or "Tender for Asphalting," as the case may be, to be addressed to the Chairman of the Highways Committee, and delivered to me not later than 12 o'clock noon on the 1st day of February, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
F. W. BROOKE,
Clerk to the Council.

Council Offices, Heaton Moor,
Lancashire.
January 17, 1912.

### NORTHAMPTONSHIRE COUNTY COUNCIL.

*MAIN ROADS.*

SUPPLY OF GRANITE.

The Roads and Bridges Committee invite Tenders for the Supply of Broken Granite, delivered at various Stations and Wharves in the County.

Tenders to be sent in not later than January 30th next to the undersigned, from whom Forms of Tender and other particulars may be obtained.

C. S. MORRIS,
County Surveyor.

County Hall,
Northampton
January 17, 1912.

### BOROUGH OF GILLINGHAM, KENT.

TO CONTRACTORS AND MERCHANTS.

The Town Council of the Borough of Gillingham are prepared to receive Tenders for the following for the term of One Year, commencing on the 1st day of April, 1912:—

1. Road Materials.
2. Portland Cement and Lime.
3. Requisites for Precipitation Works.
4. Stoneware Pipes, &c.
5. Timber.
6. Sewer Ironwork.
7. Coal and Coke.
8. Bricks.
9. Paints, Oils and Varnish.
10. General Stores and Ironmongery.
11. Disinfectants.
12. Forage.

Specifications, Conditions of Contract and Forms of Tender (in duplicate), together with any other information, may be obtained from Mr. J. L. Redfern, Borough Engineer and Surveyor.

Sealed Tenders, endorsed with the name of the articles tendered for, accompanied by samples of each class of material, and addressed to the undersigned, to be delivered not later than 12 noon on Tuesday, February 6th, 1912.

Neither the lowest nor any Tender necessarily accepted.

F. C. BOUCHER,
Town Clerk.

Corporation Offices, Gillingham, Kent.
January 16, 1912.

## CITY OF NORWICH.

Tenders are invited for the Supply and Delivery of a Road-roller.

Specification and Forms of Tender can be obtained on application at my office.

Tenders, on the forms supplied, enclosed in envelopes sealed with sealing-wax, and endorsed "Road-roller," and addressed to the Chairman of the Executive Committee of the Norwich Corporation, must be delivered at the City Engineer's Office, Norwich, not later than 10 a.m. on Monday, 5th February, 1912.

The Corporation does not bind itself to accept the lowest or any Tender.

ARTHUR E. COLLINS, M.INST.C.E.,
City Engineer.

Guildhall, Norwich.
January 16, 1912.

## THE URBAN DISTRICT OF CHESHUNT.
### ANNUAL CONTRACTS, 1912-13.

Tenders are required for the Supply of the following during the 12 months ending March 31st, 1913—*viz.*:—

Steam Coal and Coke, Granite Macadam, Flints, Local Gravel, Sand and Hoggin, Portland Cement, Ironmongery, Oils, Forage, Stoneware Pipes, Brushes, Printing and Stationery, Team Labour, and the Collection of House Refuse.

Specifications and Forms of Tender may be obtained on application to the undersigned.

Sealed and endorsed Tenders, on the forms supplied, must be delivered not later than 3 p.m., February 6th, 1912.

The lowest or any Tender will not necessarily be accepted.

J. E. SHARPE.
Engineer and Surveyor.

Manor House,
Cheshunt.

## COUNTY BOROUGH OF GRIMSBY.
### TO CONTRACTORS.

The Corporation are prepared to receive Tenders for the Supply of the following Materials, in such quantities as may from time to time be required, between April 1st, 1912, and March 31st, 1913:—

1. Columnar Basalt Macadam (100 tons per fortnight or 200 tons per month).
2. Drainage Pipes, &c.
3. Flags, Artificial.
4. Flags, Yorkshire.
5. Yorkshire Kerbs, &c.
6. Granite Setts, Kerbs, and Channel.
7. Pitch.
8. Tar.
9. Portland Cement (6 tons per month). The Cement to be in accordance with the British Specification.
10. Lias Lime.
11. Slag (Lump, Macadam and Screenings, 500 tons per month).
12. Bottles and Corks.
13. Carbolic Acid.
14. Carbolised Oil.
15. Disinfectant Fluid.
16. Disinfectant Powder.
17. Formalin.
18. Formalin Tabloids
19. $SO_2$ Tubes.
20. Brushes.
21. Drysalteries, &c.
22. Oils (except Lubricating).
23. Oils (Lubricating).
24. Paints.

Specifications, Forms of Tender (in duplicate) and all requisite information, may be obtained at my Offices; applications to be accompanied by addressed foolscap envelopes (unstamped).

Sealed Tenders, addressed to the Chairman of the Highways Committee, and endorsed "Tenders for Annual Supplies," must be delivered at the Offices of the Town Clerk, West St. Mary's-gate, Grimsby, not later than noon on Friday, February 2nd, 1912.

(By order)
H. GILBERT WHYATT, ASSOC.M.INST.C.E.,
Borough Engineer and Surveyor.

Municipal Buildings,
170 Victoria-street,
Grimsby.
January 15, 1912.

## COUNTY BOROUGH OF HUDDERSFIELD.
### TO CONTRACTORS.

The Corporation of Huddersfield invite Tenders for the Supply and Delivery of the following Materials for a period of 12 months, ending March 31st, 1913—namely:—

Form No. HIGHWAY MATERIALS.

1. Granite Setts, Gritstone and Lonkey Setts, and Macadam.
2. Furnace Slag (Broken and Unbroken) for Highway Purposes.
3. Granite, Slag and Limestone Tar Macadam.
4. Flags, Landings, Kerbs, &c.
5. Pitch and Creosote Oil.
6. Cast-Iron Materials.
7. Portland Cement.
8. Bricks, Lime, and River Sand.
9. Hay, Straw and Provender.
10. Scavenging Machine Brushes and Brooms.
11. Earthenware Pipes, Junctions, Bends, &c.
12. House Coal for Highways Department.
13. Team Work (for all Districts).
14. Shoeing Horses.
15. Oils (Engine, Cylinder, Gas-engine, Heavy-bearing, and Petroleum).

The successful tenderer will be required to execute a contract, the draft of which may be inspected at the Town Clerk's Office, Town Hall, between 10 and 4 o'clock (except Saturdays).

Specifications and Forms of Tender may be obtained on application at the offices of Mr. K. F. Campbell, M.INST.C.E., M.I.E.E., Borough Engineer and Surveyor, 1 Peel-street.

Please state the number of Tender Form required.

Sealed Tenders, endorsed "Tender for Granite Setts," or as the case may be, signed in the handwriting of the tenderer or his agent, and addressed Town Clerk, Town Hall, Huddersfield, must reach him not later than Wednesday, 7th February, 1912.

The Corporation do not bind themselves to accept the lowest or any Tender.

J. HENRY FIELD,
Town Clerk.

Town Hall, Huddersfield.
January 9, 1912.

## METROPOLITAN BOROUGH OF WOOLWICH.
### SUPPLY OF ROAD MATERIAL, FORAGE, STORES, &c.

The Council of the Metropolitan Borough of Woolwich are prepared to receive Tenders for the Supply of the under-mentioned Road Material, Forage, Stores, &c., from the 1st April, 1912, to the 31st March, 1913:—

1. Ballast, Sand, &c.
2. Brooms, Brushes, &c.
3. Cement.
4. Chandlery.
5. Drain Pipes.
6. Forage (for six months only from 1st April, 1912).
7. Harness.
8. Ironmongery.
9. Road Material.
10. Sewer Ironwork.
11. Timber.

Forms of Tender, with Schedules and further particulars, can be obtained from the office of Mr. J. Rush Dixon, M.INST.C.E., Borough Engineer, Town Hall, Woolwich.

The persons or firms whose Tenders are accepted will be required to pay Trades Union rates of wages, to observe Trades Union hours, and to enter into formal contracts.

Sealed Tenders, based on properly priced-out Schedules, must be delivered to me at the Town Hall, Woolwich, not later than 12 o'clock noon on Wednesday, the 7th February, 1912, in envelope endorsed "Tender for ——."

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
ARTHUR B. BRYCESON,
Town Clerk

Town Hall,
Woolwich.
January 17, 1912.

## TO CONTRACTORS AND OTHERS.

THE COUNCIL OF THE METROPOLITAN BOROUGH OF WANDSWORTH is prepared to receive Tenders for the Making Up and Paving of that part of Roehampton-lane, Putney, which lies between Upper Richmond-road and "The Limes," No. 41 Roehampton-lane (inclusive).

The Specification and Drawings may be seen, and Forms of Tender obtained of the Borough Engineer, at the Office of the New Streets Department, No. 56 East-hill, Wandsworth, S.W., between the hours of 10 and 4 (Saturdays 10 and 12), upon payment of a deposit of Five Guineas.

Tenders, enclosed in sealed envelopes, and endorsed "Tender for Paving Roehampton-lane," must be delivered at the Council House, East-hill, Wandsworth, S.W., and may be placed by the person tendering in the box provided for the purpose, not later than four o'clock in the afternoon of Monday, the 29th January next.

Persons tendering must in the case of all workmen employed by them in and about the execution of the Contract pay wages at not less, and observe hours of labour not greater, than the rates and hours recognised by the Associations of Employers and Employees and in practice obtained in the district where the work is to be executed.

No Tender will be received unless it be made upon one of the Forms provided for the purpose. The Council does not pledge itself to accept the lowest or any Tender. If required, the Contractor must provide two sureties for the due execution of the Contract.

HENRY GEORGE HILLS,
Town Clerk.

Council House,
Wandsworth, S.W.
January 14, 1912

## HEATON NORRIS URBAN DISTRICT COUNCIL.

### SMALL FISH OFFAL AND GARBAGE DESTRUCTOR.

The Heaton Norris Urban District Council invite Tenders for the Supply and Erection within their District of a Small Fish Offal and Garbage Destructor.

A full description of the requirements in respect of the proposed Destructor may be obtained on application to Mr. Walter Banks, A.M.INST.C.E., Surveyor to the Council, at his office here, any day between the hours of 10 and 5.

The tenderer whose Tender may be accepted will be required to enter into a contract, which will, amongst other things, provide for the payment by the Contractor of the rates of wages and the observance of the hours of labour recognised or prevailing in the district in relation to work where such work is actually executed; the responsibility for the observance of these conditions by any Sub-Contractor, and the furnishing of approved sureties for the due performance thereof.

Sealed Tenders, endorsed "Destructor," to be addressed to the Chairman of the Sanitary Committee, and delivered to me not later than 12 o'clock noon on the 25th instant.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
F. W. BROOKE,
Clerk to the Council.

Council Offices,
Heaton Moor, Lancashire.
January 12, 1912.

## WORCESTERSHIRE COUNTY COUNCIL.

*MAIN ROADS.*

### TENDERS FOR MATERIALS.

The Highways and Bridges Committee are prepared to receive Tenders for the Supply of Road Materials, including Tar-Macadam, delivered to Railway Stations and Wharves in the County, during the year ending 31st March, 1913.

Full particulars and Forms of Tender will be forwarded on application to the undersigned not later than 31st January, 1912.

The Committee do not bind themselves to accept the lowest or any Tender.

(Signed) C. F. GETTINGS,
County Road Surveyor.

Shirehall, Worcester.
January 15, 1912. [R 121.]

## GRANTHAM RURAL DISTRICT COUNCIL.

Tenders are required for the Supply of Materials (Granite and Slag) for the year ending 31st March, 1913.

Specification, with Form of Tender, may be obtained from me by forwarding stamped addressed foolscap envelope.

Tenders, together with Samples, must be sent to me, on or before Wednesday, the 7th February, 1912.

AUBREY H. MALIM,
Clerk to the Council.

Grantham.
January 13, 1912.

## BOROUGH OF EALING.

### PRIVATE STREET IMPROVEMENTS.

The Town Council of this Borough hereby invites Tenders for the Making Up of the following Roads:—

Chamberlain-road.
Curzon-road (from Pitshanger-lane to No. 33).
Junction-road (from No. 49 to Ealing Park-gardens).
Meadvale-road (from No. 136 to No. 196).
Overdale-road (from No. 50 to Derwent-road).
Derwent-road (from Overdale-road to Devonshire-road).

The Drawings and Specifications may be seen, and Forms of Tender, together with Schedule of Quantities and other particulars, obtained from Mr. Charles Jones, M.INST.C.E., Borough Engineer, Town Hall, Ealing, W., any day during office hours, upon payment of a deposit of 10s. 6d. for each road, which will be returned upon receipt of a *bonâ-fide* Tender.

Sealed Tenders, in the envelopes provided, endorsed "Tender for Making Up— ," must be delivered at my Office not later than 9.30 a.m. on Tuesday, the 30th day of January, 1912.

The Council does not bind itself to accept the lowest or any Tender.

Dated this 16th day of January, 1912.

(By order of the Council)
GEO. E. BRYDGES,
Town Clerk.

Town Clerk's Office,
Town Hall, Ealing, W.


RAMMERS | SHOVELS | HAMMERS

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# The Surveyor

And Municipal and County Engineer.

Vol. XLI. JANUARY 26, 1912. No. 1,015.

## Municipal Engineering in 1911.

The expressions of appreciation which have reached us from time to time in regard to our efforts in former years to provide by means of our Special Annual Issue a *résumé* of municipal engineering in all its varied phases have led us to make a similar attempt this year. It is no easy task to compress within a reasonable compass an adequate account of past activities, together with a forecast of works contemplated for immediate execution; but we venture to hope that in our seventeenth Special Annual Issue, which contains all the usual features, we have not been unsuccessful in achieving this object. The province of this introductory article, which may perhaps best be described as a summary of a summary, is merely to point to the most striking matters which are dealt with in the special articles which follow. The subjects of these articles are Electricity Supply, Tramways, Water Supply, Municipal and Public Buildings, Sewerage and Sewage Disposal, Refuse Disposal, Roads and Streets, Highway Bridges, and Street Lighting, with each of which we shall deal very briefly in turn. A year ago we pointed out the overwhelming importance of the effects of the introduction of the tungsten lamp upon the development of electrical industry. We then ventured to prophesy that the new lamp would prove in the end beneficial to electrical undertakings. This prophecy has been fulfilled. Electric lighting is now more popular than it has ever been, and the improved standard of illumination has enabled electricity to hold its own in the contest with rival illuminants. Mention should here be made of the proposal to erect a new generating station at Glasgow, and the intention of that authority to spend a sum of no less than half a million sterling. Many undertakings have been run at a profit, and in not a few instances payments have been made in relief of the rates. In some cases such payments appear to have been made without first making adequate provision for the future. This is to be deprecated as not being in the best interests of the undertakings in question. In regard to tramways the most striking event has been the opening of the first railless trolley system (between Leeds and Bradford). Many extensions have been carried out; and in most cases the working results have proved to be satisfactory, notwithstanding the general prevalence of strikes. Turning now to the subject of water supply, we find that the year under review has been one of unexampled activity. The Metropolitan Water Board, which controls the greatest undertaking in the world, has made further progress in the construction of storage reservoirs. The Board are deserving of special praise for having maintained a perfectly regular and sufficient supply during the recent drought. Outside the Metropolis attention should be called to the huge Derwent Valley scheme which is approaching completion. In regard to municipal and public buildings, the principal schemes have been concerned with town-halls and schools. The new County Hall for London continues to progress; and other buildings which are worthy of mention are the Middlesex Guildhall and the projected town halls for Marylebone and Coventry. Many new elementary schools have been erected during the past year, the largest being those at Tottenham, Northampton, West Bromwich, Chelmsford, and Leytonstone. Considerable activity is being shown in many localities in regard to town planning. Full authority to proceed with the preparation of schemes has been given in eight districts, while many others have the matter under consideration. All work in connection with municipal and public buildings has been affected by the increased use of reinforced concrete as a material for construction. Dealing next with the subjects of sewerage and sewage disposal, which occupy such a large proportion of the time and attention of the municipal engineer, we find that there have been no striking innovations, but that much steady progress has been made along well-established lines. Two additions to the Reports of the Royal Commission on Sewage Disposal have appeared during the year, the most interesting part of which was concerned with Dibdin slate beds. All the well-known makers of refuse destructors report a busy year; and there can be no doubt that such plant is no longer generally regarded as a luxury, but that it is considered as a necessary adjunct to the efficient sanitary administration of every well-ordered town. The work of the Road Board naturally occupies the first place in considering the year's record as to roads. It will be generally agreed that the Board have carried out a difficult task with conspicuous fairness. The second Irish Road Congress was brought to a successful issue; and perhaps we may be pardoned for mentioning THE SURVEYOR Conference of Highway Engineers which took place at Olympia in April under the chairmanship of Sir George Gibb. Among the more noteworthy works of bridge construction, mention may be made of the Reigate Hill Footbridge, the Berw Bridge, and the new bridge over the Wye. Finally, in regard to street lighting, although there have been no epoch-making improvements, the keen competition between gas and electricity as illuminants has led to the adoption of many new devices of a minor character. Fuller information in regard to all the matters which we have briefly referred to above will be found in the special articles which follow. It will be seen that the magnitude and number of works of municipal engineering shows no sign of declining. The year under review has been one of considerable activity, and steady progress has been made in every department.

## ROADS AND STREETS.

Highway engineers in the British Isles have had much to occupy their attention during the past year. The developments brought about by the creation of the Road Board have not only proved interesting when considered in their local applications, but have also provided no small part of the subject matter discussed at the Irish Congress held in Dublin in April, and at THE SURVEYOR Conference of Highway Engineers at Olympia in the same month.

### THE SECOND IRISH ROAD CONGRESS.

The proceedings of the Second Irish Road Congress, which was held on April 19th, 20th, and 21st, were reported in our issues of April 21st and 28th, May 5th, 12th, and 19th, and June 16th. Much of the subject matter of the papers and discussions related especially to conditions in Ireland, and largely to administrative matters, but some of the papers were valuable contributions to the study of highway engineering, while suggestions and opinions of considerable importance are to be found in some of the shorter ones. Reference may here be made to the following papers, the date in brackets referring to the issue of THE SURVEYOR in which it will be found:—"The Road Question Viewed Generally," by P. C. Cowan, M.INST.C.E. [April 21st]; a very valuable paper, presenting and discussing important statistics, and treating of foundations, widths, cambers, methods of maintenance, and steam rolling. "Is the Macadamised Road Out of Date?" by C. O. Seymour [April 28th], in which the use of rock asphalt as a binder for broken-stone roads is advocated. The idea may require some development in practice, as the possible effect of the asphalt in holding the stones too rigidly, with resulting slipperiness, seems to have been overlooked. Even with tar pitch binders it is already being found that a road crust with the stones appearing at the surface may be slippery in the summer, and possibly inferior in this respect to the tar film. "The Growth of Ordinary Traffic on Irish Roads," by E. K. Dixon, M.INST.C.E. [May 12th]. In this paper the dimensions and ordinary loadings of Irish carts and side cars are given. "Heavy Motor Traffic in County Kerry," by Singleton Goodwin, M.INST.C.E.; an instructive account of the effects of heavy motor coach traffic on crusts of insufficient strength, needing, it would seem, a good foundation course in parts of the route, and an increased thickness of the crust in other parts. The wheel loads were, perhaps, somewhat heavy, having regard to the present conditions in Ireland, and the new coaches for this service carry from 10 to 14 passengers each as against the 22 passengers of the coaches which did the damage. It may be noted that the old coach roads in Ireland were provided with such crusts: that which runs through County Tipperary having been found, when opened up, to be nine inches or more in thickness. "The Relative Value of Road Stones," by Henry F. Gallan, ASSOC.M.INST.C.E. [June 12th]. In this paper an interesting comparison is made, with diagrams, of the results of rattler tests of stones and the behaviour of the same stones in service. "The Maintenance of Rural Highways," by Arthur Gladwell [June 30th]; a short but useful paper, noteworthy for its advocacy of a method of strengthening the edges of the crust. "Road Improvement and Traffic Requirements," by Reginald Ryves, ASSOC. M.INST.C.E. [September 8th]; a paper illustrated by diagrams and dealing with the treatment of roads at bends and crossings, the effects of wheel loads at the edges of a road crust, methods of treating the edges of the crust in narrow lanes, road widening, and the theory of the hydraulic gradient. "Bog or Peat Moss Roads," by J. W. Lecbody, B.A., B.E. This interesting paper is notable as dealing with a problem in road construction, or reconstruction, under conditions of special difficulty.

While the above papers are mentioned either because they deal with matters of general interest to highway engineers or because of some element of wide application, there were other important papers dealing with specific subjects (such as those on quarries and quarrying, respectively by W. F. Barry, ASSOC.M.INST.C.E., and by James Lang); a paper on Urban Roads and Streets, by A. C. Larminie, J.P.; a short paper by Prof. C. W. L. Alexander, on reinforced concrete; and a paper on wheels and tyres, by A. B. E. Cheeseman. One of the subjects fully discussed at the Congress was "Steam Rolling," with reference to Irish roads; and another subject which was fully thrashed out was "Direct Labour." In the issue of July 14th, p. 69, will be found our own "Notes from the Papers and Discussions" of the Congress; and the collected papers, with reports of the proceedings, are contained in the "Record of Proceedings" (Dublin: Eason & Sons).

### "THE SURVEYOR" CONFERENCE AT OLYMPIA.

THE SURVEYOR Conference of Highway Engineers, held at Olympia, on May 5th, under the presidency of Sir George Gibb, was reported in the issue of May 5th. Of the nine propositions submitted, two, the first and the fifth, were withdrawn. The discussion of the first, relating to the Road Board specifications for tar, which had not been published long enough to have been considered by the members of the Conference, was postponed to a future occasion. The fifth, relating to the total width demanded for the control of a road, covered a somewhat wide field, and on the ground that there was no specific point on which the Conference could make a resolution the proposition was withdrawn, doubtless to reappear on some occasion which will provide a suitable opportunity for the discussion of the administrative and engineering aspects of this important matter. In the third proposition, which was accepted, the substitution of the expression "roads of light traffic" for "a road of the second class" involved a consideration which was overlooked, namely, that with limestone and sandstone of good quality very good water-bound roads can be made for "light traffic," and where the traffic is of a mixed character such materials are by no means to be despised for secondary roads. The fourth resolution, relating to "wheels upon highways," was passed in a form which may be regarded as very satisfactory, since it embodies THE SURVEYOR recommendation of April 21st, p. 554, "that there ought to be for the whole country a minimum scale, the several counties being allowed to make regulations demanding greater widths. . . ."

The important proposition moved by Mr. Boulnois relating to "small constant repairs" was well-timed, for, with all due respect to road surveyors, it is certainly true that the confusion of mind arising from new conditions and the use of new materials has, as Mr. Boulnois pointed out, led to a tendency to neglect small constant repair. The opportunity presented by the holy calm in which this retrospect is written may be used to point out that there was at least a grain of sense in what the wicked motorist said to Mr. Davies: "Why not leave the road until it is bad enough to recoat?" Now, a really zealous application of the principle of small constant repair, if it is constant enough, maintains a road in good condition until the crust is worn to such a small thickness that it must be made up again. There is seldom any loose metal about because the patches are shallow enough to be done with chips alone, or small enough to be dealt with by the rammer. A large proportion of motor car traffic gives rise to special difficulties, but constant attention always tends to

reduce the size and depth of patches. That the seventh resolution, relating to records of costs of maintenance, was passed with the inclusion of the words "where an adequate staff is available for the purpose" may be regarded as an encouragement to surveyors who are at present without efficient staffs. The eighth resolution will do good service in fixing attention on the important subject of wheel forms and wheel loads. As regards the ninth resolution readers of THE SURVEYOR have been kept fully informed of the subsequent course of events, and may doubtless be relied upon to "keep the pot boiling" till the authorities consent to make the tea.

By confining the discussion to definite propositions the Conference succeeded in passing six quite definite resolutions:—Suggestive of the value for road crusts of some of the sedimentary rocks; affirming the importance of regulations regarding wheels and tyres; recognising the value of an old and well-tried principle in the maintenance of highways; noting that experience recorded is experience gained; affirming the importance of a study of traffic as affecting roads; and asking that highway engineers may be allowed to use at once the information telegraphed daily to London from the weather sentries of Western Europe.

### OTHER LEADING MATTERS AND EVENTS.

At an April meeting of the Institution of Civil Engineers, Mr. H. P. Maybury contributed an interesting paper on "Recent Developments in Road Traffic," and at the same meeting Mr. J. Walker-Smith contributed a paper, "The Improvement of Highways to Meet Modern Conditions of Traffic." These papers should be studied, with the discussion, in the "Proceedings" of the Institution; but it may be remarked that Mr. Walker-Smith's paper was crammed with good stuff, a little rich, perhaps, and with not quite enough groundwork of flour and egg to make it easy of digestion. Nevertheless, a welcome change from the "Spotted Dog" too often served up in Great George Street. It may be suggested that as regards both his estimates of the costs of maintenance of tar-macadam roads and his apparent view as to the suitability of this material for secondary and tertiary roads, Mr. Walker-Smith was providing a basis for argument and suggestions rather than advocating a policy.

A summary of a report on the Highways of Maryland appeared in the issues of March 17th and 24th, pp. 398 and 449. Apart from its value as a professional report, the volume is a record of absorbing interest on the human side of highway studies. Another report from the Western side of the Atlantic will be found summarised on p. 948 [June 30th], the Michigan Specifications; balanced by a criticism specially written for THE SURVEYOR. In the issue of August 18th (p. 212) there is reproduced a useful paper in which Mr. H. P. Maybury deals with "the value of good roads: the supply of tar: the Road Board tests: and bridges." This paper was read at the annual meeting of the Institution of Municipal and County Engineers.

One of the most important movements of the year has been that in favour of the establishment of motor omnibus routes, the vehicles being propelled by electric motors fed from overhead wires. The important advantages which this system offers as a substitute for tramways were alluded to in last year's Annual Issue, in the issue of October 20th, p. 458, and in that of October 27th (p. 487) where it is pointed out that its suitability or otherwise for any particular district may depend upon the nature of the area—four classes being distinguished. The importance of insisting upon provisions for reasonable widths of tyres and diameters of wheels, and for a reasonably low maximum weight of the whole vehicle, is urged in the same article.

By his successful use of whinstone with clay binder, the sturdy north countryman, J. G. Bell, who passed away last year has made himself a place in the history of highways development, and his stone bridges form lasting monuments of another kind to his memory. It is safe to say that in both branches of the subject, roads and bridges, his work will be worthy of attention for many years to come.

### ADMINISTRATION: THE ROAD BOARD.

Hearty congratulations to the Road Board, which has carried out its work without fear or favour, and, in spite of wails from Norfolk and demands for more from Ireland, has impressed everyone with the sanity and fairness of its methods. No doubt the grants actually made have seemed to favour the owners of motor carriages and the owners and occupiers of houses alongside main roads, but it would have been difficult to make out a case for the *immediate* undertaking of works, either of a more general or of a more intimate character. The criticisms of THE SURVEYOR have been, it is hoped, rather constructive and suggestive than destructive or narrow, and have been made with absolute frankness; referring to secondary and by-roads, main road engineering and staff. The reader may be referred to the general indexes for Road Board matters generally, but the following, as specially important, may be noted here. The Board's "General Directions and Specifications" relating to the tar treatment of roads will be found on p. 611 [April 28th], and comments on p. 702 [May 12th], p. 880 [June 16th], and p. 917 [June 23rd]—Mr. Chambers Smith, Mr. H. G. Turner, Mr. J. Hutchinson, Mr. J. Runnells, and Mr. R. O. Wynne-Roberts. Certain misconceptions which appeared in a *Times* article were flattened out in the issue of May 26th (p. 769). THE SURVEYOR's view of the Board's first annual report appears in the issues of October 27th (p. 485) and November 3rd (p. 537); and it is considered in connection with the general policy in highway administration on p. 637 [December 1st] and p. 667 [December 8th].

Special attention may be drawn here to the importance of the policy of making good the improvements to any particular stretch of road with a view to linking up the improved portions later on; matters of drainage, width, levels, gradients and the forms to be given to cross-roads and turnings to take precedence of the re-making or building up of the road crust.

As regards London's traffic problems, nothing of importance has been done during the year. The extension of London County control of roads and of the planning of suburbs has been suggested, and for references to this matter and to the Board of Trade report the general indexes may be consulted.

As a matter of interest in highway administration the formation of the Association of Kent Surveyors is recorded with satisfaction.

### TRAFFIC.

The subject of traffic enumeration was dealt with in the issue of February 17th, and figures for Colwyn Bay (Mr. W. Jones) are given on a Road Board form in the issue of October 6th (p. 412). The matter will probably receive greater attention in the current year, especially as regards the numbers and characteristics of vehicles which specially wear or tear the roads. As regards traction engines, it may be noted that some of those exhibited at the Dublin Spring Show were provided with strips of wood, filling the spaces between the diagonal bars on the tyres, and it may be suggested that highway engineers when ordering engines or steam-rollers should give the preference to firms which send out new traction engines either with wheels so provided or with wheels the tyres of which conform to the regulations for "heavy motor cars." Small traction engines classed as "heavy motor-cars" get along quite well with these tyres, pulling loads quite as

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heavy in proportion as those of the large engines. A conviction for wilful damage has been obtained against a traction-engine driver who placed bricks and stones in front of the wheels of his engine in order to get a grip of the road; thereby injuring severely both the crust and the under-drainage. As regards horsed vehicles, a table of wheel loads and tyre widths—the by-laws for a number of representative counties, under the Act of 1878—was given in the issue of April 21st (p. 556). This was specially prepared for THE SURVEYOR, and gives the information both ways; maximum weights allowed on different widths, and minimum widths for different loads. Increased cost of maintenance on account of motor carriages has been chiefly on main roads, and largely in the form of prevention; but in some districts *narrow* by-roads have suffered from severe wear by motor-cars owned by residents, and this damage, even where the roads are not narrow, has been very severe at corners and sharp bends. By an important decision the use of the roads for testing motor-cars in such a way as to cause excessive wear has been declared to be extraordinary traffic if it give rise to substantial extraordinary repairs. When THE SURVEYOR, some years ago, called attention to the impropriety of certain long-distance trials, the Automobile Club and a part, at any rate, of the motor Press withdrew their countenance and support from such trials. It may be suggested that if hill-climbing tests are now reduced to what is reasonable and necessary there will be little need for convictions.

The plan of painting guide marks on street surfaces involves a principle of much wider application and of considerable importance, to be dealt with, it is hoped, in the pages of THE SURVEYOR during the current year.

### STREETS AND STREET PAVING.

A considerable amount of space was devoted during the year to the subject of town planning. It is impossible to make any brief general summary under this head, but reference may be made to Mr. P. C. Cowan's paper on "Town Planning in Ireland" [September 1st, p. 281] to another general paper by Mr. G. W. Hayler [June 9th, p. 867], and to Mr. J. Bryce's paper in the issue of September 29th (p.384). The Birmingham deputation's report on "Town Planning on the Continent" [p. 640, May 5th] contains the important consideration that in town planning the creation of factories and works of an offensive nature should not be at the end of a town towards the direction of the prevailing winds. The north end would be the best location, it may be observed, in most parts of the British Isles.

Though dealing with a period somewhat earlier than last year, the report of the Metropolitan Paving Committee [March 24th, p. 431] may be cited as indicating the general trend of paving work in the metropolis. The table on page 433 gives average initial costs.

Creosoted deal has been in favour in Fulham, the City of London, Wandsworth, Islington, St. Pancras, and the City of Westminster; Creosoted larch for new work in Fulham; Larch in Hackney and St. Pancras; Clinker blocks in Kensington; Tar macadam in Hampstead; and "Lithofah" blocks in Hampstead; while "Cork asphalt" has been under trial in the City and in Hampstead. Brick paving has not as yet found favour in the United Kingdom, but its advantages in certain respects should be kept in view, and its possible value for special purposes should be borne in mind when developments are taking place. Staffordshire blue bricks seem to be better than the paving bricks used in America [see p. 62, January 20th].

It is to be hoped that the present year will mark the end of the practice of strewing flint pebbles for the purpose of gritting streets. The matter was carefully considered in a "Minute" [p. 459, October 20th], in which a distinction was drawn between initial armouring, for which flint pebbles may be suitable, and subsequent gritting, for which sand seems to be a far better material. Another matter of some importance, especially where asphalt and tar-macadam street surfaces are much used, is the severe wear during hot weather occasioned by the use of narrow tyres, especially with certain kinds of loads [see p. 179, August 11th]. Municipal engineers are indebted to Mr. W. Marriott, F.R.MET.SOC., for the careful observations of street temperatures which he made on some of the hottest days of last year, summarised in THE SURVEYOR, December 1st, p. 649.

### TAR-MACADAM.

But little headway has been made with tar-macadam during the year. Two difficulties in connection with its use are its slipperiness under various conditions of weather and its failure to withstand severe traffic, at any rate under some conditions. As regards the latter point, Mr. Claude Robson (Willesden) wrote in his annual report [January 6th, p. 9]: "An attempt to introduce this material as the medium of repair upon roads receiving heavy traffic has not been altogether satisfactory, a small portion laid as an experimental section upon a road receiving public motor traffic having been practically destroyed within twelve months of its construction." In a paper giving the results of ten years' experience of tar-macadam [G. H. Ashworth and V. W. Laithwaite; March 3rd, p. 348] the results of using tar-macadam in a Lancashire urban district are described as generally very satisfactory, and in some cases surprisingly so. Special reference may be made to the cheapening of the process by the use of a large proportion of sand, as described in this paper; an idea which will not be new to readers of THE SURVEYOR. It may safely be said that very often indeed the quantity of small binding material used with tar-macadam is insufficient. Another cause of failure is that, when stone previously coated has been kept for some time in order that the coating of tar may become sticky, it becomes too sticky. The material put down before the roller is too stiff, and it is not consolidated as a water-bound crust is consolidated. Moreover, light rolling of this material gives a smoothness and evenness of surface which can only be obtained by heavy rolling in the case of a water-bound road or a road rolled nearly dry to receive tar grout. Comparing tar-macadam crusts with tar-grouted crusts, Mr. Hadfield (Sheffield) states that the latter seems able to withstand heavier traffic than the former. Let us think also of the significance in this respect of Mr. Gladwell's method. There is a primary difficulty, in that if we jam the stones together first it will be difficult to force in a stiff grout incorporated with the lesser binding solids. If, on the other hand, we roll stones into a matrix, the stones may not be sufficiently jammed together, and the final crust will probably depend to some extent on the stiffness of the matrix. This primary difficulty does not seem to be insurmountable; but it suggests that a middle course is not the safest and that tar-macadam which is merely tar paving with road metal is not good enough for the job.

### SURFACE TARRING.

A consideration of the extent of the advantage obtained by surface tarring on the scale to which we have recently become accustomed and an estimate of the force which there may be in any of the principal objections to the process are beyond the scope of an annual retrospect. The leading matters which have occupied attention in this connection during the past year have been duly recorded in THE SURVEYOR. A special translation of a paper by Mr. E. Griffon appeared in the issue of January 27th, dealing with the effect on vegetation of tarring roads; and the

records of certain observations are given in another specially translated paper [by C. L. Gatin, September 15th, p. 327]. Reference may also be made to a paper by Dr. Guglielminetti [July 28th, p. 112]. Owing to the serious nature of the evils which sometimes arise in connection with the manipulation of pitch, it has been thought desirable to place certain considerations before surveyors, so that if occasion should arise they may be prepared to take whatever precautions may be necessary to preserve the health of the men who tar the roads [June 30, p. 941, and September 15th, page 321]. Attention has been drawn to the dust nuisance arising from the neglect to remove excess of blinding sand. It may often be necessary to use more sand than the tar film will ultimately take in, and in this connection the following passage from THE SURVEYOR of June 9th, p. 842, may be quoted: "The practical conclusion to which we have come is. as soon as the tarred road is in good order the excess of sand and the dust that is with it should be removed to give it a good start, even if the weather forecast points to rain, because the rain may not be heavy enough to swill down the road." Tarred roads are, in fact, sometimes dusty under motor car traffic when water-bound roads in the neighbourhood are quite dustless. But the amount of dust is usually small. On this point Mr. W. Oxtoby (Camberwell) stated in a report [p. 546, April 14th]: ". . . in 1908 . . . I stated that the treatment was more efficacious in the maintenance of surface than in its dust-laying properties, the water-cart being still found indispensable. . . . The results confirm and strengthen the opinion I first formed." Tarring roads in urban districts is, in fact, quite a different matter from the tarring of country roads.

As regards the complaints which arise owing to the greasiness of tarred roads when the tar-film breaks up under rain and traffic in combination, or traffic and seepage, these will no doubt be followed by complaints of slipperiness in frosty weather. [See the issue December 1st, p. 639 and p. 643.] Without going further into the matter it may be suggested that the best way of tarring has not yet been found out, having regard to materials, methods, the times of year, and the quantities per square yard. What does demand attention is the high cost of tarring in many cases. We believe that it would not be difficult to find an engineer who would undertake to make a water-bound road crust for main-road traffic at a reasonable cost and keep it dustless—or as dustless as the tarred roads—for £50 a mile, by sweeping and sprinkling alone. In this matter, and in connection with measures to be taken to prevent dust, it is worth while to consult Mr. R. Ryves' summary of Mr. W. Marriott's tables and diagrams, in order to obtain a clear idea as to the manner in which dry and wet spells of weather have occurred in the past twenty years [September 22nd, p. 359].

### THE ROAD CRUST.

Methods of strengthening the edges of the road crust have already been referred to (Mr. Gladwell and Mr. Ryves—Irish Congress), and another way in which the parts near the edge may be strengthened when the camber is too steep is suggested by Mr. J. G. Powell's method of reducing excessive camber, explained, with a diagram, in the issue of August 18th (p. 230). A consideration which is very important in principle and admits of application in many, though not in all, cases has been put forward by Mr. G. H. Jack (Herefordshire), who pointed out that the parts of the carriageway near the edges may be made up with a material of less wearing strength than the stone used for the middle part. It should be noted that it may be impossible to avail oneself of this principle if the edges, for want of support, sink or break away, and the results of "tear" dominate those of "wear."

On the subject of costs, useful data referring to the resurfacing of main roads in a Midland town are given in the issue of February 17th (p. 272) (Mr. W. Ransom), and figures relating to main roads in the Lake district (Mr. C. Watson) will be found in the issue of March 17th (p. 404). As regards materials, there are recorded on p. 264 [February 17th] cases noted by Mr. W. W. Crosby (Maryland), showing that there are good road stones which give poor results with rattler and cementation tests. This was the case with a quartzite, and with oyster shells which in that country, as elsewhere, are quite a useful road material. A paper, "Notes on Kentish Rag Tar-Macadam," by Mr. P. W. Harrison, was reported in the issue of May 26th. It contains an analysis of Kentish Ragstone. The important subject of the classification of sizes of road stones is dealt with in the issues of October 27th (p. 485) and November 10th (p. 546). This kind of standardisation does not impose fetters, but makes a definite connection between words and their meaning. One reason why it is necessary is that unless sizes can be anticipated with fair accuracy proper grading cannot be done, and really solid rock roads cannot be made except by special work in grading on the spot. In road crusts dirt is bad because it is matter out of place, but places without matter may be quite as injurious. Contrariwise, a drainage layer should contain voids of known size, effective in keeping back solids and allowing of the trickling of water.

Random setts, at present little used in this country, provide quite a large proportion of the paving of German towns, 18 per cent. in the larger and 8 per cent. in the smaller towns, and nearly a third of the paving of Greater Berlin [see p. 232, February 10th].

An application of the carpeting principle to residential, and apparently shaded, streets in Ann Arbor (Michigan) is described in the issue of November 10th (p. 571). The subject of damage done to road crusts by the practice of locking the wheels of vehicles when descending hills was brought up by Mr. C. H. Cooper, and was the subject of a "Minute" [p. 457, October 20th]. The properly-managed use of skids seems to be a satisfactory solution of the difficulty as regards ordinary vehicles, but there are some special cases that demand further investigation, and this may be regarded as a subject handed on to the present year. It is, perhaps, easier than is generally supposed to obtain convictions for "wilful damage," and this may be worth considering in such cases.

### THE ROADSIDE.

It is gradually being realised that the margin of width beyond the carriageway is an important part of a highway. Sufficient width is needed for the provision of adequate drainage, not only for taking away the rain water from the surface, but also for dealing with seepage water and bank water before it reaches the road. A hedge which admits of the passage of air currents, especially in winter, is better than a wall which keeps a road damp, but it demands more room. Similarly the space between the hedge and the carriageway being occupied by a snow-drift shows that the snow has been kept off the road, which it is more likely to block if the hedge is close to the carriageway. There is also to be taken into account the doctrine of emergency width, which, it is believed, first saw the light in THE SURVEYOR some years ago, and has recently been taken up in other quarters. As regards roads in Scotland, the law of 1770 provides that there must be 20 feet width of clear, passable road [see February 3rd, p. 212]. The road authority can take ground free of charge for this width, clear of banks and ditches, if they put the fences in their new position. They can take a width up to 30 feet by payment and up to 40 feet by application to the Sheriff. The principle is a good one, but probably only a

small allowance would be made for ditches and banks under this procedure. However, supposing 16 feet or 20 feet to be sufficient for the carriageway, the rest of the passable road, 4 feet or 10 feet respectively, might be grass margins, or one footpath and one grass margin. In this connection the reader should look at the Legal Summary in this issue, and turn to the indexes and look up "Law Queries: Highway," for the interesting points that have been noted on during the year.

TREES.

With reference to trees in towns, Mr. Claude Robson has pointed out that an objection to the horse chestnut is the attraction which its fruit ("conquers" or "conquerors") has for boys, and the resulting danger to windows. Mr. Robson thinks that for some of the narrower streets the acacia may be preferred to the plane. In the issue of February 10th (p. 232) there is a reference to the value of shade trees for asphalt roads. A defence, by Mr. W. Weaver, of the managementof the London trees will be found in the issue of April 21st. Roadside tree management is really very good in London. It is much neglected in many parts of the country, and it often seems to be overlooked that far the worst drip is from dead and rotten branches.

In a paper by Mr. G. W. Hayler [June 9th, p. 867] we read: "The choice of trees is a matter of serious consideration, as so many of the existing specimens in our streets, struggling bravely on amidst countless disadvantages, lead the man in the street to regard the subject as a costly fad." The range of suitable trees, it may be remarked, is very much wider than present practice would lead one to suppose, and the question whether the tree *thrives* in the particular soil and climate may be more important than the question whether, possibly on inadequate data, it is supposed to be a species which thrives in cities. Some years ago Mr. H. Percy Boulnois prepared a list of trees which have qualifications as city residents, and the matter has been since referred to in The Surveyor. If the information is not in the window, please ask for it, sending particulars of soil, width of road and height of houses.

"The Planting and Care of Young Shade Trees," a report by the forester of the Massachusetts Highway Commission, is summarised in the issue of October 20th (p. 470), and the matter is considered somewhat more generally on p. 514 of the issue of November 3rd.

MAINTENANCE.

One of the most striking facts brought to the notice of highway engineers during the past year is that the cost of maintenance of English roads is, when the density and grouping of population and the heavy traffic are taken into account, very low compared with the cost of maintaining French roads. Further, if we take Irish roads into account, the proportionate effect of weathering on the large mileage with its small population has to be considered. It may then be urged that the Irish roads are not so good as those of France, and that cost of haulage and slow speeds have to be reckoned with. The fact is that comparisons with figures alone are very misleading and there is no way of comparing roads except by the exercise of judgment, and taking into account all the factors, including climate and the cost of living. It is a matter of asking for the opinion of a good judge of roads. For important figures and the correction of a serious error, see Mr. R. J. Thomas's letter on p. 77, January 20th; and for some leading factors of comparison see the issue of December 16th, 1910 (not 1911), p. 789. In the British Isles the problems now include, we are glad to record, that of making a judicious and sufficient capital expenditure in order to reduce the cost of maintenance or to lessen the rate of increase of cost with increase of traffic. This can, it may safely be said, be done in many parts of the Kingdom. The actual costs per mile are best studied over areas of small size. It is fairer to compare the roads on chalk in one county with the roads on chalk in another county than it is to compare whole counties as regards their main or other roads. Another important point is that the greater the mileage of main roads per square mile of the county the less should be their costs per mile.

The costs of maintenance of the Warwickshire main roads rose from £76·2 in 1908 to £88·9 in 1909, and £92 in 1910, and this is typical of similar increases in other counties. These increases are to some extent imaginary, inasmuch as the difference is partly due to the falling value of money.

On the administrative side of road maintenance, the subject of roadmen's wages and the organisation of staffs is one which is coming to the fore. A condensed account of a debate by the Staffordshire County Council will be found in the issue of December 8th (p. 689), and some comment on p. 665. The Surveyor supports the policy of better pay and conditions for road men, accompanied by better organisation and sound discipline. A part of the "increase" in pay will be no more than restitution, since the value of money has fallen. The increase in the national income, however, more than covers this fall in value, and those who maintain the roads have a right to their share and should claim it. This is not Socialism, but the law of self-preservation in the realm of economics. Associated with the subject of staff, that of keeping careful records of road work demands attention, and reference may be made to a short paper on this subject contributed by Mr. E. P. Hooley to the Second Irish Road Congress [see p. 598, April 28th]. As a matter affecting the cost of maintaining roads of a light class, surveyors should not overlook the fact that whatever the width of a road may be, the Local Government Board may, if they see fit, and on application being made by the local authority, make an order closing the road to any kind of "motor car," including big vans, for which the road is not suitable. In the case of new roads the procedure adopted at Malden—warning notices—may be followed [p. 379, September 29th].

WATERING.

There are signs that watering for maintenance, or for dust-laying and maintenance together, will be one of the subjects discussed during the present year. Mr. Whinery (New York) considers that water is the "least developed" of the dust layers. The cost of tarring is by no means small, and in some parts of the country it is less easily done and is less useful than in other parts. In urban areas tarred roads have to be watered and swept, and they become very unpleasant if this is done in a half-hearted fashion. There are useful notes in a short paper on "The Dust Nuisance" [by Mr. J. S. Brodie, August 18th, p. 217]. In Blackpool, Mr. Brodie explains, the streets are really *washed*, and loose dust is not "laid," but is swept off. Sprinkling is done with sea-water to prevent dust. "Rolling and Watering in Road Maintenance" is the subject of an article on p. 437 [October 13th] and a letter (p. 469) in the issue of October 20th. The broom or besom is a great economiser in road watering, and it may be suggested that the roller may be used to the same end. If roads, when in the plastic state after *heavy* rains in the spring, were lightly rolled, the quantity of water needed afterwards to keep the bumpy parts damp would be reduced. Given a road sealed from the full effects of summer sunshine and sheltered from the full effects of drying winds—and there are many such—the water-cart, aided by the roller and the broom, might be used as an alternative to spending some £50 a mile for tarring. The method should be especially effectual on portions of road in cuttings or between high walls, which places are easily kept

damp since they dry slowly, are often narrow because the cuttings cost money, or because the land is valuable, and are places where the tar-mud nuisance, owing to concentration of traffic and lingering wetness is often serious. The conditions are specially bad for tarring and specially favourable to cheap watering. If the plan outlined should prove effectual, a further economy could be effected by using a light roller, rolling a width equal to the path of a 10-ton or 12-ton roller. The same machine would be useful on by-roads, which are now often injured when being made up, because the work is done in the wet, when the nearly worn-out crust is at its weakest. In other cases the thickness of metalling rolled is too great because a thin layer would, if rolled, be crushed into the subsoil. It should not be impossible to design a machine which would embody Mr. Ryves' idea of an ordinary roller convertible into a high-pressure roller with somewhat narrower path and heavier wheels. The third set of wheels would be lighter with a wider path. Certainly two rollers should be obtainable with one body, either an ordinary one convertible to a high-pressure roller or an ordinary one convertible to a low-pressure roller; somewhat less, too, in total weight.

As regards the management of rollers, an interesting statement by Mr. J. W. Harrison (Uxbridge Rural District), shows that he found a chaldron of coke, costing 12s. 6d., lasted as long as a ton of coal costing 18s., and did as much work. A paper dealing with the details of the management of steam-rollers was read before the Society of Municipal Engineers [Mr. W. Maugham, p. 902, June 16th].

A comparison between the costs of horse haulage and of mechanical haulage in Wiltshire (Mr. J. G. Powell) will be found on p. 218 [August 18th]. In a paper read by Mr. J. W. Gleave, at Manchester, there is a table of expenditures on scavenging and ordinary repairs during recent years in a borough. Several different kinds of paving are referred to [see p. 933, June 16th].

The present year bids fair to be a very interesting one for highway surveyors, but a very difficult one. It will be less difficult if the experience of the past year is carefully studied and rightly interpreted. The best has not yet been done with existing knowledge, which is scattered and hidden. The best has not been done with existing materials, subjected as they are to heavy loads on small wheels with narrow tyres, and otherwise maltreated in ways which would not be possible if drainage, width, and proper means of strengthening the crust were given the foremost place in road improvement. The most has not yet been made of watering, sweeping and rolling, nor with grading to get a really solid crust. The best use has not yet been made of tar, nor alternatives provided in the places where it is least successful. Surveyors must not be bluffed into the idea that they have failed and that someone else—smelling of petrol—should be given a chance. If this year sees a rally to sound principles, a firm stand on the point of tyre widths and wheel loads, and another firm stand on the point that the road must be treated as a whole and improved as a whole before it is condemned, then surveyors will be able to show that they have not failed and are not going to fail. If the Road Board will pour back as a flood the information and inspiration which it gathers from them as a vapour, the organisation will work as a whole, and all will be well.

## HIGHWAY BRIDGES.

It is impossible in a brief annual retrospect to refer to more than a few of the most significant or most interesting of the bridges which have been built or described in the past year. The special difficulties, and more or less new features, almost always met with in the design and the building of bridges of very large span cannot be discussed, nor can we pause to consider unusual difficulties of sites and circumstances. As regards highway bridges in the British Isles, the opening paragraph under the present heading in last year's annual issue still holds good, and need not be repeated, this, and the paragraph under "stone bridges," being "taken as read" again.

### GENERAL NOTES.

The summary of book reviews should be scanned for references to books dealing with bridges and materials used in bridge building; not forgetting Mr. J. Allen Howe's book on building stones. A matter of general interest is that it has been suggested that in order to get over a difficulty which sometimes arises respecting the renewal or destruction of an old bridge which is of historic interest some bridges of this character should be taken under the protection of the Royal Commission on Ancient Monuments. (See the issue of February 17th, p. 258, and September 29th, Supplement, p. 11.) Cement grout may sometimes be used to give strength to weak masonry, but in many situations the chinks between the stones of bridge masonry have filled with soft earth or other material and the work cannot then be done as easily as in the case of the masonry of a dry building. As regards strengthening generally, a bridge may sometimes, when the waterway is ample, be strengthened by additions under the spans and in front of the abutments. Works of this kind are referred to in the issue of June 9th, p. 865 (Mr. E. Stead, Somerset).

An interesting work of bridge widening by means of ferro-concrete was done at Tenbury (Mr. J. H. Garrett, Worcestershire), affording an instructive example of the value of ferro-concrete as a material for use in widening and strengthening a masonry bridge without destroying the general features of the old bridge. It would, of course, be possible to make too much of a case such as this; or, rather, to misinterpret its significance, for there is such a thing as widening and strengthening a masonry bridge with masonry work, not reinforced.

Up to June 30th, the Road Board grants for the reconstruction and improvement of bridges amounted to nearly £10,000, about one seventy-eighth of the amount applied for, compared with grants amounting to about one-seventeenth of the total applied for in the case of improvements of road crusts. Probably this was due to the consideration that the crusts will anyhow require renewal, while the bridge work would be lasting. This necessitates scrutiny of the plans, especially with a view, one may suppose, to guarding against the construction of a bridge which would be a weak link in a chain of bridges and roads. The Road Board can hardly be expected to take up the complicated and difficult subject of bridges in the first year or so of its existence. With regard to heavy vehicles on highway bridges, reference may be made to p. 213 of the issue of August 18th (Mr. A. P. Maybury).

An historic sketch of Rochester bridge and its predecessors (September 23rd, p. 369) reminds us that important facts relating to the durability of bridges of another class—iron bridges—have been recorded in the past year, and attention may especially be drawn to the old chain bridge at Newburyport, Massachusetts, some particulars as to which will be found on p. 271 in the issue of September 1st. There seems good reason for supposing that some of the iron links had been in service 100 years, and certainly over eighty years. The date given as 1910 in the article should, of course, be 1810.

Some of the conditions affecting the choice of type,

or rather of general form, in bridge design, were discussed in a paper which was summarised on p. 887 of June 16th (Mr. C. R. Young, Canada).

### FERRO-CONCRETE BRIDGES: THE LEADING TYPE.

On account of its adaptability to a very great range of spans, we must regard as the leading type for ferro-concrete work, just now, that which consists essentially of two or more arch ribs supporting spandrel columns, on which the deck beams rest. The type may be followed in masonry and steel bridges, a notable example of a large span masonry bridge of this kind having been built in France a few years ago. It is, however, the development of this type in ferro-concrete (reinforced concrete) which at present claims our attention. An ordinary form is the span of two or more arch ribs of plain or reinforced concrete braced together, and supporting spandrel columns and the longitudinal girders, these in their turn supporting the cross beams and deck: all this work being in ferro-concrete, but not necessarily monolithic. The footways are usually carried on cantilever continuations of the cross beams, in wide bridges, while in other cases little more than the parapet overhangs the outer ribs.

### GEIL BRIDGE AND KELTY BRIDGE.

A good example of this type is Geil bridge, Lanarkshire (Scotland). The span is 50 ft. with a rise of 8 ft. There are two ribs, 12 in. wide by 21 in. deep at the springings; wind bracings 12 in. square; spandrel columns, and cross beams extended as cantilevers. The deck is 5½ in. thick. The test load for this bridge was two 17-ton rollers moving across it at the same time, the static load, 140 pounds per sq. ft., being much less severe.

A bridge of somewhat larger span, 58 ft., has been built at Kelty, near Callander, Scotland; and in this case there are no columns, the ribs being extended upwards as spandrels. Usually, the smaller span would be the more likely to have continuous spandrels, but, comparing these two bridges, we find that the rise of the Kelty bridge is much less than that of Geil bridge, about 5½ ft. against 8 ft., the rib-spandrels of Kelty bridge being 1½ ft. deep at the crown, 7 ft. deep at the springings, and a foot thick. Separate wind bracing was not needed, the total depth being small, and the spandrels being braced by the twelve cross beams, which are 10 in. deep by 5 in. wide, carrying a 5-in. decking. These beams are extended as cantilevers, carrying the parapets, which are 20 ft. apart in the clear.

The necessity for reinforcing the ribs in some such bridges is not always apparent, though it is not suggested that there was insufficient reason for it in this case. Both arch ribs and simple arches are usually, though not always, reinforced when ferro-concrete is used for other parts of the bridge. In some cases reinforcement, or main reinforcement as distinct from subsidiary, may reduce the cost of foundations by lightening the span and lessening loads on the foundations, and thrusts. In other cases reinforcement facilitates the attachment or, rather, the building in of spandrels and cross bracing, and distributes their reactions, while in large spans the weight of the plain concrete arch might itself impose stresses great enough to make the ferro-concrete arch the cheaper alternative. Steel under compression in a ferro-concrete arch rib is being used economically when it is taking a greater load than it could take as part of a strut, a higher average stress.

### BERCAIL HILL FOOTBRIDGE.

Of the same general type as the above, the graceful Bercail Hill footbridge (Mr. H. Deuchar) of 64 ft. span is a good example of the development of the type as a bridge for heavy load. The girder between parapets is 8 ft. 6 in. and the decking for a loading of 1½ cwt. per sq. ft. results in a design which suggests a larger span, till one notices the smaller proportionate rise and the wider spacing of the spandrel columns, realising that width of roadway and loading per ft. run influence the form which the type will take for a given span.

### BERW BRIDGE.

A bridge of the same type, but of much larger span, 116 ft., has been built at Berw, near Pontypridd, across the river Taff (see p. 67, January 20th). The width between parapets is 24 ft., and the 116 ft. main span consists of three arch ribs, with a rise of 24 ft. Each rib has eight spandrel columns, with a continuous spandrel in the middle part. There is an approach span of 26 ft. at each end, and, as the springings of these are far above those of the main arch, the six piers are strutted from the abutments by six ferro-concrete struts, 18 in. by 16 in. Since the springings of the main arch ribs are well above these struts, which are underground, the design has a decidedly uncomfortable appearance, especially as the thrusts have to be transmitted by way of separate piers founded on groups of piles. In other respects the design would be better if the piers at each end were made into one below high water level, but the lack of a direct connection between the main arches and the abutments is what makes the bridge look tired.

### MEADOW STREET BRIDGE.

At Pittsburg, Pennsylvania, there has been built a bridge of 209 ft. span, with an arch rise of 40 ft., of the same type as the preceding examples. The approaches have each three arches of 21 ft. spans, carried on columns which resemble the spandrel columns. The main piers are cellular, 14 ft. thick, and are balanced to the eye by the similarly made ends of the approaches or abutments proper. The three ribs are each 6 ft. 2 in. deep at the springings and 5 ft. at the crowns, the outer ones being 3 ft. thick and the inner one 5 ft. They are connected by braces at the panel points. The spandrel columns, 24 in. sq., support spandrel girders, which are developed as semi-circular arches; probably quite a sound engineering feature, having the effect of shortening the columns and providing them with "good ends." The cross beams are continued as cantilevers to support the footways. The design seems well adapted to the steep, rocky valley.

### GRAFTON BRIDGE: NEW ZEALAND.

The Grafton Bridge, Auckland, New Zealand, is the longest span bridge of this type, and next to the longest span masonry or ferro-concrete bridge in the world. On account of the great length of span, 320 ft., there are developments from the more usual forms of the type. One of these is the high ratio of rise to span, the 70 ft. rise being within 10 ft. of a quarter of the span. This reduces the thrust in the arch and brings the thrust at the springings nearly normal to the ground. (See the issue of March 10th, p. 366.)

Each of the two ribs has a centre hinge and, accordingly, the half ribs are biggest at the quarters. The main piers are large and are heavily reinforced. Another point to be noticed is the provision of expansion joints at several places in the bridge, which is more than 900 ft. long.

### A TYPICAL HIGHWAY BRIDGE.

The Wye has been bridged at Newbridge with three elliptic arches, all of 50 ft. span. The description of this bridge, which will be found in the issue of May 26th, p. 33 of the Supplement, should be carefully studied, since it is not only a good example of a modern development of a very old type of highway bridge, but it has several features of interest. In some of the examples already considered the main interest was in the span itself, but this is an example of a bridge where a typical river crossing, and from that point of view the type would have been the same if the arches had been segmental ones of solid

masonry. Elliptic arches of sold masonry, or plain, rammed concrete, would have been heavier, exerting somewhat greater thrusts and, at the same time, less stable than segmental ones or the elliptic ferro-concrete arches. On the other hand, this being a crossing with some ten feet difference between high water level and low water level, segmental arches would have exerted flatter thrusts at the abutments, and somewhat greater average thrusts if their springings had been clear of high water level and the soffits no higher. If the thrusts had been reduced by giving these arches a greater rise, either they would have obstructed the waterway, or the road would have had to rise to the bridge. Avoiding both these drawbacks would involve a lengthening of the span. While there are cases in which the lower parts of the arches will have to be submerged anyhow, this was a case in which it was possible, by adopting elliptic arches, to keep the springings above high water level, which is usually worth aiming at if little or no extra cost is involved and the road is not humped. The battered piers of solid concrete faced with stone, are typical of sound ordinary practice at a favourable site; and the light iron tube railing, divided into lengths of about 50 ft. by the upper parts of the piers, is a good form of parapet when it is desired to keep down the total load, to prevent the roadway from becoming a dust trap in dry situations in hot countries, or muddy in damp glens. The inclination of 1 in 55, which is given each way from the centre of the bridge, the waterproofing of the deck, and the drainage outlets near the ends of the bridge, are means of drainage suitable for bridges of moderate total length such as this. The greater rise of the main span, 9 ft., compared with the 8 ft. rise of the others, provides the greatest headway where it would be looked for in case of need, and is not enough to introduce unbalanced stresses. The details of the beams and decking show that the bridge is a very strong one, and the proportion between the spacing of the arch ribs and the overhang of the cantilevers is suggestive of a due regard for the demands of original economy and lasting stability. The cost, excluding supervision, was about 17s. per square foot between abutments and between parapets, and is by no means high for such a bridge.

BEAM BRIDGES.

Using the term "beam bridge" to denote the type in which there are no main girders, but a number of shallower beams side by side, we have to record the development of this type in ferro-concrete. The usual conditions demanding the use of this type are necessity for headway or the costliness of cross girders for a very wide bridge. At Blaina, Monmouthshire, a bridge of this type has been built, partly using old abutments. The roadway is 60 ft. wide, and there are fourteen ferro-concrete beams, spaced 4½ ft. apart. Twelve of these are 8 in. wide by 12 in. deep, the two outermost being 2 in. deeper. Traffic was carried on during construction, which is one of the advantages offered by this type, whatever the material (September 29th, Supplement, pp. 10 and 11).

Another bridge of the kind was built at Llanvihangel, 12 ft. span, with a roadway 23 ft. wide. Both these bridges were designed by Mr. W. Tanner, county engineer.

The same type was adopted at Timsbury, a bridge of two 30-ft. spans, each consisting of four main beams and resting on four ferro-concrete piles as the central pier. This is a good type for sluggish streams; and not only is the type an old one, but the particular form of bridge is familiar in timber in some districts.

OTHER BRIDGES.

Mention may be made of three Gloucestershire bridges referred to in the issue of March 10th, p. 363, two of them 12-ft. spans, and one of them a 28-ft. span.

Long Eaton bridge (March 17th, p. 402) is 50 ft. in total length, with brick and concrete abutments and retaining walls, faced with pressed blue bricks, the copings being of Derbyshire grit. Not many stones harmonise really well with blue brick, but the effect in this case seems to have been satisfactory. As to blue brick itself, it is, perhaps, better suited than is usually supposed, for some kinds of bridge work.

A bridge of six ferro-concrete arches, each of the five piers resting on ferro-concrete piles, has been built across the Stour, and another Midland bridge is that across the Sow, at Stafford, an elliptic arch of 56 ft. (Mr. W. Plant).

Cuckoo Bridge, at Spalding, has a segmental arch of 27 ft. span, with 4 ft. 6 in. rise, the old masonry abutments being used. It is not clear why this arch should be reinforced. There may be a good reason in this case, but it is to be suspected that in some small spans the real service performed by the steel is that its presence, and that of the trained workmen employed when it is used, ensure the concrete being of good quality, without any large stones near the surface, and thoroughly rammed. It is like the clergyman at the feast whose presence, even if he says nothing, ensures good behaviour.

Perhaps the most important lesson of the year is that no basic principle in bridge building ever dies, but is, rather, fulfilled "in many ways." For a considerable period the pre-eminence of steel made the pair of main girders, spaced the full bridge width apart, the dominant type. That phase has passed. The rolled steel beam and trough flooring brought out again the old principle which was first developed in timber bridges, consisting of two main beams, with cross girders projecting somewhat beyond them as cantilevers. The same materials revived the principle of the beam bridge with cross planking. In the masonry arch itself both principles have come forward, giving us bridges with two or more arch ribs and more or less overhanging footways. The old tubular bridge at Menai has survived to see an important principle of its design embodied in bridges in Italy and California.

## SEWERAGE AND SEWAGE DISPOSAL.

The record of the past year in the domain of sewerage and sewage disposal is one of steady progress in the development of systems and methods previously in vogue. No radical changes of opinion have appeared, but knowledge of these subjects has increased with the experience which has been gained in various directions. One of the most noteworthy features of the year's work is the increased activity in these branches of engineering in America where, both in Canada and the United States, the various problems have been discussed at many meetings, experimental works on a large scale are being carried out, new works of considerable magnitude are being constructed and several valuable reports, such as those dealing with the disposal of the sewage of New York and Chicago, have been published. In addition to these the adoption of the Imhoff tank and of means for sterilising final sewage effluents in several cases will provide experience beyond that which we in this country are in a position to obtain, and it is becoming evident that instead of Americans coming to us for information as in the past, we shall, before long, have to go to them.

SEWERAGE.

Among the most important works of sewerage which have been in progress during the past year, one of the largest is the trunk sewerage system of

Toronto, Canada, part of a scheme estimated to cost £500,000. A description of the work was included in the annual report of the city engineer, Mr. C. H. Rust, whose labours were not confined to this one contract, as mention is made of 17 miles of new sewers, 19½ miles of private drains, and a large contract for water filters. A scheme of sewerage involving the expenditure of £443,000 has now been adopted for the town of Port Elizabeth, in South Africa, and it is anticipated that it will be commenced during the coming year.

It is impossible to mention in detail the many schemes of sewerage in this country which have been in progress during the past year, but they have been described from time to time in these pages. A large number consist of extensions and additions required to deal with the increase of population or in connection with new schemes of sewage disposal.

Mention must, however, be made of the deep sewer which is being constructed as a part of the great scheme of the London County Council for increasing the drainage facilities of London. This work is being done on the advice and under the direction of the chief engineer to the London County Council, Mr. Maurice Fitzmaurice, C.B., M.INST.C.E., and the section of the work now in hand was described in a paper read before the Institution of Municipal and County Engineers at a meeting in Battersea in October last by Mr. R. M. Gloyne, the district engineer, who is in charge of the work. This sewer is about 8 miles in length and varies in diameter from 6 ft. to 8 ft. It is built partly in brickwork and partly in cast iron rings lined with blue bricks and concrete, practically the entire length being tunnelled at depths from the surface to invert level varying from about 22 ft. to about 70 ft. A fully detailed description of the method of construction is given in the paper, and it is anticipated that the contract will be completed in about twelve months' time.

### STORM-WATER SEWERS.

This subject received further consideration by American engineers, and it is interesting to note the difficulties they encounter when it is suggested that it is necessary to decide definitely upon certain surcharge periods when a city can afford to have its sewers flooded rather than incur the higher cost of larger sewers. Such a conclusion will be better understood when it is explained that there are records of rainfalls at the rate of 4 in., 5 in., and even 6in. per hour for a period of 10 minutes in several towns in the United States of America. English engineers are in a happier position when it is considered that it is, as a rule, sufficient to provide for the 1 in. in one hour usually prescribed by the Local Government Board. A feature of sewer construction is the increase in the use of reinforced concrete for the larger sizes.

### SEA OUTFALLS.

In connection with sea-outfalls, an ingenious automatic controlling apparatus, the invention of Messrs. Dodd and Dodd, M.M.INST.C.E., of Birmingham, was described in these pages on January 27, 1911, and on September 8th we printed a valuable article by Mr. C. J. Yorath, ASSOC.M.INST.C.E., dealing in full detail with the design of a scheme of sewerage for a seaside town. This is a very clear and concise statement of the principles governing a scheme of this type, and the various points to be considered in arranging the different parts of the scheme to the best advantage. Among the important matters dealt with are: point and period of discharge into sea, the question of pumping, volume of sewage and storm water, main trunk sewer, tank sewer for storage, and the construction of the outfall sewers. In estimating the maximum quantity of storm-water Mr. Yorath cites some of the heaviest known rainfalls in this country, and in one case only do the figures approach those quoted above from America.

### RIVERS BOARDS.

It was expected by many that the rivers boards for the various watershed areas in this country, together with the central controlling authority recommended by the Royal Commission on sewage disposal, would be brought into being during the past year, but once more we have to record that nothing has been done. A very similar authority which has been in operation in Germany for some years was described in detail early in the year (THE SURVEYOR, January 20th, 1911, p. 83); and a commission on practically the same lines has been proposed for part of the United States of America. We are still hoping that the recommendations made for this country may be carried into effect during the coming year, but we are not very sanguine in view of the heavy programme of legislation already foreshadowed in the daily press. This matter was the subject of a discussion at the annual meeting of the Institution of Water Engineers, in December, in connection with the report of the Water Areas and Statistics Committee. The report of the Joint Committee of the Houses of Parliament upon the Water Supplies Protection Bill of last year was strongly in favour of the recommendations of the Royal Commission on Sewage Disposal, and in view of the possibility of legislation being brought forward the opinions of water engineers as expressed in the report of their Committee will doubtless receive consideration by those in charge of any bill that may be introduced. In this report the matter is dealt with entirely from the point of view of water engineers and of the local authorities, companies and others who provide water for drinking purposes, and there would appear to be room for a similar report dealing with the subject in the interests of the many local authorities and individuals who are required to purify their sewage in order to prevent the pollution of rivers from which *others* draw their water supplies.

### SEWAGE DISPOSAL.

Among the many methods of sewage treatment recorded last year, several were described which are out of the ordinary run of things. In one case (needless to say this is in America) the liquid sewage disappears in a large fissure in the subsoil. This fissure is appropriately named the "Big Sink," and according to the report (THE SURVEYOR, September 15th, 1911) the sewage from some 10,000 people, without preliminary treatment of any kind, disappears into this subterranean passage and is seen no more. This is without doubt an efficient and economical method of sewage disposal so long as it lasts, and the city in question, Bowling Green, U.S.A., is fortunate in possessing a subsoil of such peculiar formation. There is only one question that arises in connection with this matter and that is as to the source from which the water supply of the city is drawn.

Another very satisfactory method of sewage disposal is to persuade some other person or authority to do it for you. This is the course which has been adopted by the Willesden Urban District Council. After struggling for years with ever increasing volumes of sewage in dry weather and enormous volumes of storm-water in wet weather; with an area of land for the sewage works very limited in extent, and during the last few years more and more hemmed in by a new, thickly populated residential district, the council, upon the recommendation of their engineer, Mr. O. Claude Robson, have made arrangements with the London County Council to take over the whole of the sewage from the district and thus relieve them of the worry and expense of treating it themselves. Incidentally the river Brent will be relieved of a considerable volume of sewage effluent and will be better able to deal satisfactorily with the effluents from the other districts which still discharge into this small river. An interesting feature of the work involved in delivering the sewage to the London County Council sewer was the construction of a 6 ft.

by 4 ft. egg-shaped sewer, in tunnel for its entire length, and the arrangements made by means of measuring weirs, controlling valves and automatic alarm-calls to ensure that the statutory quantity of sewage discharged into the London County Council sewers shall at no time be exceeded and that all surface water above this quantity shall be diverted automatically into the storm tanks or upon the existing bacteria beds, which will be utilised in future as mechanical filters for the excess storm-water before it is discharged into the river Brent.

AERATION OF SEWAGE.

The possibility of assisting the purification of sewage by means of forced aeration has in the past formed the subject of many discussions and experiments, but for some years now little or nothing has been heard of it, and the idea has generally been considered impracticable, if not useless. The subject has, however, been revived in connection with the question of the disposal of sewage by dilution, and in particular in the case of the treatment of the sewage of New York before it is discharged into the Harbour. It has been pointed out that there does not appear to be any agreement among experts as to the capacity of water to receive and purify sewage without creating a nuisance. In a report upon the New York problem Col. Black and Prof. Phelps stated that in their opinion sewage should not be discharged into water to such an extent as to reduce the amount of dissolved oxygen below 70 per cent. of the full saturation value. They also carried out a number of experiments with forced aeration of sewage after preliminary treatment in tanks, and in the end it was estimated that the cost of the process for current alone would be about 8s. 4d. per 1,000,000 gallons, with an initial outlay of about one-twentieth of the cost for construction of sprinkling filters after deducting land costs. One of our American contemporaries, in dealing editorially with this report, expresses the opinion that while it does not say definitely that satisfactory and economical results cannot be obtained by forced aeration of sewage, it very much doubts whether much benefit can be derived from this treatment alone without a thorough preliminary straining and it does not think that it has been determined by these experiments that such treatment will produce results in any way commensurate with the cost.

The matter is, however, still engaging the attention of American engineers, as forced aeration is mentioned tentatively in the report upon the disposal of the sewage of Chicago, which will be dealt with later under the heading of "Dilution." In this case, however, it is admitted that further information is needed before any definite conclusion can be formed. On the other hand, a scheme of sewage disposal for a seaside town in this country which included forced aeration as one stage of the process of purification was refused sanction by the Local Government Board.

THE DISINFECTION OF SEWAGE AND STERILISATION OF SEWAGE EFFLUENTS.

A further development of use of hypochlorite for the sterilisation of water and sewage effluents is found in the suggestion made by Prof. W. T. Sedgwick, of the Massachusetts Institute of Technology, to the city engineer of the town of New Bedford, that the sewage which it is proposed to discharge, unpurified, into the tidal estuary upon which the town is situated should first be disinfected by means of a modern disinfection plant. After discussing the proposal in full detail, not omitting the question of storm-water and storm-water overflows, Prof. Sedgwick expressed the opinion that it is to-day possible to disinfect during the year perhaps 99 per cent. of the entire sewage of a modern city at a cost which, though considerable, is by no means prohibitive; and he therefore, in view of all the facts he has brought forward, ventured to recommend the city of New Bedford to instal and operate a sewage disinfection plant in connection with the new outfall sewer. Prof. Earle B. Phelps also reported upon the matter favourably. To our mind the one thing that is not clear is whether it is suggested that "disinfection" by means of hypochlorite will destroy or oxidise the organic matters in suspension in the sewage. We have always understood that "disinfection" or sterilisation implied destruction of the bacteria and other living organisms only, and in particular the pathogenic organisms in the sewage. If this is the case, Prof. Sedgwick's recommendations bring to mind the now old-fashioned process of chemical precipitation, which nearly always resulted in secondary putrefaction, and we fear the same thing will happen after disinfection unless there is sufficient dissolved oxygen in the tidal waters to oxidise the organic impurities in the sewage, in which case disinfection is only useful in delaying the real process of purification. Again, we do not see how disinfection will prevent the deposition of the matters in suspension, even if the *grosser* particles have been removed by screening. We have always held the opinion that disinfection can only be usefully adopted as the final stage *after the organic impurities have been oxidised* in order to remove any pathogenic germs that may still exist in a sewage effluent, and we have not seen or heard anything as yet to cause us to change this opinion.

Although we have no knowledge of any place, in this country where it has been decided to sterilise an effluent from sewage purification works, we have held the opinion that such a course might be an excellent safeguard to adopt in cases where the effluents are discharged in the neighbourhood of shellfish layings. It is admitted that even the most perfect effluents, of a high degree of purity from the chemical point of view, usually contain a very large number of micro-organisms, and it is impossible to state definitely that these do not include pathogenic organisms. In spite of this, our local authorities appear to lack the initiative, or fear the cost, of adopting the obvious safeguard by sterilising their sewage effluents in cases such as those mentioned above. In the United States of America, however, we find the authorities do not hesitate to accept the advice of their expert advisers and the sterilisation of sewage effluents by means of hypochlorite, generally in the form of bleaching powder, is in actual operation in several places. The result of this is that instead of having experience of our own to guide us in the future we shall have to rely upon the results obtained in the United States of America and Canada in the further development of this process. A notable instance is that of Philadelphia, where, in addition to other investigations, experiments were made with crude sewage. It was found that the purification of crude sewage by dilution was accomplished without offence to sight or smell and without depleting the dissolved oxygen of river water below 50 per cent. saturation when the sewage was first screened to remove all solids above 1-25th in. diameter, disinfected with six parts per million of available chlorine from calcium hypochlorite and discharged in volumes not exceeding one-fourth of the volume of the river water, i.e., a dilution of 4 to 1. We have already mentioned the suggestion for adopting a method of this kind for the treatment of the sewage of New Bedford, and the most important point to be noted is that it is considered necessary to *remove by screening all solids above 1-25th inch diameter.* A little consideration of this statement will show that far from being *crude* sewage in the ordinarily accepted meaning of the term, the liquid actually dealt with was more like the effluent from a rough sedimentation tank. The question thus arises whether it is less costly and more convenient to remove the solids by screening than by the use of efficient sedimentation tanks of the Dortmund type,

or by Imhoff tanks as recommended in the Chicago report.

An instance of the sterilisation of a sewage effluent is to be found in the case of the Ohio State Tuberculosis Hospital. The sewage is of a highly infectious character and as the effluent is discharged into a small watercourse in which there is practically no flow during the summer months, and, further, this stream is used for watering cattle, it was necessary to take special precautions. The purification works consist of a screen chamber, two sedimentation tanks, a dosing chamber, four intermittent sand filters, one sludge bed and a sterilising apparatus. The amount of available chlorine added to the final effluent varied from 4 parts per million to 2·8 parts per million during the period of maximum flow. The effluent after receiving the hypochlorite solution was subjected to storage for 2·3 hours. The effect of the sterilisation was that the total numbers of bacteria were reduced to figures so low that they would not be considered objectionable even in a drinking water. In the untreated effluent the colon bacillus was generally present in so small a portion as 1 c.c., while in the treated effluent it was usually absent in quantities as large as 50 c.c.

### DISPOSAL BY DILUTION.

This subject has received a considerable amount of attention during the past year, notably in the two reports upon the sewage disposal of New York and Chicago respectively. The conclusions and recommendations contained in these reports were printed in these pages (The Surveyor, June 23rd, and December 22nd, 1911), but the reports are worthy of careful study in detail and should also be filed for future reference. The investigations made by the Royal Commission on Sewage Disposal into the problem of sewage treatment at Belfast and described in the seventh report, although primarily concerned with the prevention of nuisance from decaying seaweed in Belfast Lough, throw much light upon the question of disposal by dilution. In all three cases the chief point in the recommendations is that the removal of the solids in suspension is necessary to ensure success, and this brings us back to the same difficulty in all processes, the disposal of the sludge, or solids in suspension, removed from the sewage. The evidence given in the New York and Chicago reports as to the evil effects of the deposition of the solids in suspension in sewage is very clear, and the only points upon which no agreement can be found is as to the most satisfactory and most economical methods of settling out these solids, both from the point of view of efficiency in the actual removal of the solids and in the subsequent disposal of the sludge.

### THE IMHOFF TANK.

This leads up to the consideration of one method with regard to which much has been written during the past year. The Imhoff tank, also known as the Emscher tank, has been described in these pages and elsewhere in pamphlets and articles on a number of occasions recently. Voluminous reports upon the results obtained by its use in the Emscher drainage district in Germany have been issued by various members of the administrative staff of that body, but very little notice appears to have been taken in this country. In America, however, it has already been adopted in several schemes on the recommendation of the eminent engineer, Mr. Rudolf Hering, of New York, who has been watching the operation of this tank in Germany for some time, and eventually was sufficiently satisfied with the results to introduce it into the United States of America. More recently it has been the subject of experiments carried out in Chicago for the purpose of ascertaining the most efficient and most economical method of removing the suspended solids in the sewage before discharging it into the sanitary canal, and its adoption is recommended in the report of Mr. G. Wisner, whose conclusions and recommendations, together with some other interesting extracts, were printed in our issue of December 22nd last. In every case the advocates of this type of tank lay special stress upon the rapidity with which the sludge, after removal, can be deprived of the bulk of its contents of water by simple drying on properly constructed sludge draining beds, and the ease with which it can be handled. Apart from the advantages claimed in facilitating the disposal of the sludge, the fact that the liquid effluent from this type of tank does not become fouled by the products of the septic fermentation of the sludge and leaves the tank in practically as fresh a condition as it entered, renders it more suitable for subsequent treatment upon filters than the more or less foul effluents from other types of tanks in which the sludge chamber is common to, or partially connected with, the rest of the tank. Among the interesting facts that we have been able to gather from the various reports and other writings dealing with the Imhoff tank, we note that the area of sludge draining beds required per head of population varies from 0·07 sq. ft. proposed for Atlanta, Ga., to 0·16 sq. ft., which was found to be ample in the case of the Emscher district, and 0·30 sq. ft., which is recommended as the result of the Chicago experiments. By means of these sludge draining beds it is stated that the water content of the sludge from these tanks is reduced to between 50 and 60 per cent. in a few days, and in this condition it may be dug out with a spade and used to fill up low-lying areas without creating a nuisance.

### DIBDIN SLATE BEDS.

Another method of preliminary treatment for sewage, specially designed to reduce the difficulties of sludge disposal, has received special attention during the past year in the form of a report by the Royal Commission on Sewage Disposal upon the results obtained from the use of the Dibdin slate beds in three separate installations with different kinds of sewage. A fully detailed review of this report by Messrs. H. C. H. Shenton and W. C. Easdale appeared in these pages (The Surveyor, December 1st, 1911), so that there is no need for any detailed observations in connection with this subject on the present occasion. It is, however, desirable to draw attention to the communications which we printed in subsequent issues from the surveyors at High Wycombe and East Dereham, two of the places where these beds have been in use for some time. Even more interesting is the statement made by Mr. F. G. Billingham, Borough Surveyor of Devizes, as to the results obtained from these beds, which have been in operation at Devizes for between six and seven years, dealing with an exceptionally strong sewage (The Surveyor, December 22nd, 1911, p. 755). One of the most important facts contained in this statement is that whereas the annual expenditure for sewage disposal prior to the adoption of slate beds was between £650 and £700, it is now under £200 per annum. Under the old system they were unable to get rid of the accumulation of pressed sludge, which amounted to about 700 tons per annum, and there were frequent complaints of a nuisance from smell in the town when the wind was in a certain direction. Since the slate beds were constructed the estimated quantity of solids to be dealt with in the form of air-dried humus, has been from 20 tons to 30 tons per annum, and there has been no complaint as to smell. Mr. Billingham's conclusions are very definite. He says that he is "of the opinion that the system solves the sludge problem, gives an excellent effluent, and a total absence of smell from the beds, and that the slate beds do not silt up . . . Definite statements of this kind, based upon actual experience extending over a number of years, are probably of greater practical value than the information given in the report of the Royal Commission.

### SLUDGE DISPOSAL.

It is not difficult for anyone who was accustomed to inspect a number of sewage works a few years ago to picture the accumulations of pressed sludge, with which Mr. Billingham had to deal before his present works were constructed. As Devizes is situated in an agricultural district, it might be anticipated that farmers would be glad to take it for use as manure. It is now well known that such anticipations have been found to be incorrect, not only at Devizes, but in many other places. In spite of this we still find people ready to prove by figures that sewage sludge, if pressed, dried, and converted into a marketable commodity as manure, can be sold at a profit. An American writer in one of our contemporaries expresses the opinion that on a conservative estimate a profit of about 10s. per ton of finished product can be made by this method. English engineers will, we believe, be very sceptical as to the accuracy of these calculations, or at any rate as to the possibility of securing a market for the manure which could be produced in this manner from all the sludge produced in this country.

Another writer, this time in a Canadian contemporary, describes some experiments which were made for the corporation of a "big English town" some years ago in making gas from sewage sludge. The results were: gas produced per short ton, 8,538 cub. ft. on the average, with a candle power of 5,605, and a calorific value of 335 B.T.U. per cub. ft.; and in addition 2·6 gallons of tar and 26 gallons of ammoniacal liquor, and the final "disposal" was reduced to that of a little harmless inorganic dust. It is curious that we have heard nothing of these experiments recently as, on the face of it, they would appear to be worthy of consideration.

### ROYAL COMMISSION ON SEWAGE DISPOSAL.

Two additions to the reports of the Commission have appeared during the past year, one dealing with the problem of sewage disposal in Belfast Lough, and the other giving some further evidence taken in connection with the treatment of trade effluents and a report upon Dibdin slate beds. Our observations upon the former appeared in the form of a "Minute" on March 10th, 1911, and, as already stated, the report upon the Dibdin slate beds forms the subject of a special review, which we printed in our issue of December 1st, 1911. We have nothing to add at the moment except to repeat the statement contained in the first mentioned report, that the investigations with regard to the disposal of trade effluents when not mixed with sewage, and with reference to the question of standards and tests for sewage effluents, are still proceeding.

### DESCRIPTIONS OF SEWAGE WORKS.

Fully detailed descriptions, in many cases accompanied by drawings and illustrations, of various sewage disposal works have appeared in these pages and in other journals from time to time, and the following brief details of some of these, with references to the original articles, may be of use for reference.

*Market Harborough* (The Surveyor, February 17th, 1911).—Population, 9,300. Dry weather flow 300,000 gallons per day, consisting of 190,000 gallons of domestic sewage, 30,000 gallons of trade waste, and 80,000 gallons of subsoil water. The new works are capable of dealing with the sewage from a population of 12,000, and consist of rough screening chambers, two detritus tanks, two sedimentation tanks, screening chamber and lagoon for the sludge. The tank effluent is further treated by broad irrigation on 57 acres of land. The sludge is drained in specially constructed lagoons and afterwards spread over the land or given away to farmers. It has also been found that with careful attention the semi-dry sludge can be readily burned.

*Hyde, Lancs* (*Sanitary Record*, March 2nd, 1911).—Average daily dry weather volume of sewage, 1,200,000 gallons. Two detritus chambers, each with two screens in tandem, eight settling tanks of a total capacity of 1,860,000 gallons; 15 percolating filters with a total area of 5,190 sq. yards and a depth of 9 ft.; two humus tanks of a total capacity of 214,000 gallons, and one storm-water filter, one acre in area, which simply acts as a strainer. The percolating filters are capable of treating satisfactorily nearly 2,000,000 gallons per 22 hours. Volume of sludge, between 3,000 and 4,000 tons of wet sludge per annum, which is run on to land and air dried. Over £2,000 saved in six and a half years by abandoning chemical precipitation.

*Croydon* (The Surveyor, May 5th, 1911).—The sewage dealt with is derived from a population (estimated) of 170,000. Daily dry weather flow, 4,500,000 gallons to the Beddington Farm and 900,000 gallons to the South Norwood Farm, and in addition to this the sewage from 5,000 people is discharged into the metropolitan sewers. The "Norbury" outfall works consist of continuous flow sedimentation tanks, total capacity 750,000 gallons, and 28 percolating filters, each 56 ft. diameter, total effective area 7,500 square yards, with a depth of 4ft. The "Croydon" outfall works consist of two detritus tanks and screens, four sedimentation tanks, with a total capacity of 800,000 gallons, and twenty-four percolating filters, each 80 ft. diameter and 6 ft. deep, total area 13,500 sq. yards. There are also two storm-water sedimentation tanks with a total capacity of 400,000 gallons. The whole of the effluent from the filters is given further treatment on about 480 acres of land. A fine screen is used between the tanks and the filters at the "Croydon" outfall and has been successful in reducing the work of cleaning the sprayholes of the sprinklers. The amount of sludge deposited in the tanks is about 20 cub. yards per million gallons, or, say, 90 cub. yards per day, and is pumped on to the land for disposal. The South Norwood works consist of 22 acres of contact beds, the effluent from which is treated on 168 acres of land.

*Stratford-on-Avon* (The Surveyor, May 26th 1911).—Daily dry weather flow 296,920 gallons, equal to 35·7 gallons per head of population, and containing much brewery and fellmonger's trade wastes. The works consist of four septic tanks, each having a capacity of about one-third the daily dry weather flow; eight percolating filters, each 85 ft. diam. and 5 ft. deep, arranged in two sets of four at different levels, so that single or double filtration may be used. The filter effluent receives final treatment on land. Storm-water above a certain volume is treated in contact beds with a total area of 1,488 sq. yards and a depth of 3 ft. The sludge from the septic tanks is discharged on to drying beds or trenches. After the sludge has settled the top water is run off and the surface of the thicker sludge left behind is covered with pulverised peat and dry slaked lime to prevent aerial nuisance. When dry the contents of the trenches are removed by farmers. The total cost of sewage disposal for the year ending March 31st, 1910, was £6 17s. 11d. per million gallons, or 2s. 2·8d. per head of population.

*Hucknall Torkard* (The Surveyor, November 17th, 1911).—The scheme makes provision for dealing with the sewage from 16,500 people at 20 gallons per head, which gives a daily dry weather flow of 330,000 gallons. The works consist of detritus and septic tanks with a total capacity of 350,000 gallons; eight percolating filters with a total area of 3,928 sq. yards, two humus tanks, storm-water stand-by tanks with a total capacity of 82,500 gallons, and sludge lagoons.

*Frome* (The Surveyor, October 6th, 1911).—Daily dry weather flow, 420,000 gallons of sewage, heavily charged with brewery waste. The new works will provide a total tank capacity of 358,000

gallons. Two of the tanks are deep vertical flow tanks, with a combined capacity of 246,000 gallons. There are eight primary circular filters, each 64 ft. diameter by 3 ft. deep, and four secondary rectangular filters 450 ft. long by 52 ft. wide and 4 ft. deep, and some existing tanks have been converted into storm-water storage tanks. The two series of filters can be used either for single or double filtration as may be required.

*Sawbridgeworth* (The Surveyor, November 10th, 1911).—Population 2,000; daily dry weather flow, 30,000 gallons; two grit chambers, one septic tank with a capacity of one day's dry weather flow; one dosing tank, and twelve contact beds, each with a liquid capacity of 10,000 gallons, and arranged in three tiers of four beds each, for triple treatment of the sewage. The sewage from the low-level areas is raised by three Adams's sewage lifts, operated by the high-level sewage.

*Leipzig* (*Strassenbau*, p. 587, 1911).—An interesting feature in connection with some experimental percolating filters in operation at Leipzig was the forced aeration of the filters from the floor upwards by means of *ozonised* air blown in through the upper open portion of the effluent outlet pipe.

*Strasburg* (*La Technique Sanitaire*, December, 1911).—Experiments have been carried out in connection with the purification of the sewage of this city. The preliminary treatment consists of elaborate mechanical straining or screening. This is followed by sedimentation, after which the effluent flows into fish ponds. In April 700 carp of 350 grammes in weight were placed in these ponds, and in December they weighed 2 lb. each. Trout also throve under similar conditions. If the experience thus gained is confirmed by subsequent tests, the whole of the sewage will be treated in the same manner. A number of schemes have also been described in other journals, and notably in our American contemporaries, but we regret that limit of space prevents us from giving any further details on this occasion.

LITERATURE.

Among the additions to the literature of sewerage and sewage disposal we may mention "Modern Methods of Sewage Purification," by G. Bertram Kershaw (The Surveyor, February 17th, 1911), an excellent compilation of the matter embodied in the various reports of the several commissions which have sat upon this subject, and appropriately prepared by the author, who was for twelve years engineer to the present Royal Commission on Sewage Disposal. "Sewerage Systems, their Design and Construction," by Hugh S. Watson (The Surveyor, March 10th, 1911), deals very comprehensively with the subject indicated in the title. The sections dealing with the practical side of construction and the maintenance of sewers are well done and should prove very useful. Quite recently a small book by H. C. H. Shenton, on "Sewerage and Sewage Disposal," has been published. This volume differs from most books upon the same subject in that it is severely practical and gives definite advice, based upon the author's own personal experience, upon everything connected with sewers and sewage works. Its price brings it within the reach of everyone, so that it should enjoy a large sale. It is published by S. E. Rogers.

A considerable number of interesting and useful papers upon matters pertaining to sewerage and sewage disposal have been read at various meetings during the past year, and the first thing that strikes the reviewer is the evidence of continual development in the principles of sewage disposal, and that there is still much to learn in this section of municipal work.

In January, 1911, on the occasion of the annual meeting of the Canadian Society of Civil Engineers, at Winnipeg, the committee on sewage disposal presented a report upon the progress which had been made in Canada in the provision of works of sewerage and sewage disposal. This should be of considerable interest to English engineers (The Surveyor, February 17th and March 10th, 1911).

Mention was made in these pages on April 28th, of the difficulties encountered in dealing with the wastes from sugar factories. This information was taken from an interesting paper upon various kinds of trade wastes, which appeared in a Hungarian contemporary. *The Canadian Engineer*, of May 18th, contained an abstract of a paper upon "The Pollution of Streams by Paper Mill Wastes," which was read before the American Paper and Pulp Association, and in which it is suggested that the solution of the problem may be found along the lines of the recovery of by-products.

A very interesting and useful paper upon "Pumping Plant for Sewage and Water Works," by Mr. A. J. Price, was read at a meeting of the Institution of Municipal and County Engineers (The Surveyor, April 28th, 1911). Practically every type of pump was described and illustrated, and, in addition, particulars were given of air-lifts, sewage lifts, pneumatic ejectors, hydraulic rams, and the Humphrey internal combustion pump.

Among other papers the following may be mentioned:—

"Proper Methods for Guarding Against Odours in Sewage Disposal Works," by G. W. W. Fuller (*Canadian Engineer*, May 4th, 1911).

"Sewage Purification," by Dr. S. Rideal; "The Discharge of Sewage into Tidal Waters," by W. Harper, and "The Chemical Principles Involved in Mixtures of Sewage and Sea Water," by Prof. E. A. Letts. These last three papers were read at the Belfast Congress of the Royal Sanitary Congress, and were dealt with in these pages on August 4th and 11th, 1911.

"The Disintegration of Concrete in Sewage Disposal Tanks" (The Surveyor, August 11th, 1911).

"The Purification of Sewage," presidential address to the Association of Managers of Sewage Disposal Works, by J. D. Watson, M.Inst.C.E. (The Surveyor, August 11th and 18th, 1911).

"Some Characteristics of the Birmingham Sewage," by T. R. O'Shaughnessy, F.I.C. (The Surveyor, September 15th, 1911).

"Notes on the Theory and Practice of Percolating Filters," by J. E. Farmer (The Surveyor, October 6th, 1911).

"Report upon Sewage Disposal at Leeds," by G. A. Hart (The Surveyor, September 22nd, 1911).

"The Berlin Sewage Farms," by H. A. Roechling, M.Inst.C.E. (The Surveyor, November 17th, 1911).

A characteristic paper upon "The Principles of Sewage Treatment," was read by Dr. Owen Travis, at the annual meeting of the Managers of Sewage Disposal Works. The paper was printed on December 8th, and our observations upon it will be found in our issue of December 15th last.

As we go to press we learn from our contemporary the *Contract Record*, of United States of America, that a symposium on biological sewage disposals was held on the third day of the First Annual Congress of the Canadian Public Health Association, held at Montreal on December 15th last, and consisted of the following five papers: "Physical and Economic Aspects of Sewage Disposal Plants;" "Progress in Canada in Biological Methods of Sewage Disposal during the last Twenty Years;" "Chemical Problems Involved in Methods of Sewage Disposal;" "Bacterial Problems Involved in Biological Methods of Sewage Disposal;" and "Engineering Problems connected with Biological Sewage Disposal." These five papers together form a magnificent programme, and should serve as the basis of a very useful discussion, and we hope to return to them on some future occasion, when

we have had time to digest them and space available to deal with them in an adequate manner.

APPLIANCES.

Messrs. Daniel Adamson & Co., of Dukinfield, have supplied a number of their sewage ejectors during the past year, among which the following are the most important :—

*Biggleswade.* — Engineer, Mr. J. T. Eayrs, M.INST.C.E., of Birmingham. The whole of the sewage is raised by four ejector stations, each containing two ejectors, varying in size from 50 to 250 gallons capacity each.

*Southampton.* —One 500 gallon ejector.

*Alnwick.*—Engineers, Messrs. Spinks, Pilling & Rodwell, of Leeds. In this the "Coombs" re-compressing arrangement has been adopted in connection with the ejectors. By this means the horse power required to do the work has been reduced by one-half as compared with ordinary pneumatic ejectors, and is the first installation of its kind so far as we are aware.

*Faversham, Kent.*—Two 300 gallon ejectors have been supplied for raising the sewage from the low-level area. The air-compressors are driven by electricity.

*Urmston and Flixton.*—Engineers, Messrs. J. B. Wilkinson & Son, of Manchester. This is a complete installation of ejectors, air mains and air-compressing plant, and a pair of ejectors have been supplied for raising the sewage from Davyhulme.

In addition to the above, a small electrically-driven pneumatic installation is being supplied for raising the sewage from an underground convenience at Walsall, and an order has been received for lifting sludge from the tanks in connection with the new sewage disposal works at Surbiton.

The same firm have recently completed an order for their "Coombs" "Seaborne" fixed sprays for filters, with an area of 2¼ acres at Dukinfield, for the Stalybridge, Dukinfield and Audenshaw Joint Board, and additional filters are being constructed and will be fitted with the same type of distributing apparatus.

The Ames Crosta Sanitary Engineering Co., Limited, of Nottingham, state that during the year 1911 their sales have shown an upward tendency. Installations of their patent simplex rotary and rectangular sprinklers show a large increase over previous years, and include many very large and important works throughout the country. The Crosta patent surface-water gully is supplied to authorities throughout the United Kingdom, and upwards of 30,000 gullies have been sold to three only of our large towns during the last few years. The latest patented speciality is Ames' "Gripmac" manhole cover, which is designed to give safety to traffic when the surface of the road is worn and to dispense with the costly and unsightly setts around the frame. After the novelty of this patent had been challenged and the ensuing litigation satisfactorily settled, the "Gripmac" covers were in great demand. Many large orders and repeat orders have been received, and the sales are rapidly increasing.

From Messrs. Goddard, Massey & Warner, Limited, of Nottingham, we learn that during the past year the sewerage department of this firm has been extremely busy carrying out various small additions and alterations and bringing up to date installations which have been in existence for some time. The county borough of Stoke-on-Trent have laid down considerable plant to deal with sewage, and the whole of the machinery, pressing plant, etc., for this has been carried out by this firm under the engineer, Mr. Makepiece. The work will shortly be completed and put into operation. At Kiveton Park, near Sheffield, a sewage pumping plant has been put down by this firm, and the scheme was designed to work in conjunction with a Goddard, Massey & Warner, Limited, destructor, and the whole of the pumping for this district is carried out by means of the steam generated from the refuse, which is, of course, a great saving to the council. The destructor and pumping plant have now been at work some months. The same firm have just secured a contract from the Stone Council, under their consulting engineer, Mr. Commin, for laying down a new plant and overhauling their present machinery. This includes gas engines, presses, air compressors, etc. This work is not yet very far advanced, and it will be late in 1912 before it is completed.

Messrs. Ham, Baker & Co., Limited, of Westminster, report that they have been kept extremely busy in their sewerage department throughout the year. They have been engaged on contracts for the supply of sewage distributors, of which they are now makers of four types, which include their new power-driven machine, which is suitable for beds 50 ft. wide, and as they now build these machines of such extreme width, only four are required for a one-acre filter bed. The automatic travelling distributor, which is so well known and is largely used in Great Britain, is now finding its way abroad, and they have put down more than the usual number in England during the year. The rotary distributor list has been added to by the addition of the "Candy-Whittaker" machine, for which they are now appointed manufacturers and licensees. As regards fixed sprays, they have been appointed sole licensees for the "Enots" spray, and they therefore consider they are well equipped for supplying the demands for any form of distributor required for filter beds, both at home and abroad. Messrs. Ham, Baker & Co. also report that they are making a speciality of screening and elevating plant for sewage disposal works, and that they have supplied a large number of sluice gates, penstocks and valves during the past year.

Messrs. George Jennings, Limited, report another successful year in the sewage disposal department, numerous installations of their improved revolving distributors having been completed, including, among others, two 84 ft. diameter for the Burnley Rural District Council ; one 80 ft. diameter for the Maldens and Coombe Urban District Council ; two at Barcombe, Sussex, for the Chailey Rural District Council ; one at Donisthorpe, for the Ashby Woulds Rural District Council ; three, including one 125 ft. diameter, for the Tipperary council ; and one 120 ft. diameter for the Borough of Barnsley. The last, mentioned is an addition to the eight of a similar type already installed by them and completes this important scheme. They further report an increasing demand for their special fittings for private disposal works, a number of important orders having been executed in various parts of the country.

Messrs. Jones & Attwood, Limited, Stourbridge (incorporating Messrs. Birch, Killon & Co., of Manchester), proprietors of the Fiddian and other patents for, and manufacturers of, the waterwheel type of sewage distributor, fixed pipe and nozzle, power driven, "Barkers Mill," and other sprinklers for all kinds of percolation sewage filters and automatic valves for slate beds, also automatic sewage lifts and syphons, report a busy year, and orders from all parts of the world. The special feature of the past year's work has been the successful introduction of the mono-rail type of sewage wheel sprinkler for travelling on straight or curved lines on both sides of a feed trough and around its end. The first one on a filter 1,000 sq. yards in area, at Nuneaton, has been so successful, that a second one for the same Corporation on another and similar area is now on order. Improvements have also been effected in the distributors for both circular and rectangular filters for large schemes. This firm's automatic sewage lifts, embodying new features, several ejectors being worked from one compressing station, have been installed at Chelmsford.

At Queensferry, Flints, a sewage scheme, which

possesses points of considerable interest, has been carried out by Messrs. Manlove, Alliott and Co., Limited, of Nottingham. The plant consists of a pair of 50 gallon Alliott and Philps' patent pneumatic ejectors, which are so arranged that while one ejector is filling, the other one is discharging, and neither ejector can fill at the same time as the other one. The ejectors are provided with valves which enable either ejector to be worked by itself whilst the other vessel is shut down for examination. The plant also includes an electrically-driven air compressor, capable of providing sufficient air to work the ejectors. This compressor is driven by an alternating current motor, arranged with reduction gearing, and fixed on the same bedplate as the compressor. The motor is fitted with an automatic starting panel, which is so controlled by the air supply that the motor is only started when there is a call for air, and it is shut off as soon as the pressure of air has reached a predetermined point. Consequently the motor will not be running unless the flow of sewage demands a supply of air. The air receiver is of mild steel, and measures about 3 ft. in diameter by 10 ft. high. Another ejector plant of the same size, and practically similar arrangement as the one described above, has just been shipped by Messrs. Manlove, Alliott and Co., Limited, to H.M. Dockyard, Malta, to the order of the Admiralty. Messrs. Manlove, Alliott and Co., Limited, have also secured the contract for a large sewage pumping plant for the Borough Council of Napier, New Zealand. The town of Napier itself consists of a large hill almost surrounded by water, and the new sewerage works will be situated in the flat portions of land which circle the hill at its foot. The plant will deal with the sewage from about 15,000 people, and the scheme will comprise the installation of five ejector stations with capacities varying from 200 to 800 gallons per minute. The air-distributing valves will be so arranged that either of the vessels can be actuated whilst the other is shut down for examination, and the control gear is such that when working alternately the two vessels cannot both fill or empty at the same time, thus always providing a vessel into which the inflowing sewage can go. The inlet and outlet flap valves are arranged with covers on the boxes fastened down by means of shackles and vice handed screws. This method of securing the covers enables the valves to be examined quickly and without undoing any bolts, requiring spanners or loose tools. This is a good feature, as it is important that the examination of flap valves may be done quickly and readily. The plant will also include two sets of plunger pumps, each set consisting of three throw single acting pumps. Each set will be coupled to an electric motor and will be capable of delivering 750 gallons per minute each into the storage tank. A steam engine will be provided to drive one of the pump sets. The double cylinder motor-driven air compressors, of which there will be four sets, will each be set to deliver air at a suitable gauge pressure, and the volume swept by the pistons will be 250 cubic feet per minute. Motors for driving these compressors will also be provided. The whole of the air piping, of which there will be about 17,000 feet, will be supplied by the contractors. The same firm have also just been favoured with an order for erection of sewage machinery for the town of Bedford. The plant consists generally of supplying and erecting motor-driven air compressors, ejector chamber consisting of cast iron tubing, one pair of Alliott and Philps' patent pneumatic 50 gallon ejectors, rising main and air pipes.

The Meadow Foundry Co., Limited, of Mansfield, have supplied their fittings both direct to councils and through contractors. Among the former the most important undertaking with which they were connected recently was the new sewage disposal works at Mansfield, for which they supplied most of the ironwork required, such as the main screens, penstocks, floating arms, sludge valves, and sluice valves. This firm also supplied screens and sludge elevator to the Knaresborough Urban District Council, and various fixed type of distributors with patent brass sprayers to the Blackwell Rural District Council and other places.

Mr. F. Wallis Stoddart, of Bristol, reports that the greatly increased demand for his distributors, which was experienced during the past few years, is still continuing, and over 50 installations were erected during 1911. Of these, several are in New Zealand, South Africa and Canada, and repeat orders have been received from engineers in the latter colony, who have had experience of the working of these distributors under the severe climatic conditions prevailing there. These examples, taken in conjunction with others in operation in the tropics, afford grounds for the conclusion that this method of treatment is independent of extreme variations of temperature in either direction. Works in hand and contemplated promise another successful year for 1912.

Messrs. Tuke and Bell, Limited (incorporating the Carlton Engineering Company), have had a very successful year in sewage disposal work. They have during the past year introduced some important specialities in sewage disposal apparatus, amongst them being their "Autoflush" patent revolving distributor, their "Ideal" revolving distributor, and the "Pulsator Ram" system of distributing sewage by means of fixed sprays. These specialities have, apparently, all been tried with undoubted success in actual practice. At Tiverton, the "Autoflush" distributors of 79 ft. in diameter which this firm have supplied, are, we understand, working well, and the device for keeping the orifices in the distributing arms clear of solid matter is all that can be desired. A momentary pressure of approximately 11 lbs. to the square inch is brought to bear on the flow passing through the arms, and this forces the liquid out of the orifices to such an extent as to clear them instantaneously. This firm have just issued a very complete catalogue of sewage disposal apparatus, sewerage ironwork, sanitary fittings, and drainage appliances, and we recommend anybody interested in the latest improvements in the various branches of sanitation to obtain this book, which, we are told, will be sent post free on application. It is evident that Messrs. Tuke and Bell, Limited, have given very special study to the designing of apparatus suitable for village sewage schemes, where the difficulty usually experienced is in securing the right kind of labour to look after the apparatus. This difficulty they have to a large extent overcome by the introduction of the specialities referred to above, viz., the "Ideal" distributor, and the "Pulsator Ram" system of distribution by fixed sprays. The former are now in operation at various sewage installations of the kind mentioned above, notably at Gayle Sewage Works, Yorkshire (engineers, Messrs. Rodwell and Son); at the Agatha Stacey Homes, Redhill, near Birmingham (for Messrs. Cossins, Peacock and Bewlay); at White Webbs, near Enfield, and other places. The action of this machine is positive, the motive power being produced by means of alternating tippers, and not by the reactionary force produced by the flow from orifices in the distributing arms. The flow is distributed through channels with a serrated edge in the form of a thin which falls gently on to the filter without any force to break it up and cause unnecessary smell. There are no holes to become clogged, and no parts to get out of order. The "Pulsator Ram" system has also been in operation at various places for a considerable time now, and has proved to be very suitable for village schemes where there is sufficient fall to ensure its efficient working. The minimum fall required is 2 ft. 6 in.

One installation of this system has now been working at Tandridge, near Oxted, for nearly a year with the most satisfactory results, the engineer of this scheme being Mr. T. C. Barralet, surveyor to the Godstone Rural District Council. Another of these schemes may be seen at Hennock, in Devonshire (engineer, Mr. R. A. Rogers, surveyor to the Newton Abbot Rural District Council), and Mr. Hart, the sewerage engineer to the Leeds Corporation, has also tried it with success at the Leeds Sewage Works, and expressed himself as satisfied with its working. In addition to the work referred to above, the company have done work in connection with sewage disposal at the following places :—Singleton, Sussex ; Hassocks, Sussex ; Northiam, Sussex ; Seaford, Sussex ; Weybridge, Surrey ; Hurst Green, Sussex ; Lingfield, Surrey ; Farnham, Surrey ; East Grinstead, Sussex ; Godden Green, Kent ; Cranleigh, Surrey ; Goudhurst, Kent ; Killucan, Ireland ; Lowestoft, Suffolk ; Kirbymoorside, Yorks ; Hunstanton, Norfolk ; Killinghall, Yorks ; Llandinam, Montgomery ; Braughton, Lancs ; Leighton Buzzard, Beds ; Radlett, Herts ; Twyford, Winslow, Banbury, Little Wymondley, Herts ; Ingatestone, Essex ; Old Fishbourne, near Chichester ; Holt, Wiltshire ; Launceston, Cornwall ; Chagford, Devon ; Grateley, near Salisbury ; Plympton, Devon ; Truro, and elsewhere.

Messrs. Hartley, Causton and Richmond, Limited, of Stoke-on-Trent, manufacturers of the well-known Hanley distributors, have introduced a circular electric motor-driven distributor, the merits of which compare in every way with their rectangular power-driven distributor. An order for 20 of their circular machines is being executed for works at Walsall, and similar machines are being installed at other places. The firm have already altered several circular motor-driven distributors made by other firms, and applied to them their own improvements. Their distributors are now at work on filters of an area of nearly 30 acres at Hanley, Burslem, Fenton, Longton, Ilkeston and Walsall, and they have some large contracts coming on. They state that the power required per acre is only 1½ B.H.P., whether on circular or rectangular beds, and it is claimed that by having independent motive power, small though it is, absolute control in quantity and interval of discharge is obtained. Another considerable development has been secured by adopting power driving. The firm have designed a simple mechanical rake which is drawn along by the distributor arms, and at Hanley, where it has been recently introduced, one man employed twelve hours a week can do the same work as two men who are constantly employed throughout the year on nine acres of beds. This has meant a saving of £100 a year to Hanley on the raking of the beds. In the case of their circular distributors, these can be driven only where electric current is available, but in the case of the rectangular distributors these can be driven by electric motors, gas or oil engines. The firm state also that they have perfected mechanical-power-driven screens and sludge elevators, and are manufacturing decanting valves, special sluice valves, and penstocks.

Messrs. W. E. Farrer Limited, of Birmingham, send the following list of places where their distributors for sewage filters have been used during the past year :—

Chesterfield, Upper Wyche (Worcestershire), Cirencester, Berkhamsted, West Bromwich Corporation, Theale (nr. Reading), Cranbrook, Sparkford, Durham, Ripley, Frome, Chichester, Shepton Mallet, Pontypridd, Clown, Brigg, Yeadon (Yorks), Darlington, Stratton-on-the-Foss, Bradford-on-Avon, Thurgarton (nr. Nottingham), Ewesley (N.B.), Enville (nr. Stourbridge), Wolverton (Warwickshire), Heanor, Castle Donnington, Bangor, Lancaster, Shotton (Cheshire), Newport (Mon.), Kingham (Oxon), Orpington (Kent), Boxmoor, Doveridge, Hereford, Slough, Long Marston (Herts), Wooler (Northumberland), Stoke Poges, Dulverton, Huntingdon, Brigg, Lichfield, Weardale, Birtley (Durham), Prudhoe (nr. Newcastle-on-Tyne), Penshurst (Kent), East Grinstead, Pontardawe, Wareham, Croydon, Headley (Hants), Borough of Stoke-upon-Trent, West Grinstead, Shincliffe (Durham), Wigston Magna.

## REFUSE DISPOSAL.

The year 1911 may be classed with any of the best of those preceding so far as real satisfactory progress is concerned. For, after all, the actual number of installations either erected or decided upon is not the criterion upon which progress must be judged. While the reports from the firms engaged in the erection of disposal plants show, at any rate, no falling off from the usual output, in addition there has been evident throughout the year a desire both on the part of the public generally, of local governing bodies, of the press, and of the Government departments to appreciate the desirability of dealing with municipal refuse by strictly scientific methods, and in such a manner as to preclude, so far as is humanly possible, danger to the community.

Evidence of favourable public opinion is distinctly noticeable in the reports on this subject we have received throughout the year, that people no longer regard refuse destructors as expensive luxuries ; on the other hand, they are gradually proving themselves to be necessary adjuncts to every small or great population.

For example, in November last Mr. J. W. Cockrill, the Borough Surveyor of Yarmouth, stated concerning the scavenging of Gorleston :—

"At present the work is performed by contract for £500 per annum. The supervision is not under my department ; any complaints which have been made to me have been passed to your sanitary office. The deposit of the material is by no means satisfactory. If you put out again to contract, some more stringent clauses must be inserted, and the emptying of all house refuse bins twice a week made compulsory. This will add very considerably to the present contract price. The work can be efficiently undertaken by your own staff for £550 per annum, including horse-keep and men's wages. In this estimate I have provided for carrying two-thirds of the refuse to the destructor to be burnt. This will obviate a great deal of the nuisance at the place of deposit by paper blowing about. I am certain that a full investigation of the existing conditions will ensure their not being continued."

The council are recommended by the Health Committee to carry out the scavenging of the Gorleston district with the corporation staff on the termination of the existing contract.

At Blackpool, Mr. James Bee, in his annual report, states that the revenue derived from the destructor by-products last year reached the record sum of £1,605. "This amount," he writes, "is the more remarkable when it is remembered that only a comparatively few years ago the by-products which are responsible for this revenue were not only unremunerative, but cost the corporation a good sum annually to deal with. Now we are unable at various times to meet the demand for ashes and clinkers, while the demand for fish manure is so great that we should experience no difficulty in disposing of whatever quantity we had for sale. The rapid transformation which has taken place in the utility of these residuals makes it very unsafe to hazard any opinion as to the revenue they will provide in the future, but experience during the past few years leads to the conclusion that we have not by any means reached the high water mark."

Again, the Local Government Board recently addressed a letter to the Bognor Urban District Council on the subject of a nuisance caused by the Council's refuse tip at North Bersted. The Board state they are satisfied that a nuisance, sometimes of a serious character, exists and, while expressing the opinion that the practice of burning refuse on open sites should be discontinued, they suggest the tip should be abandoned with as little delay as possible, and that the Council should take into early consideration the recommendation of their medical officer of health that a destructor should be provided.

These three are the first instances to hand of a mass of evidence suggestive of a steady growth of such an opinion as will lead to refuse destruction occupying a much more important place amongst the duties of a borough engineer in the not distant future. The multiplication of plant will mean more people interested: it has been the history of all new machinery and apparatus, as exemplified particularly in the cases of bicycles and motor cars, that improvement increases with the increase of users up to the limiting point of proximity to perfection.

RESULT OF MORE ACTIVE PROPAGANDA.

How is this likely to affect destructors? We have made it a practice in these special reviews to submit from time to time the particular direction in which improvements were possible, the points where destructors of all types left open the door for economy, whether in cost of construction, cost of maintenance, or in the utilisation of heat or by-products. This side of the question has also been to the fore in many quarters during the past year, and there are now signs that progress is about to be made. The American Consul in Amsterdam reports that hitherto rubbish collected by street cleaners in that city has been assorted: paper, rags, metals and glass have been sold to dealers and the residue as manure. The city authorities are now, he says, considering converting the street rubbish as a mass into combustible briquettes for heating boilers. They have found that at Southwark, London, and at St. Ouen, France, street rubbish is transformed into a marketable product. It is estimated that an establishment to work this will cost about £40,000, that the annual expenses will be about £19,600, and that the product will be about 85,000 tons. It is believed that the briquettes can be sold at a profit of over £4,000 a year. At present the street refuse of Amsterdam is disposed of at a loss of £3,600 a year.

Recently we quoted from the *Engineering Record* of New York a description of a plant costing £36,000 for dealing with 80 tons of refuse in twelve hours. In this the refuse is digested with steam for six hours and the grease afterwards extracted by means of both presses and solvent degreasing machinery. The whole scheme includes drying plant, consisting of vacuum and revolving dryers, multiple effect evaporators, grease separating plant, oil stills, pumps, compressors, and so forth, and the whole was erected and is controlled by a municipal authority.

We are quite prepared to admit that not all refuse in this country would pay for grease recovery; but we must insist that ammonia recovery and the further utilisation of heat is possible. These two points are accentuated by the recent enormous increase in the amount of artificial manure which is being exported from this country to Canada and elsewhere, the basis of which is dried sewage sludge.

The dried sludge from septic tanks, powdered, and "fortified" with phosphates and ammonia salts, seems to be a manure which is greatly in demand, and there is certainly no difficulty in disposing of it at a profit. At the present time, however, private companies are put to the expense of erecting and manufacturing rotary driers and adding ammoniacal salts, while the local authorities have refuse destructors often at hand which could be utilised for both drying and supplying the ammonia as we have advocated frequently in the past.

A junction between the sewage works and the refuse destructor is evidently about to be made. The combination will mean undoubtedly something more in the way of automatic handling of both sewage and refuse, and the mechanical firing of refuse destructors is bound to receive further and full consideration.

MECHANICAL STOKING.

If we turn to ordinary boiler-house practice and ask why mechanical stoking is resorted to, we are told that hand firing involves certain inherent objections. The first of these is that an even depth of material on the bars is not maintained, and that the draught, induced or forced, gets through at the shallowest places, these places thereby becoming gradually shallower, and so permitting an excess of air with consequent loss of heat in flue gases. The average $CO_2$ figure, we are told, is also kept low because of air rushes when the furnace doors are opened for feeding; and worst of all are the losses due to clinkering, both with regard to excess air and boiler efficiency and economy, owing to time wasted. Therefore, mechanical stoking is resorted to as embodying a level feed on the bars, no opening of doors for clinkering or feeding, automatic clinkering, and last, but not least, economy of labour.

Now the advantages enumerated above are all applicable to destructor practice, only more so, because when handling poorer fuels economy is necessary to a greater extent. What then are the difficulties? First, ordinary mechanical stokers only deal with fuel broken or graded to one size. Secondly, high temperatures result in big and heavy clinkers unsuitable for moving fire bars. But the removal of the first difficulty almost obliterates the second. High temperatures are both desirable and requisite; but anyone who has seen a destructor furnace newly charged must have been struck by the fact that for some considerable time after charging a drying process is going on—the one hearth, incandescent, passing its hot gases over a hearth covered with wet black refuse. After the latter has become dried the burning operation has to be started—the burning of a huge piled-up mass. Blasting is necessary to get it fairly going, and when once going, the blast is continued with the resultant high calorific intensity and the fusion of the clinker. Yet, if the material had been assorted, sized, dried, and mechanically fed on to a bed of red fire, there would have been no unnecessary blast, no fusion of clinker, in fact the material would approximate to some of the very poorer quality coal, which is used at pit banks and which is found to be quite amenable to mechanical stoking and movable fire bars.

The crux of the problem then is a preliminary sorting and disintegrating, a matter of no great difficulty; in fact, a preliminary sorting is already carried out by the stoker in the very act of firing though he has no opportunity of throwing down a particular shoot easily and quickly that which is readily combustible, that which would need breaking up, that which is absolutely incombustible, and that material such as offal calling for a special furnace reserved. We are pleased to know, however, that one progressive local authority has decided to make an attempt with mechanical stoking early in the year and trust the matter will be persevered with. Of course difficulties unnamed will arise. The blast will need to be tempered to the character of the refuse so as to prevent the fine dust being carried away; disintegrating machines must be able to cope with anything from clog tips to undetected salmon tins or candlesticks; drying ovens must deal with possible nuisance; but all known and imaginably possible difficulties have been overcome in other industrial pursuits, and it is only reasonable to assume they will be here. The accomplishment of mechanical stoking is desirable not only as an economy in itself, but the

experience gained in such a process would pave the way for further developments which are at present blocked because of the handling and drying difficulty.

PAPERS READ AT PROFESSIONAL SOCIETIES.

The number of papers read on this subject in 1911 is very small, and even those read call for no special comment. That read by Mr. C. Owen Baines at the Paignton meeting of the Institution of Municipal and County Engineers, in October last, included a description and test of a 25 ft. grate destructor, which gave a duty performance of 70 lb. per sq. ft. grate area, a boiler pressure of 96 lb., and a temperature in the combustion chamber of 2,000° Fahr. Apart from this nothing can be said of the literary contributions of the year.

MAKERS' ACTUAL OPERATIONS AND TESTS OF NEW PLANT.

Messrs. Meldrum Bros., Limited, have completed a few destructors during the year, these however being restricted to a smaller type of plant for industrial works and institutions, with the exception of the following: a two-cell plant for Seaford Urban District Council with boiler and other accessories, the plant being used in connection with the pumping of the town's sewage; similar sized plants for the parish of Govan, N.B., and the Board of Guardians of the Manchester Union; and destructors of the three-cell plant, top feed type, for France and South America, besides additions and work now in hand at places in this country.

Messrs. Hughes and Stirling, Limited, have recently completed the destructor for the city of Sydney, New South Wales, an installation claimed to be one of the largest and most complete in the Colonies. It is of the front shovel-fed type, comprising two units of four cells or grates each, with a total grate area of 200 ft. Offal hearths are provided for each unit, as also a Babcock and Wilcox boiler of 1,218 sq. ft. heating surface—the working pressure being 160 lb. The firm's contract, in addition to plant and equipment already referred to, included entire steam, feed, and exhaust piping, and all the necessary accessories. On August 14th last, the City of Sydney took over the plant—estimated capacity 100 tons to 120 tons per 24 hours—for the final four months working under the supervision of the contractors. Other work recently completed by the same firm includes: for the Lanarkshire County Council, at Blantyre, a three-grate front-fed type regenerative destructor, with Lancashire boiler, accessories, also complete buildings, steel chimney, etc.; and for the corporation of Yeovil, under Messrs. T. and C. Hawksley, of Westminster, a two-grate back fed type regenerative destructor with Babcock and Wilcox boiler and accessories, also the complete buildings, engine houses and chimney. Among recently accepted contracts are the following: Abertillery (Mon.) Urban District Council, a complete four-cell back-fed type regenerative destructor with boiler, buildings and chimney; the Lanarkshire County Council for New Stevenston, a complete two-cell front-fed type regenerative destructor, with Lancashire boiler, buildings and steel chimney; the City of Turin, Italy, a large and important installation of the top-fed type.

Messrs. Heenan and Froude, Limited, report one of their busiest years for 1911, in fact it is evidence of this country's continued predominance in engineering progress that they report the actual capture of 75 per cent. of the world's orders for refuse destructors during the past year.

One noteworthy success is that at Singapore, where a destructor of the top-feed type, for dealing with tropical refuse containing from 60 per cent. to 75 per cent. moisture and but little heavy carbonaceous matter, has just been put into operation. In addition the refuse generally holds a quantity of adherent water, rain falling practically every day, the average rainfall being 300.

TEST ON "HEENAN" DESTRUCTOR ERECTED FOR MUNICIPALITY OF SINGAPORE, STRAITS SETTLEMENTS.

Date of test, June 12th to June 15th.
Duration of test, 72 hours
No. of cells at work, 4.
Grate area, sq. ft., 78·5.
No. and type of boiler, one B. & W. water tube.
Weight of refuse burnt, tons, 243–6–8.
Rate per hour, 7,570 lb.
Rate per hour per sq. ft. grate area, 96·4 lb.
Total water evaporated, 14,430 galls.
Rate per hour (actual), 200·4 galls.
Average steam pressure at gauge, 135 lb. per sq. in.
Average temperature of feed, 83° Fahr.
Lb. water evaporated per lb. of refuse burned (actual), ·265 lb.
Lb. water evaporated per lb. of refuse (from and at 212° Fahr.), ·31 lb.
Average temperature combustion chamber, 1,577° Fahr.
Maximum temperature combustion chamber, 1,850° Fahr.
Minimum temperature combustion chamber, 1,225° Fahr.
Average analysis:—

| $CO_2$ | O | CO | N by diff. |
|---|---|---|---|
| 12.8 | 6.7 | 0 | 80.5 |

The plant was brought up to normal temperature with refuse tipped previous to start of test, and the time the first charge was dropped into furnace noted; the water meter and level of water in the boiler was noted and checked by officials of the Municipality. The refuse was weighed on the municipal weighing machine and the weight checked at the finish of the test. The hopper was swept clean and the time taken; meter readings again being noted and checked. The temperature in combustion was automatically recorded by a Cambridge Scientific Instrument Company thread recorder—analysis by Orsat apparatus.

The state of the weather during the test was on the first and last days fair. On the morning of the 14th rain fell heavily for two hours and most of the refuse was wet and the remainder damp.

The firm reports the following installations to be in progress of construction:—Swinton and Pendlebury, back feed, capacity 50 tons. Bellshill, Scotland, front feed, capacity 30 tons. Surbiton, back feed, capacity 60 tons. Barnes, Surrey, back feed, capacity 60 tons. Lichfield, back feed, capacity 30 tons. Nuneaton, front feed, capacity 40 tons. James Scott and Sons, Manchester, top feed, capacity 30 tons. Dinnington Main Coal Company, Chesterfield, front feed, capacity 25 tons. Pontypridd Extension, back feed, capacity 15 tons. Droylsden, back feed, capacity 30 tons. Largs, Scotland, back feed, capacity 30 tons. Paris, top mechanical feed, capacity 480 tons. Nancy, top mechanical feed, capacity 200 tons. Trouville, back feed, capacity 24 tons. St. Petersburg, top feed, capacity 150 tons. Moosejaw, Canada, top feed, capacity 50 tons. Calgary, Canada, top feed, capacity 75 tons. Ottawa, Canada, top feed, capacity 75 tons. Buffalo No. 2, Canada, top feed, capacity 60 tons. San Paulo, South America, mechanical feed, capacity 50 tons. Rio de Janeiro, South America, front feed. Havana, Cuba, top feed, capacity 500 tons.

Plants completed during the year, or started and handed over are as follows:—Hertford, front feed, capacity 25 tons. Troon, Scotland, back feed, capacity 15 tons. Havre, France, back feed, capacity 150 tons. Rouen, top feed, capacity 150 tons. Buffalo, No. 1, top feed, capacity 60 tons. San Francisco, top feed, capacity 240 tons. Montgomery, U.S.A., top feed, capacity 60 tons. Clifton, New York, pan feed, capacity 90 tons. Singapore, top

feed, capacity 200 tons, maximum. Adelaide, back feed, capacity 100 tons. Wellington, New Zealand, back feed, capacity 150 tons, largest in colonies.

The Horsfall Destructor Co., Limited, report that during the past year they have completed for the Mersey Dock and Harbour Board an installation which has a capacity of 130 tons per diem; also a similar plant for the Urban District Council of Aberdare. Extensions have been carried out at Grimsby and a small contract completed for the urban district council of Newtown, Montgomery, the latter being of the front feed type. The installation for the Mersey Dock and Harbour Board was under construction at the time of our last Special Issue, but was completed later in the year, and described and illustrated in *Engineering* for November 17th last. From a special trial, described there, the duty of the destructor was found to be 120 tons per 24 hours in the five cells, which is at the rate of one ton per cell per hour of 90 lb. per sq. ft. of grate area—a good performance in view of the miscellaneous nature of the refuse, which consists largely of dock sweepings, dust, grit, dirt, and a large proportion of light material, which sometimes measures nearly 200 cub. ft. to the ton.

During the past year Messrs. Manlove, Alliott & Co., Limited, have completed several refuse destructor plants, and have at the present time a number of important contracts on hand. In the review of their work in this direction in last January's Special Issue, reference was made and descriptions given of several destructor plants they then had on hand, which included plants for the towns of Guildford, Bedford, Huddersfield, Wolverhampton, Gosport, Rugby, Basingstoke and Ryhope. These are now all completed and said to be giving entire satisfaction.

A few remarks with regard to some of these completed plants will no doubt be of interest to our readers. The Huddersfield plant, which consists of eight cells and two water tube boilers, arranged in two units each of four cells, combustion chamber, water tube boiler and accessories, is in full working order, and is giving results which are said to have surpassed expectations. The steam generated, which is employed as an auxiliary supply for the corporation electricity works, is twice the amount originally contemplated or guaranteed, and forms a very valuable adjunct to the electricity department.

The past year has seen the completion and final setting to work of the Guildford combined refuse destructor and power plant, mention of which was made in our last New Year's issue. It consists of four cells and two water tube boilers arranged in a row. The cells are of the top-fed isolated grate type, and are arranged with the boilers on the Wood and Brodie unit system, so that each boiler is sandwiched between a pair of cells and is fired by the high temperature gases from each cell. The steam generated by the waste gases, in addition to serving the needs of the destructor plant itself, drives three sets of steam-driven air compressors, which supply nine ejector stations with compressed air and deal with the sewage of a wide area embracing Guildford and the neighbouring district under the authority of the Hambledon district council. An official test has recently been carried out at Guildford, and from this the capacity of the refuse destructor for burning town's refuse was shown to be more than half as much again as was stated in the specification, the actual figure being 68 per cent. in excess of the specified capacity. The amount of steam produced by the destructor available in the compressor house was found to be practically double the amount asked for in the engineer's specification, while the evaporation of water was 2½ times the evaporation called for by the specification.

Another important contract which has been completed during the past year is the erection of the destructor at Bedford. The plant in question has four cells and two water tube boilers, each boiler having approximately 1,100 sq. ft. of heating surface. Forced draught for combustion of the refuse is obtained by means of steam jets. The furnaces are of the top-feed type, with special arrangements for handling the refuse mechanically. The steam generated by the burning of the refuse is employed for the needs of the destructor itself, and for forced draught and steam hoists, and it is proposed at an early date to use it in connection with the sewage pumping station. This plant was officially opened last July and is said to be giving very good results. At Gosport the firm has completed during the past year a two-cell destructor plant, back charged, with one water tube boiler, 1,440 sq. ft. of heating surface, air heater and combustion chamber. The steam generated is being used for working air compressors which operate sewage ejectors. During the past year Messrs. Manlove, Alliott & Co., Limited, have also secured the contract for the erection of a two-cell destructor for Bognor. The two cells are arranged side by side on the continuous grate type, each cell being provided with a short drying hearth and arranged for back hand feed. The plant also includes one water tube boiler with 593 sq. ft. of heating surface, constructed for 120 lb. working pressure, a combustion chamber, air heater and so forth. The whole plant is designed for the destruction of 24 tons of refuse in 24 hours. Forced draught is obtained by means of steam jet blowers. The plant is now at full work and giving good results. At Chadderton, this firm have recently completed a two-cell destructor plant, top hand charged, with Lancashire boiler and combustion chamber. Forced draught is supplied by means of steam jet blowers. The steam generated is utilised for driving a horizontal engine which is used in connection with the local sewage works.

In addition to the above contracts, Messrs. Manlove, Alliott & Co., Limited, have been notified that their tenders have been accepted for the provision of an eight-cell destructor plant at Bristol, an eight-cell destructor plant for Margate, and a two-cell plant for Stroud. The first-named is in addition to the destructor erected twenty years ago by this firm.

Messrs. Goddard, Massey & Warner report the usual successful year and lay stress on the latest production of their Mr. W. Warner, who has had over thirty years' experience in works of this character, and has designed and patented an arrangement by which the dust is caught upon inclined blades placed in several positions along the flues leading from the destructor cells. Under these blades is arranged a series of catchpits in the brickwork, which are provided with sliding doors at the top so as to allow each pit to be shut off separately, permitting the dust to be raked out. The deflecting blades and dust catchpits are found to work very successfully in the plant just started at Bournemouth, as upwards of five barrow loads of dust are caught each day. This otherwise would go along to the chimney and out at the top. These blades are formed in grills about 2½ in. to 3 in. apart, so that many surfaces are at work at one time, giving a very large catching power.

The firm have also devised a patent screen for preventing the escape of paper from the chimney shaft, this being also designed and constructed upon the same principle as the mesh of the screen, consisting of slanting blades in the form of a grill, so that when the paper is caught upon the mesh and fired, the dust is deflected downwards towards the bottom of the flue, being there caught while passing along in the catchpits referred to. The destructor recently started at Bournemouth with the apparatus in question has been sufficiently satisfactory to induce the corporation to place the order for taking down and rebuilding the old cells.

During the year the firm erected and started a

small destructor for the Kiveton Park district council, this consisting of two cells of the back-feed type, the heat produced being utilised in generating steam for driving pumping machinery. It has been proved that the refuse collected in the town is ample for pumping the whole of the sewage, which is lifted by three separate centrifugal pumps of 5 in. diameter. As each of these is driven independently from a main line of shafting, and the engines in duplicate are fixed in the engine-house for driving such main line of shafting, each of sufficient power for driving the whole of the pumps, provision is made both against breakdown and for the working of each pump separately or jointly with the other. The steam boilers are also in duplicate, each being of sufficient power to generate steam for driving the engines and each having an arrangement of dampers by which either boiler can be used to take the heat from the destructor cells. Messrs. Goddard, Massey & Warner have also completed and started to work the six-cell plant at Govan, Glasgow, where they have erected their specially designed steam boiler, which has an unusually large surface for taking up the products of combustion passing from the cells.

## WATER SUPPLY.

If it were possible to see and record the world's work of water supply during one year, the result would show that the year 1911 has been one of unequalled activity. Works of water supply, water power, canals and irrigation have developed at a rate unknown before. The spread of civilisation and knowledge create the demand for water works and expedite the methods of construction. The subject is therefore one of considerable magnitude. If it is taken that the consideration of what has been done in this country alone is sufficient, such a review would be misleading. This is an age of continual progress. New ideas and methods are daily being put to a practical test, and this is so particularly in new countries, where the engineer is unhampered by the restrictions of conflicting interests ever present in this country. The State publications of America show that we are behindhand in gathering and recording data. While we wait for a proper hydrographical survey of our country we see that in America, Canada, Australia and the Transvaal such work is actually going on. While we discuss the question of rivers boards under State control, we find that Germany has already empowered a commission to exercise control over all watercourses and sewage disposal in the Emscher watershed, the organisation of which was fully described in these pages a year ago. Our own Royal Commission has pointed out the inferiority of our canals to those abroad, and advised sweeping changes, without, however, producing any apparent effect.

As far as the national aspect of our water supplies is concerned, we cannot congratulate ourselves on our condition or progress. Taken as a whole our scheme is badly planned. Improvement is everywhere hindered by conflicting interests, there is great waste of money, and it appears that nothing short of State control can get us out of the present difficulty. On the other hand, we may certainly pride ourselves on the excellence of our works considered separately, and, above all, this statement applies to the London system, the greatest water supply undertaking in the world.

### WORK OF THE METROPOLITAN WATER BOARD.

The Metropolitan Water Board may be congratulated upon the successful result of the past year's working. The great drought which caused trouble to so many towns established the fact that the Metropolis is in a better position with regard to regularity and sufficiency of supply than any other city or town in the country. Not only was there an abundant supply of water throughout the rainless period of the year, but visible evidence existed that Londoners had no reason to fear a shortage. It was stated authoritatively that if the drought had lasted till Christmas no special measures would have had to be taken. Thus in one of the driest periods on record the resources of the Water Board proved to be sufficient; but these resources have been increased very considerably since the drought ended. At the end of the summer the Water Board possessed reservoirs to hold 8,000,000,000 gallons, but at the beginning of November another 900,000,000 gallons of storage was added, when the Island Barn Reservoir at Molesey was opened; while a further 3,000,000,000 gallons of storage will be added this spring when the Chingford Reservoir is opened. Thus it is a practical certainty that for many years to come Londoners need not fear a shortage of water even in the driest seasons. It is, however, as well to bear in mind the fact that the reservoirs are required for two purposes, *viz.*, for storage and for purification. Also that a single year with a very low rainfall does not necessarily produce the worst conditions. The rivers from which London derives the bulk of its supply are fed very largely by water which is stored in the various strata upon which it falls, and from which it is given off slowly. Thus in the past year, in spite of the drought, the flow of water in the Thames was good owing to the fact that the preceding year was a wet one. The river flow was much less in the years 1906, 1899, 1893. Making due allowance for this fact, it is not to be doubted that the Board have adopted a wise policy in making reservoirs that will meet an increasing demand under conditions more trying than those which existed in the year 1911.

The Metropolitan Water Board supplies an estimated population of over 7,000,000 persons, a population very much larger than that of Scotland and Wales put together, as large as that of Canada, and nearly as large as that of Norway and Sweden. Though the supply is unlimited, careful attention to the detection of leakage and waste makes the supply per head comparatively low —*viz.*, 31·89 gallons per head in 1909-10, and 31·57 gallons per head in 1910-11. The success of the Water Board is largely due to the careful and systematic manner in which the detection of leakage and waste is attended to, and smaller water authorities would do well to pay more attention to this very important matter. The reservoirs in use prior to November held 39·59 days' supply. In the last annual report published by the Board the existing storage was given as 8,844·7 million gallons, and the storage authorised by Parliament as 6,000,000,000 gallons.

With regard to the purification of the water it is impossible to take exception to the methods adopted, seeing that they have produced water of a quality quite suitable for human consumption, and that the trial has been continued daily and hourly under every sort of condition for years.

Dr. Houston, in a recent report, pointed out that most persons consider a drinking experiment as more conclusive evidence of safety than any negative results obtained in a laboratory. This evidence referred to one person only, *viz.*, to Dr. Houston himself, but the doctor has a far better drinking experiment to point to—*viz.*, that which applies to the 7,000,000 Londoners who have thriven on the water supplied to them, who can show by their diminishing death and disease rate that they are living under healthy conditions superior to those of persons who drink from a water supply gathered on the mountains. Why is it that the death rates of Manchester, Glasgow, Liverpool and Birmingham,

with their upland supplies, are respectively 17·9, 17·5, 19·0, and 15·4 per thousand, while London, drinking the water of two sewage-polluted rivers has a death-rate of 14·0? Obviously the precautions taken by the Water Board produce a water which is wholesome, and it is even open to question whether it is not safer to rely upon such methods of purification as are used by the Board than to place unlimited faith in a water which is pure at the source remaining pure when it reaches the consumer. Whether it will be necessary in the future to adopt further methods of purification for the London water is not certain, and it is even possible that if such steps were taken a still further decrease in the death and disease rates might follow. The methods of purification at present in use are storage and subsidence in reservoirs, followed by filtration. There are 170·26 acres of sand filter, or ·86 acres per 1,000,000 gallons of water treated. Four mechanical filters supplied by four different firms, for the purpose of testing the filtration of raw river water, raw and stored water mixed, and stored water, have been installed at Hampton, where experiments have been carried out for some time past. Thus it is clear that the Board do not lose sight of the advances made in the science of water purification, and that such improvements as are necessary or profitable will be made, also it is quite clear from the reports that the possibility of sterilisation is admitted if it should ever be required.

Sixty-one miles of water mains were laid in the year 1910-11. Continual extensions are therefore being made.

Having regard to the future needs of the Metropolis, the Board adopted a scheme for the construction of additional reservoirs in the Thames Valley near the existing Staines Reservoir. This led to the promotion of a Bill in Parliament during the 1911 session. The scheme included eight reservoirs—Nos. 1 and 2 near Wraysbury, No. 3 near Horton, No. 4 near Runnymede, No. 5 near Staines, Nos. 6 and 7 near Littleton, and No. 8 near Sunbury. These made provision for a population of 12,000,000 people in 1941, and an estimated daily supply of 300,000,000 gallons from the Thames alone out of a total of 420,000,000 gallons from all sources. The estimated additional storage would have been 20,000,000,000 gallons.

Some sixty-four petitions were lodged against the Bill, largely on the grounds that the works would prejudicially affect the amenities of the river. As a result the Board had to abandon Reservoirs 1, 2, 3, 4 and 8. Three reservoirs—*viz.*, Nos. 5, 6, 7, remaining. The construction of these reservoirs has now been sanctioned by the Act.

NEW WORKS.

It is extremely difficult to review the other works which have been in progress even in this country. A complete list would occupy a considerable amount of space, while any effort to describe them in detail would be beyond the scope of the present article. It is however necessary to mention a sufficient number of works to illustrate the subject. One of the largest and most interesting examples of reservoir and dam construction is nearing completion in the Derwent Valley. These vast works, which include the Howden and Derwent Reservoirs, holding respectively 1,886,000,000 gallons and 2,000,000,000 gallons, and the Ashopton Reservoir, holding 30,000,000 gallons, have been described already in these pages. They are to be opened on a ceremonial occasion by the King. The completion of the Alwen Waterworks and Embankment, for the conservation of the mighty resources still flowing to waste, carried out by [illegible] gallons, is another interesting work. The Leighton Reservoir at Leeds, having three times the capacity of the Alwen, is nearly finished. In October the ceremony of laying the first stone of the Alwen Reservoir for the supply of Birkenhead was performed. The water of the river Alwen will be stored in a reservoir three miles long, with an average width of 350 yards, and containing 3,000,000,000 gallons of water. This reservoir will be formed by a masonry dam and a small earth embankment. The dam will be curved in plan, and will be 90 feet high and 458 ft. long. It is interesting also to note that the compensation water will be utilised for the generation of electricity for use at the head works. The three large reservoirs, costing over £80,000, completed by the Chesterfield Gas and Water Board, are of considerable interest, also the Devonport Reservoir, to hold 21,300,000 gallons, recently opened. Not the least interesting are the Lincoln Corporation waterworks, finished during 1911. After sinking the deepest boring in England only to find the water unsuitable for drinking purposes, the Lincoln authorities had to make a fresh start, and finally obtained good water in abundance from the new red sandstone at a distance of twenty miles from the city. A huge dam which will retain 1,100,000,000 gallons of water, is under construction at Angram, in connection with the water supply of Bradford. The pressing need for this work was demonstrated by the shortage of water during the drought in the past year. The works will probably take three more years to complete. The trouble experienced at the Walshaw Reservoirs of the Halifax Corporation is of special interest to engineers. These reservoirs leaked on completion. The leakage is now being stopped by the following method. The source of the leakage is discovered by sinking shafts. When found, the eroded puddle of the embankment is replaced and boreholes are made in the ground 5 ins. in diameter. Down these liquid cement is poured and pumped until all crevices in the strata are filled, so that no more water can flow along them. The laying of the third line of pipes on the Manchester Thirlmere scheme, and the construction of the Heaton Park reservoir is proceeding. The large works at Ystradfellte are expected to be ready next summer. Harrogate has spent nearly £1,000,000 on its waterworks, and the new reservoir, which has been under construction during 1911, has a capacity of 540,000,000 gallons. One of the most interesting of modern works is that which has been completed at Clydebank in laying Bonna ferro-concrete water mains.

PRIVATE BILLS.

Of water bills passed during the session 1911, the Metropolitan Water Board Bill has been already mentioned, the Blackburn, Chesterfield, Chester, Ely, Felixstowe and Walton, Hastings, Luton, Merthyr, West Cheshire and Wirral Bills have been passed, and one may look for the works to be put in hand. The remarkable difficulties which beset the promoters of water bills at the present time is a matter upon which further comment will be made. Private Bills for the session 1912 relate to Bawtry and Tickhill, Belfast, Church Stretton, Derwent Valley, Dunstable, Egremont, Felixstowe and Walton, Fylde, Ivybridge, Llanelly, Scunthorpe, Shipley, Staffordshire Potteries, Sutton and Mablethorpe, Swansea, Tendring Hundred, Windermere and Ystradfellte. Applications for provisional order have been deposited for Bacup, Euxton Carnforth, Cheddleton, Dearham, Dunbar, East Surrey, Elham Valley, Glasgow, Henley-on-Thames, Morecham and Wombourne, Murcot.

THE DROUGHT.

The effect of the drought upon the water supplies of the country is a matter which has caused considerable attention. Springs and wells which were believed to be constant have failed, while others have stood the test. Valuable is the experience they gained as it should be remembered that the great drought was preceded by a wet year, so that

even at the end of the summer it is questionable whether many of the wells in the chalk and of the springs fed from strata having a large outcrop had even begun to feel the effects of the dry season. One of the chief reasons why a dry period leads to shortness of supply is that the consumers then use very much more water per head. Gardens and lawns and roads are watered, sewers are flushed, and the quantity of water drawn from the wells or sources of supply may easily be trebled in dry weather. Hence the supply is apt to be exhausted. A very serious result of the drought in 1911 was the deficiency of water in canals. In the Peak Forest district and near Macclesfield, canals were closed. In other places the navigation was restricted. The Leeds and Liverpool Canal was rendered practically useless, and water transport from Blackburn to Liverpool and Manchester was impossible. There was shortage of water also in the Aire and Calder Canal and in the South Yorkshire Canal. Much damage was done to trade from these causes, and also owing to actual shortage of water at works, which in some cases led to a complete standstill of trade. A very large number of districts suffered from shortness of supply, which was very acute in places. Manchester was put upon a short supply, and at Bradford serious trouble was caused. There can be little doubt that if the drought had been preceded by a dry year, the consequences would have been very much worse. The immediate result should be the improvement of a very large number of works, but there can never be freedom from similar trouble in a dry season till the question of water supply is regarded as a whole. Prof. J. W. Gregory has pointed out that the rainfall of the British Isles would supply every inhabitant with nearly 500,000 gallons of water per year. As the actual requirements of each individual cannot exceed, say, 11,000 gallons, it is evident that the supply is ample and that all that is required is to gather it and store it properly. This, however, must be done as a national and not as a local matter.

### LEGISLATION.

The pressing need for legislation and for the conservation of our national water resources is so generally acknowledged and has been so fully dealt with in these pages that there is little to be said further. Nevertheless, the matter is so vital that no effort should be spared to press the matter forward. Papers read before the Society of Engineers, the Association of Waterworks Engineers, and other bodies have in the past year dealt freely with the subject. The formation of a department capable of making a complete hydrographical survey with water boards under the control of a central authority for the entire country is required. The new department should be capable of producing such information as is now gathered by the Geological Survey, and various authorities for isolated purposes. At present our knowledge is absolutely incomplete, and each town, district, or person obtains a water supply without regard to his neighbours. The extraordinary difficulties present were well exemplified in the case of the Merthyr and Rhymney water Bills last session, and in the struggle which for years has wasted the resources of South Wales. Owing to the difficulties encountered in constructing works over coal mines, new reservoirs must be placed outside the area of the coal measures. Swansea, Merthyr, Neath Valley and Ebbw Vale have their reservoirs or reservoir sites, and there has been a great fight over the proposed new reservoir at Taff Fechan. The affected Merthyr Rhymney Valley, Pontypridd, Rhondda and Barry. Various schemes have been promoted without any sort of co-operation. There is no sort of central or Government control, and each authority does what it likes and grimly opposes its neighbour. It will be remembered that the Birmingham Corporation obtained powers to take water from the Elan Valley against the strenuous opposition of the Glamorgan County Council, and that Glamorgan, Carmarthen and Monmouth then combined to protect the remaining available area of watershed. Though an Act was obtained to enable the Glamorgan authority to enquire into the water resources of South Wales, the Bill to form a Water Board failed owing to strong opposition. While this was going forward, Pontypridd obtained powers to obtain water from the Brecon Hills. The Rhymney Valley Bill of last session had for its purpose the combination of several areas into a water board with powers to take water from Taff Fechan. Unfortunately, the Merthyr Water Bill was promoted for the purpose of acquiring the same area as that included in the Rhymney Bill. The Merthyr Bill passed, and the Rhymney Bill failed. There is absolutely no reason why a joint scheme for the whole coalfield should not have been arranged. If there had been any controlling body it certainly would have been arranged, but without this control there is endless conflict and enormous waste of money. The whole country is full of such instances of the conflict of interests leading to waste and there is abundant proof that the present delay in setting matters right is without excuse. The much-needed legislation ought to receive immediate attention.

### IRON AND STEEL MAINS.

The papers read upon wrought iron, cast iron, and steel pipes combined with general experience during the year show a difference of opinion as to the merits of the three materials, but it has certainly been demonstrated that in the general opinion steel pipes are trustworthy and possess some very important advantages. Ancient specimens of wrought iron buried for over 2,000 years exist which have not been destroyed, while new steel pipes sometimes rust quickly. It is argued that steel makers should direct their efforts to the production of metal of a higher resistance to corrosion. This opinion has been generally endorsed and much work has been done, and it certainly seems that the possible results of corrosion of steel mains under certain circumstances are serious. The steel pipe line to supply water to the Kalgoorlie mines is 350 miles in length and cost the Government of Western Australia over £3,000,000. During the past five years the internal corrosion has reduced the carrying capacity of the mains 40 per cent. Apparently the corrosion is arrested by treating the water with lime. It is to be noted that the steel pipes of the Catskill Aqueduct will be lined with cement. On the other hand, small sized steel pipes are being used in large quantities at home. And almost everywhere abroad one hears of large sized steel pipes being used. Mr. Allan Hazen, in a paper read before the New England Waterworks Association, compared large steel pipes with cast-iron pipes for water mains. He pointed out the fact that while the cast-iron pipe is generally given a much larger factor of safety than the steel pipe, it frequently breaks in service, while the steel pipe practically never breaks. In cast-iron pipes there are internal strains in the casting resulting from unequal cooling of the metal plus the stresses due to the weight of the filling on the top and to unequal support. Thus there will be some points subject to cumulative stresses—*viz.*, to stresses due to unequal cooling of the metal, stresses due to the pipe having to act as a beam owing to unequal support, stresses due to internal water pressure and water ram, and stresses due to the weight of the filling material on top. When these stresses at any point exceed the ability of the material to resist them, the pipe is broken. It should be noted that the ordinary formulæ take into account only the internal water pressure and water ram. Instances were given by Mr. Hazen of pipes actually broken by the pressure of the overlying material before water

was admitted. Some 72 in. diameter mains, 1⅛ in. thick, laid in connection with the Croton Aqueduct, failed with a depth of about 10 ft. of filling above them, about 4 per cent. of the pipes being broken. For the reasons given it was quite evident why cast-iron pipe which had stood a hydrostatic test pressure in the foundry often failed with a fraction of that pressure in the trench. On the other hand it was demonstrated that steel pipes may be loaded till they are permanently deformed without diminishing their strength. It was also pointed out that steel pipe corrosion is mainly pitting, and that this does not greatly reduce the strength of the pipe. The pipe even if it is pitted will still be much stronger at that point than it is at the riveted joint. A hole in a pipe can be easily plugged, but, as a matter of fact, "very few steel pipes have reached this stage up to the present time." The paper is interesting and shows the advantages of the steel pipe. It is certain that the quality of the water and the quality of the steel are the important factors. Efficient coating is a matter deserving serious attention, and it seems probable that notwithstanding such instances as the Kalgoorlie pipe line that the possibility of corrosion of steel pipes is a matter which has been much exaggerated, as it is to be borne in mind that plenty of instances of serious corrosion are to be found in the case of cast-iron pipes.

### WATER PURIFICATION.

Many papers have been read upon the subject of water purification. The possibility or impossibility of fixing a standard for the bacterial purity of water has been much discussed, and it does not appear that any satisfactory result has been reached. While the engineer is quite ready to sterilise the water if required, the bacteriologist hesitates to say whether it is necessary or not. It certainly does appear that the bacteriologists are not agreed and are fearful of giving a definite opinion. The principle of storage by purification does not seem to be accepted in its entirety, notwithstanding the practical proof in London. Some authorities appear to hold the opinion that the presence of coli in water is inadmissible, while others seem to regard them as indicators of danger, only under circumstances when the danger is apparent enough without the evidence of the coli. It appears that the findings of the bacteriologist are of little value beside the findings of common sense. Dr. Rideal, in his paper on "Modern Methods of Water Purification" read at the Chemical Engineering and Industries Exhibition, demonstrated that statistics proved that upland water supplies were not satisfactory. Such water needed purification, and did not get it, while water known to be impure was carefully treated, and in consequence rendered more fit for human consumption. He emphasised the danger of animal pollution, which appears to be generally considered harmless.

The paper by Dr. W. T. Sedgwick and Mr. J. Scott MacNutt published by the Massachusetts Institute of Technology, gives facts and figures relating to certain phenomena observed independently by Mr. H. F. Mills, of Lawrence, Mass., and Dr. J. J. Reincke, of Hamburg. It was found that the purification of the polluted water supplies of Lawrence and Hamburg respectively, produced a notable decrease in the death-rates of those places. Mr. Alan Hazen, as long ago as 1894, pointed out as the result of observation that where deaths from typhoid fever have been avoided by the use of better water, a certain number of other deaths have also been avoided. The evidence of the health statistics of a number of cities clearly show a sudden and lasting decrease in the death-rate, not only of typhoid, but in the death-rate from all causes excluding typhoid, when a pure supply of water has been obtained. Manchester, U.S.A., a city which has been supplied with pure water from the start, shows no change in its death-rate. There is no sudden and lasting drop in the death-rate as in the case of the other cities, which goes to prove that the improvement in the death-rate from all causes other than typhoid in their case was due to the sudden change which took place in the quality of their water, but which did not take place at Manchester. This result is quite in keeping with the statements of those bacteriologists and medical authorities who have held that coli and other organisms which are generally believed to be harmless in themselves are harmful in a minor degree. It follows that water cannot be too pure, and that it is highly probable that with the increase of knowledge it will be considered altogether insufficient to merely remove the germs which are known to produce mortal sickness. There is also the health rate to be considered. Water may produce, and probably does produce, or assist, a number of minor ailments which seriously affect the well-being of the individual and of the State. All the advances which are being made in the methods of purifying water are therefore to be welcomed. The mere fact that water does not produce death cannot be considered sufficient evidence of its purity.

It has been estimated that within recent years the capacity of storage reservoirs in various places has been increased by over 100,000,000,000 gallons as the result of the successful results obtained in the purfication of water by storage. Owing to the fact that this method is not applicable to many cases, and also to the fact that scientists are not agreed as to the absolute safety of the method, sterilisation processes are being largely used. Also it is always necessary when the supply of a large town is drawn from rivers passing through an infected area during the prevalence of zymotic diseases to take special steps to ensure the safety of the supply. In such a case even London might have to adopt some method of sterilisation. In America a very large number of towns and cities use hypochlorite for the purpose, and in that country it may be now reckoned among the ordinary accepted methods. On the Continent ozone treatment is more generally used. The vast works of St. Petersburg and Paris may be quoted. It is stated that the town of Knutsford in this country is about to sterilise its supply by means of ozone.

Considerable attention has been paid to the method of sterilising water by means of the Ultra Violet Rays. The researches at the Sorbonne described by Mr. Recklinghausen resulted in the introduction of a steriliser to deal with volumes of water up to 150,000 gallons per day. Dr. Billon-Daquerre has devised an improved lamp which can be inserted in the water, and claims to have succeeded in producing a lamp in which the whole of the electrical energy is transformed into ultra violet rays, and that thus his method is very economical. One of the latest additions to water purification methods is Dr. Nogier's ultra violet ray process. A small purification plant was exhibited at Olympia. This was a small household apparatus capable of sterilising water at the rate of 500 gallons per hour. The apparatus is extremely simple, consisting of a mercury vapour quartz lamp which is contained in a vessel through which the water passes, the water being brought into actual contact with the quartz lamp. It is stated that for the sterilisation of 22,000 gallons per hour by this process the apparatus required measures 8 ft. by 1 ft. 8 in. by 2 ft. and that the consumption of electricity is 2 units per hour. It does not appear that the Ultra Violet Rays have yet been applied to the sterilisation of any large supply such as is dealt with by the ozone and chlorine methods.

The mechanical filter has been installed at many places of importance during the past year.

Messrs. Bell Bros. have completed the prolonged test that has been taking place of the efficiency of the mechanical filtration plant installed to purify

2,000,000 gallons per day of the Talla Water at Fairemilehead, Edinburgh. The testing and the analysis of the results have been conducted by Drs. Ritchie, McGowan, Hunter Stewart, Williamson, Houston, Professor Walker, and Mr. G. D. Macdougald, The analytical results show that the reduction in bacteria on gelatine and agar is about 94 per cent., while coliform bacteria are absent from 135 cc. The Edinburgh Water Trust have now taken over the plant. The erection of the mechanical filtration plant at Stockport is now practically finished. The plant erected consists of twenty-four Bell vertical type filters, complete with all appliances for purifying the Kinder Water. The twenty-four Bell's patent filters supplied to the Bolton Corporation have now completed their first twelve months' run. The Huddersfield Corporation have installed a Bell's filtration plant for purifying the Butterley supply. In addition to purifying the water it is treated for its plumbo solvency action; the plant has 1,500,000 gallons capacity. Amongst other corporations and water companies who have adopted the Bell's mechanical filters are Beverley, New Mills, Nelson, Linlithgowshire C.C., South Westmorland Rural District Council, Brymbo, Trinidad, and Jamaica; and other large plants have been sent abroad for town supplies and manufacturers.

The Candy "De-Clor" system continues to give excellent results. At the Southcote Waterworks of the Reading Corporation (where it has been in operation night and day for nearly two years) it destroys the B. coli and pathogenic bacteria, and reduces the number of ordinary bacteria (of which there are generally an unusually large quantity present in unfiltered river water). In the hottest weather of the past summer Dr. Beaton, the Chairman of the Water Examination Committee of the Metropolitan Water Board, inspected the "De-Clor" filter plant at Reading and gave his opinion of it in the Corporation Report Book, kept at the Waterworks, from which the following is an abstract:—"After full examination, I was struck by the simplicity, regularity, and cheapness of the process. On appeal to the senses the finished water was found to be bright and clear, and without odour or taste. The chemical test corroborated the senses. Mr. Walker and the Reading Corporation are to be congratulated on their foresight and boldness."

It will be remembered that one of the advantages claimed for the "De-Clor" system is that the "De-Clor" method not only ensures the absolute destruction of the B. coli, but also at the same time *de*-chlorinates the water, thereby removing all traces of chlorine, so that the filtrate is not only of the highest purity, but is free from taste or smell of chlorine. It is claimed by Messrs. Candy that the cost of producing an absolutely "safe" water is far less by the "De-Clor" system than by the methods of treatment which involve the use of ozone or electricity. The success of the "De-Clor" installation at Reading has led to its adoption by other towns. At Truro the water company have laid down a "De-Clor" plant to supplement and assist their open sand filters.

One of the largest London suburban water companies is also adopting the "De-Clor" system as an adjunct to the existing sand filters; also "De-Clor" plants have been shipped to places abroad, where cholera, typhoid and enteric have been prevalent hitherto.

Candy filters are at the present time in course of erection on Dartmoor, for filtering and also for preventing the action of the peaty acid in the water upon lead. The filters remove the acidity from the soft moorland water, and harden it to 2 degrees; the water is then applied to the town of Paignton, Brixham and Teignmouth. A Candy filter plant is also being erected near Cardiff. The Hythe Corporation have extended their battery of Candy filters for removing iron from the water. At both Beccles and Woodbridge Candy filters have been installed to remove the iron from the water. During the past year Candy filters have been sent abroad to Australia, to South Africa, to Nigeria, West Coast of Africa, to Canada, Ireland, and to the Continent. At several important towns (Birmingham, Liverpool, etc.), Candy filters have been adopted for the purification of the water at swimming baths.

Thirty-three mechanical filters at Ashton-under-Lyne and of 32 mechanical filters to deal with 6,000,000 gallons per day at Sheffield are among the last years' contracts of Messrs. Mather and Platt, whose filters are too well known to need further reference.

The "Turn-over" Filter Company have supplied filters for a large number of purposes, such as the purification and softening of water generally.

One of the most important uses that this plant has been applied to has been in connection with the purification of water in swimming baths. The most important plants have been two for the Belfast Corporation and one for the Altrincham Council.

The system consists of pumping the water from the swimming bath at a high rate through the purification plant and returning it to the swimming pond, and this continues during the greater part of the time bathing is taking place. The result is that all impurities contracted from the bathers are rapidly eliminated and the water is kept constantly at a high degree of purity. A comparatively small amount of water is added each day to make up for losses.

Under this system the water has been found both bacterially and chemically purer than if the swimming ponds were filled with new water every day, and in addition the purified water is much clearer and more attractive than a new pond.

For industrial purposes purification plant and separate softening plant have been supplied for Messrs. The Brookfield Linen Company's dye works. The purifying plant deals with polluted water drawn from a small river, and renders it pure and colourless for the washing of white linen yarns. The purified water is used in the place of town supply, and it saves the Company approximately £400 per annum in the cost of town water, and they have found the purified water more satisfactory in every respect. Degreasing plants have also been provided for the complete elimination of oil from feed water, and large softening plant for collieries for steam raising by the "Turn-over" Filter Company.

Messrs. Royles, Ltd., have supplied many water softeners combined with filters and separate filters during the year 1911, and have also installed Row's patent bath water purification system, whereby it is claimed that practically the same water may be maintained in a swimming bath for a whole season, and kept all the while in a thoroughly pure, clear and inodorous condition. The advantages of such a system as this will be apparent in the case of districts where water is scarce, or where it is of a discoloured quality, due to vegetable colouring matter. The process bleaches the water and renders it perfectly clear after a short course of treatment.

### TURBINE PUMPS.

One of the most noteworthy changes in water supply work is the adoption of the turbine pump for high lifts. We hear of such pumps being used for colliery work and lifting 1,000 gallons per minute against a 750 ft. head with good results.

Very great strides have been made within the last eighteen months in the design and manufacture of centrifugal pumps, and they are being now applied to a very wide field for varied enterprises. Colliery managers are now recognising the advantages to be gained by installing high efficiency turbo-pumps driven by electric motors, and even where the pump has to work under difficult conditions most satisfactory economies may be obtained. An interesting

example of such an installation is that of a pump supplied to one of the Scotch pits by Messrs. Jens Orten-Böving and Co. It is a well-known axiom for turbo pumps that at a given head the larger the quantity of water delivered the higher the efficiency. The pump referred to is placed at a point 255 ft. below the surface, at which point there is a flow of 680 gallons per minute. In the same shaft there is a flow of 150 gallons per minute at a level of 155 ft. below the surface. The water at the higher level is collected and passed through the pump 100 ft. below, and is then raised by its own pressure to its own level, and thence to the surface by the one pump working at an efficiency of 74 per cent., whereas if a separate pump were installed at the higher level, the efficiency of this pump dealing with such a small quantity as 150 gallons per minute would be approximately only 65 per cent. The above may be cited as only one case out of many where a thorough knowledge of the conditions existing, together with up-to-date machinery has greatly increased the efficiency and *ipso facto* the economy of working.

Owing to correct design and careful workmanship such high efficiencies as 86 per cent. and 87 per cent. may be obtained, and, to quote another instance from the coalfields, we may mention a pump supplied to one of the Lambton Collieries, which gave an efficiency of 86 per cent. (this was after it had been working some twelve months) as against 78 per cent. guaranteed by other well known makers. In this case the initial cost of the installation was about £270, and the extra 8 per cent. efficiency effected an economy of £240 in the year, taking current at ½d. per unit, and the working day as twelve hours. It will be seen that by installing modern first-class machinery the capital expenditure was all but written off in the first year.

To turn to other fields of enterprise, we would mention the advances made in pumping plants for town uses, such as domestic service, fire and sewerage purposes. The firm above mentioned have recently put in eight large pumps for water and fire services to the order of the City of Toronto, Canada. Four of these pumps deliver 9,400 g.p.m. against a head of 250 ft. and four deliver 7,000 g.p.m. against 100 ft. head. These pumps are electrically driven and run at a speed of 750 r.p.m.

The larger-sized units give an efficiency of 84 per cent., and the small 82 per cent., showing that the sets have in every way justified the choice of the city authorities.

The 9,400 gallon pumps are manufactured on the double entry system, the suction and delivery being vertical, the former being brought up through the bedplate. The low pressure pumps have a horizontal suction and inclined delivery. All these pumps have specially ribbed casings so as to ensure perfect rigidity of the castings.

Centrifugal pumps are also being largely used for irrigation and sewage purposes all over the world, and in the latter case where the pump has to deal with solid matter, certain internal alterations have been necessitated to prevent the possibility of the pump becoming clogged and the plant having in consequence to be closed down. The presence of acids in the water can also to be dealt with, and for this purpose a special acid resisting bronze alloy has, after much experimenting, been found most satisfactory. In cases where gritty mud and stone are passed it has been found necessary to manufacture the impeller (in contact of a special non-corrosive steel) of a non-corrosive hardened and toughened cast steel which is extraordinarily hard, and tool resisting, much harder than ordinary toughened cast steel, while the casing has a pedal liner of the same material. In addition we would mention such installations as the sewage pumps for the Government of Perth, Western Australia, where fourteen pumps were put in, and also the plant for similar purposes for the Borough Council of Gisborne, New Zealand, as well as that supplied to the order of the Director of Works, Khartoum, for irrigation. It is interesting to note that when this pump (which delivers 6,700 g.p.m. against 70 ft. head) was tested under the supervision of the Government inspector, the extraordinary high efficiency of 84 per cent. was obtained, and that as a result of the consequent economy and satisfactory running the Sudanese Government placed a repeat order shortly afterwards for two similar pumps with Messrs. Jens Orten-Böving & Co.

With regard to the general question of manufacture and design, it has been found by long experience that certain fixed lines must be followed in order to ensure the best results with regard to durability, reliability and efficiency. The passage of the water from entrance to discharge is kept as short as possible, and the vanes and channels of the rotating and guide wheels are most carefully designed so that the water flows in smooth curves throughout. An equal additional static pressure is generated in each stage, and in each case the water is discharged at its full velocity from the impeller into the guide chambers. Great care is taken in designing the latter to prevent eddies and loss due to friction. The impellers and guide wheels are made of special bronze (except in such instances as before mentioned) and the surfaces of both are carefully finished either by machine or by hand so as to present a smooth surface to the water. The shafts are of high-grade nickel steel, and are covered with renewable bronze bushes where they pass through the stuffing boxes. The bearings are cast in one piece with the end covers, which fit cylindrically into the centre casing, making disalignment impossible should the pump be dismantled. These bearings are ring lubricated, and are specially designed for high speeds. They are separated by a gap from the packing, rendering them immune from grit, mud or water. In the case of sinking pumps the bearings are supplied with forced lubrication under pressure oil. The casing, which is of cylindrical bore, is lined in all cases with special bronze, and the guide wheels and diaphragms fit cylindrically into it, thus rendering the dismantling and reassembly extremely simple.

Two points of extreme importance may be mentioned. The first is the absence of high-pressure stuffing boxes, owing to the fact that only low pressure exists in the last chamber. In the "Victoria" pump, also, there is a patent automatic end thrust balancing device, which does away with all end thrust, a never-ending source of trouble to users of centrifugal pumps. This device is extremely simple, and automatically adjusts itself for changes of head and output while the pump is running and for any wear that may take place in the impellers.

These turbo-pumps can work under most varied conditions, driven direct, belt or rope driven or through gearing, and the suction and discharge can be arranged vertically, horizontally or otherwise, while the pumps can be installed singly or in series.

A few of the advantages which are bringing centrifugal pumps so generally into use for almost every variety of service are as follows:—(1) Extreme simplicity, resulting in greater certainty of operation. (2) Low prime cost and maintenance charges. (3) Ease of arranging direct drive and consequent high efficiency. (4) Practically no attendance required. (5) Space required only one fifth to one tenth of that required by older types. (6) No heavy foundations necessary. (7) Low running costs, and (8) high efficiency.

GENERAL.

During the past year the use of Mannesmann solid drawn tube has increased rapidly, as the result of the satisfactory experience of earlier user.

and an outstanding feature has been the ever-increasing adoption of the rigid type of joint, which modern conditions of traffic, amongst other things, renders invaluable.

Amongst those who have carried out considerable extensions to their mains with Mannesmann tubes are the Newcastle-on-Tyne and Gateshead Water Co. (10 in. and 6 in. pumping mains), Ashton-under-Lyne, etc., Water Board (9 in. trunk mains), Bacup Corporation, East, South and Mid Kent Water Companies, Glasgow Corporation Water Dept., Padiham Urban District Council, Pontardawe Rural District Council, Stroud Water Co., South Staffs Potteries Water Co., Swansea Corporation, Tredegar Gas and Water Dept., Tynemouth Rural District Council, Glanford Brigg Rural District Council, Wisbech Waterworks Co., Wolverhampton Corporation, Ystradgynlais Rural District Council, as well as such large estates as Earl Beauchamp's, Captain Morrison's (Basildon), the Earl of Minto's, and Viscount Tredegar's, together with the Great Western, Great Central (Immingham Dock), and North British (Methil Dock) Railways, the North Eastern Railway, Hull and Barnsley Railway, Caledonian Railway, and numerous collieries.

It is estimated that there are now some 1,000 to 1,200 miles of gas and water mains in the United Kingdom composed of Mannesmann weldless steel spigot and faucet tubes.

The Lead Wool Company have supplied jointing material during the past year for 9 in. pipes at Shanklin, for Garforth, Tisbury; Newcastle 6 in. and 10 in. pipes; Godalming 10 in. pipes, and for Crosby Lines. Their double lead wool collar joint is now being much used.

A new type of "Venturi" recorder has been patented by George Kent, Ltd., by which the range of registration can be considerably extended and by which the quantity ordinates of the diagram will be equal-spaced. This improvement considerably extends the useful scope of the apparatus. Apparatus for chemical injection has been designed and manufactured by the same firm, suitable for various conditions that are met with in such work, and several sets are in successful operation.

ENGINES.

Among the suction gas installations erected by Messrs. Ruston, Proctor and Co. during the year, Cheam Water Works, Surrey, and Ryde Water Works, Isle of Wight, may be mentioned.

No radical change had been introduced in the design of their suction gas engines during the year, but a new type of producer for using wood refuse has been placed on the market by this firm, and has met with a very favourable reception. Special types of producers have also been made for gasifying local fuels for colonial and foreign installations.

We understand that the claims made for the Ruston crude oil engine when placed on the market during 1910 have been fully substantiated, and that special arrangements have had to be made in the works to execute the large number of orders from nearly all parts of the world. Briefly, the principle on which the engine works is:—The piston on its outstroke takes in air, which, on the return stroke is compressed in the combustion chamber to about 270 lbs. per square inch; nearly at the point of greatest compression the oil fuel is injected by a pump operated by a quick acting cam, which drives the oil through the mechanical atomiser. The power stroke follows, then the exhaust, after which the cycle is repeated. The combustion chamber is kept hot by the recurring explosions, a lamp being required only at starting. The engine will work on any brand of crude or residual oil. The atomiser is of new and perfect construction, simple and easy to clean, which cleaning need not be done oftener than once a month.

Hornsby-Stockport suction gas engines and plants have been installed at Frimley and Farnborough; Burnham, Bucks; Amersham, Keswick, Hastings, Immingham and Luton.

The Campbell Gas Engine Company have carried out many important contracts this year for the supply of machinery for waterworks, etc., both in this country and in several places abroad. There is an increasing demand for gas engines, and especially for those operated by suction gas for water works. Some of the principal contracts carried out this year are as follows:—Shanghai Waterworks, where the plant consists of two gas engines each of 85 b.h.p., two suction gas plants of the new open hearth type and two 15 in. centrifugal pumps. This plant is worked with the local Chinese coal, and has now been running very successfully for some months.

Walton-le-Dale Urban District Council, Lancs, where the plant consists of two gas engines each of 58 b.h.p., two suction gas plants, these driving by belt two sets of vertical treble ram pumps with rams 9 in. diameter by 12 in. stroke. These pumps lift the water into a service reservoir, it having been previously raised from a bore hole by a set of pumps fitted with Ashley buckets. This plant has now been at work for about two months.

Montrose Waterworks, where an extension of the new pumps are a set of horizontal treble ram pumps 11 in. diameter by 15 in. stroke. Provision is made in the engine room for a duplicate set to be installed later on, and there are alternative methods of driving provided for. 1. By a water turbine. 2. By a vertical oil engine of the Diesel type. At a certain season of the year water power is available, and when this cannot be used the oil engine is employed.

Easington Rural District Council, where a small plant consisting of an oil engine of 6½ b.h.p., with 4 in. centrifugal pump has been installed. This is for the water supply of a small village, and is typical of many installations of similar character.

Chippenham Waterworks, where a gas engine of 30 b.h.p. and a set of treble ram pumps 8¼ in. diameter by 10 in. stroke have been fixed. This plant has been rendered necessary by the increased population of the district.

Messrs. Petters, Ltd., have this year installed two 15 b.h.p. engines with three-throw ram pumps for the Niton Waterworks, St. Lawrence, Isle of Wight, and have supplied large numbers of the combined plants for country house and other water supplies.

Messrs. Tangyes have a large number of pumping plants in hand or recently installed, among which we may mention the following:—Producer gas engines and pumps for Southend, Godalming, the Mid Kent Water Company, and for Balclutha and Auckland, New Zealand, while a steam engine and pumps have been supplied to the Herts and Essex Company and electrically driven pumps to the Newcastle Waterworks. These installations are typical of many others. Similarly the particulars given relating to the few manufacturers mentioned above are merely an indication of what has been done by a very large number of makers of waterworks plant in various parts of the world.

## ELECTRICITY SUPPLY.

The keynote of the past year's achievements in the department of electricity supply may justly be described as "steady development." Ever since the introduction of the metallic-filament incandescent lamp the industry has been striving to adapt itself to the new conditions brought into existence by the newcomer which effected so great a stride in the direction of higher efficiency and prolonged life.

The struggle was in many cases strenuous and sustained, and in some instances converted what would normally have been a profit into an actual loss, for the first consumers to adopt the new lamps were naturally those already connected to the mains, and those, moreover, who derived the greatest benefit from their introduction—those who used the light for the longest hours—with the result that the output of electrical energy for lighting was seriously diminished. However, the threatened disaster provided a much-needed stimulus to the managers of electricity works, and compelled them to bestir themselves with a view to obtaining other outlets for their commodity; their efforts met with a generous reward, for the growth of the sales of energy for motive power, as well as for heating and cooking, during the last few years has been extraordinary. As we prophesied in the first instance, and have always maintained, the tungsten lamp has proved an undoubted blessing to electrical undertakings; besides markedly hastening the development of other outlets for electrical energy, it has greatly increased the popularity of electric lighting in all quarters, raised the standard of illumination, and armed the electrician with a powerful weapon to meet the keen competition of the rival illuminant. To some extent it has helped to reduce the inevitable "peak" in the day-load curve, which compels the engineer to provide so much costly plant, to be used only for a few hours in mid-winter. By promoting the search for a day-load, it has further diminished the importance of the peak, and at the same time by enabling the generating plant to be run under better conditions it has materially improved the economy of production. Its adverse effects were but tem orary, and even last year they were almost neutralised. Now, although here and there one still meets with complaints of reduced output for lighting, the great majority of undertakings declare that the trouble is past, and the lighting supply is steadily increasing. In the interim the power demand has continued to develop, and has in many cases quite outgrown the lighting business. At Leeds, for instance, where the metallic lamp had a most marked effect, the power load has more than compensated for the loss on this account; and at Blackburn, where it is reported that the effect of the new lamp has now become a favourable one, the power output exceeds that for lighting. In some towns, of course, the demand for power would in any event have asserted itself: such a one is Coventry, to which we have often referred in the past as an example of the benefit to be derived from enterprising management and drastic scrapping of obsolete plant. Coventry reports a profit of £16,414—where there used to be an annual and apparently perennial loss.

### EXTENSIONS OF PLANT.

The cheapening of electric light has brought about the natural result that there has been a very great increase in the number of consumers, and thus at last the output for lighting has turned the corner and is steadily growing. The temporary reduction of demand for a time rendered extensions of generating plant superfluous a serious matter for the manufacturers of such products—and in 1910 there were consequently few noteworthy advances of this kind. But the turn of the tide has had the natural result, and one of the most remarkable features of the past year has been the universal demand for additional generating plant. Extensions of mains, of course, are always in progress together with the associated items such as meters and services, and the increase in the number of consumers has given a powerful impulse in this direction. But addition to the generating plant are only necessary when the demand for energy threatens to run up to the capacity of the machinery installed, and we wish to emphasise the fact that never before have we observed so general an outcry for increased generating capacity, which proves beyond question the reality of the upward tendency in the demand for electricity. There are several considerations which render this fact of great importance and advantage to the industry. First, there has never been a time when the generating plant has been so phenomenally cheap; the general adoption of the steam turbine in its various forms has led to great improvement and simplification in its design, and to an extraordinary reduction in cost, which is reflected also in the reduced cost of buildings and foundations; secondly, the steam consumption of the turbo-generators is so much better than that of the pre-existing plant—highly efficient though the latter undoubtedly was—that great economies have been effected in the consumption of fuel, and a further economy follows from the lessened boiler capacity required for a given output and the decreased labour charges. These items in themselves are of great advantage to electrical undertakings, but they do not stand alone. The crushing burden under which electricity supply has always laboured has been the heavy capital cost of the plant; each addition of new plant at a fraction of the cost of the old obviously has the effect of reducing the average cost per kilowatt of the whole installation, and thus lightening the burden of capital charges. Moreover, each new set installed is usually larger than those previously in use, thus further reducing the cost per kilowatt and increasing the economy of production. In many cases the small sets originally installed are being removed altogether—in others they are being held merely as stand-by plant. Thus the working conditions are being materially improved all round, and it is not surprising to find that the prices charged to consumers are generally falling. It is now quite common to meet with a price of 3d. per unit for lighting, and 1d. per unit for power has become the rule rather than the exception—both these charges being often subject to substantial rebates, which bring down the cost of energy for motive power in many cases to no more than ⅜d. per unit. It is an admitted fact that, taking the whole, there is no country in which the average price of electrical energy is so low as in the United Kingdom.

### TURBINES AND OIL ENGINES.

As indicated above, the new plant has in most instances been of the turbine type. The Parsons design has generally held its own, but others, such as the Curtis and its successors of the "impulse" type, have secured a firm footing in public favour, mainly, no doubt, on account of their greater simplicity and compactness, and lessened liability to the stripping of blades. The Parsons, or "reaction" type, is certainly the most economical of steam, but demands greater care in manufacture and running than the impulse type with its larger clearances. A combination of the impulse and reaction principles, as in the Willans turbine, uniting the best features of each, has been developed and presents perhaps the most desirable solution of the problem. But latterly the Diesel oil engine has forced itself into prominence, and bids fair to secure a large share of future business, especially in the smaller stations. The Diesel engine is not yet usually made in large units for land use in this country, but several firms are making it in sizes up to 300 or 400 horse-power, and it has been widely adopted with very satisfactory results. It is extremely economical in fuel consumption, and there appears to be no solid ground for the fears which were at first entertained lest the price of the fuel—crude oil—should be forced up. Stand by losses are nil, labour charges are greatly reduced, and the engine can be used in the heart of a town without causing a nuisance. In a few cases gas engines and producers have been installed, and this type of plant appears to offer

especial advantages in the case of the smallest installations, as for village lighting—which shows signs of becoming very popular.

At Glasgow the erection of a new generating station and the expenditure of half a million sterling are contemplated; the capital already laid out amounts to two millions. Last year a saving of 15,000 tons of coal was recorded, due to the improved generating plant. Birmingham is preparing to erect a new works at a cost of £250,000. Liverpool is replacing some of its small sets with turbo-generators, and proposes to erect a new station of 40,000 kilowatts within a few years. The federated borough of Stoke-on-Trent finds it impracticable to link up its four existing stations with advantage, and therefore is increasing the works at Hanley to cope with the growing load. It is noteworthy that in accordance with the policy adopted by Parliament, the borough is forbidden to make a profit out of the undertaking. Dublin was particularly hard hit by the metallic-filament lamp, but got over its troubles all the quicker, and now requires extensions costing over £128,000; the undertaking is now doing well, and showed a profit of £7,150 for the last year's working, wiping out a large proportion of the outstanding deficit.

### PROFITS AND FINANCE.

Many of the large undertakings have had an extremely good year. Manchester, the largest of all, with a capital of 2¾ millions sterling and an output for all purposes of no less than 83 million units, had a surplus of £27,573, and the Electricity Committee proposed to allot a sum of £19,500 (on the basis of 1 per cent. on the outstanding debt) to the relief of the rates; the Council, however, demanded that this should be increased to £24,500, although the reserve fund stands at an inadequate figure. Liverpool recorded a profit of £46,529, of which £25,000 was given to the rates, and Nottingham made a grant of over £15,000. Birmingham also gave over £15,000 for this purpose, and at Edinburgh the Council requisitioned the whole surplus of £7,300, in defiance of the recommendation of the Electricity Committee. It is a noteworthy fact that in many cases the increase in the revenue has far exceeded the increase in the cost of production—indeed, the latter has in some towns remained practically stationary, while the output and the income have been greatly augmented. On the other hand, it is regrettable to see that the practice of draining the treasure chest and neglecting to make adequate provision for the future is still so widely followed, for the sake of the temporary popularity engendered by a handsome gift to the rates. As noted above, the Government policy is adverse to this practice, and the inspectors of the Local Government Board have frequently commented upon the inadvisability of depleting the reserves. When sanctioning a loan for Greenock, the Scottish Office stipulated that not less than £1,500 should be annually placed to reserve, and stated that all the profits should have been so applied. Stepney, with a capital of over £400,000, has only £5,000 in reserve. In this connection it is rather significant that the London County Council has this year been trying to induce the Borough Councils to make provision for paying off their electric lighting loans in 20 years instead of 42 years, the period originally granted—a period some 10 years longer than was allowed by the Local Government Board, and certainly far too long in view of the nature of the undertakings; but the Borough Councils decline to adopt the suggestion. The Local Government Board inspectors have also brought pressure to bear upon the local authorities when inquiring into proposed loans, to make them pay for services and meters out of revenue instead of raising loans for the purpose, and in many cases this policy has been adopted, at any rate for meters and instruments. The capital expenditure of the Metropolitan Borough Councils on their electrical undertakings now exceeds 6½ millions sterling.

### SMALL UNDERTAKINGS.

We have mentioned above the adoption of electricity supply by a number of villages or small townships. At one of these (Grassington) the demand rose in six months from 30 to 85 per cent. of the capacity of the plant installed. Other instances are Whitwood, Dawlish, and Swinford and Charleville in Ireland, some with gas-driven plant and others with steam. But a far greater number are obtaining a supply from their larger neighbours, a proceeding greatly facilitated by the Electric Lighting Act of 1909. In London, the Borough of Bethnal Green, which has had the necessary powers since 1899, has not yet provided a supply of electricity, but endeavoured this year to obtain permission for its obligations to be undertaken by the adjoining borough of Shoreditch. The Board of Trade explained that the Act of 1908, which enables London supply authorities to link up their networks for mutual assistance, did not admit of the interpretation put upon it by the Bethnal Green Council, and recommended the latter to obtain a bulk supply and distribute the energy under its own powers. Poplar and Stepney have made arrangements for co-operation, to avoid unnecessary extensions. But little, in point of fact, has as yet been accomplished in the way of linking up the London systems, though the subject has been for a long time under consideration by the various local authorities and companies concerned.

Hardly any new undertaking of notable dimensions has been started during the year. A supply is about to be commenced at Bispham, and Winchester has decided to purchase the local company's undertaking. On the other hand, Pontefract has leased its provisional order to a company, and Acton its supply undertaking—which has never flourished—to the Metropolitan Electric Supply Co. At Batley, the Yorkshire Electric Power Co. sought to supply electricity in a district which was added to the Borough after the company obtained its statutory powers, and, therefore, was not covered by these—the company being prohibited from supplying within the original boundaries of the town without the permission of the Corporation. A curious position has arisen at Llangollen, where the Urban District Council has a provisional order, but the supply is carried on by a company without statutory powers. It appears that the agreement under which the powers are exercised by the latter has not received the sanction of the Board of Trade, and is therefore invalid; as the Board no longer possesses power to sanction the transfer of the order, the matter cannot be rectified without an Act of Parliament and accounts due between the parties cannot be legally settled.

### OVERHEAD WIRES.

The prejudice which formerly existed against the use of overhead wires for electric lighting purposes seems to be rapidly melting away. As we have pointed out, it is practically impossible to carry out the supply of small communities and scattered villages by means of underground mains, on account of the prohibitive capital expenditure necessary, and consequently in such places the local authorities have in many cases decided to use overhead lines, or have authorised companies to use them. In the north-eastern counties, of course, they have been very extensively adopted in connection with the huge system which has been developed in Durham and Northumberland. No one would wish to see the country-side disfigured; but when the work is properly done, it is certainly not more offensive to the eye than the often hideous aggregation of wires erected on ugly wooden poles by the Postmaster-General, and can be made very neat and unobtrusive.

NEW APPLICATIONS.

Following on the successful application of electric power to the lesser industries, its use in such large undertakings as collieries and textile mills has been seriously undertaken, and great developments have taken place in both directions. The colliery supply falls mainly into the hands of companies, but a large proportion of the mills lies within the boundaries of municipal supply authorities, and offers a very valuable field for exploitation. The textile mill, with its large and steady load, is perhaps the last great stronghold of the isolated steam-power plant, and it has been exceedingly difficult to convince the owners of such mills that anything is to be gained by the substitution of electric power. However, as the result of trial installations, it has been brought home to the proprietors that the electric drive is so much better adapted to their needs than steam power, that a very material profit can be gained by the change-over, and numerous mills are now electrically driven. In order to obtain the most reliable information regarding this subject, a joint committee of representatives of the Textile Institute and the Institution of Electrical Engineers was formed in July to investigate the whole question and draw up a report. The development of electric heating and cooking is another direction in which great progress has been made, and in which there is enormous scope for expansion. The apparatus employed has been very much improved and cheapened, and in many places electrical energy is supplied for these purposes at very low rates. Although heating by electricity must still be regarded as a luxury, its use is greatly extending, and electric cooking has been proved to offer advantages which go far to neutralise the inconsiderable difference in cost between this and other methods. Much useful work has been done during the past year towards popularising these and other domestic applications of electricity, and the "Smoke Abatement" movement, which has occupied the attention of several municipalities, including those of Glasgow, Bradford and Manchester, has proved a powerful ally, by far the greater part of the smoke nuisance being traceable directly to the emanations from the chimneys of private houses and business premises. At Fleetwood, the supply of energy to a cold-storage company has been undertaken, and this is an admirable type of outlet for the surplus production of electricity works during the summer months. The pumping of water and sewage is also becoming more usual, and by arrangement with the authorities concerned can often be restricted to the hours when the generating plant is underloaded.

COMMERCIAL QUESTIONS.

The tariff question is one which never palls, apparently, and is constantly under revision. The "telephone" system and similar tariffs based upon the payment of a fixed sum annually plus a small charge per unit consumed have gained favour; Liverpool is trying a charge of 12 per cent. to householders and 18 per cent. to other residents upon the rateable value of the premises, plus 1d. per unit, as introduced at Norwich; a contract system is in vogue at Harrogate. There is a general demand for lower prices for the outside lighting of shop windows, and this has in many cases been acceded to with advantage. The importance of an efficient "publicity" department in popularising and extending the use of electricity is being more generally recognised, though this is still inadequately dealt with in most towns.

The antagonism between wiring contractors and municipal electrical sales and wiring departments continues unabated; the conference between representatives of the two parties which was endeavouring to arrive at a solution of the points at issue was suspended in February, in view of the impossibility of attaining to agreement, and the Municipal Electrical Association is introducing a new Bill into Parliament for the purpose of securing for municipalities generally powers to sell apparatus, wire premises and hire-out motors, such as are already possessed by many authorities. In the meantime, Leicester, having been defeated in the legal action on this question, has sold its stock of fittings, etc. There can be little doubt that in the end the powers desired will be granted by Parliament, the principle having been already conceded in so many instances.

On the whole, the past year has been a very satisfactory one for the electricity supply industry, and the prospects are entirely favourable to its rapid and beneficent development.

## STREET LIGHTING.

Although there have been no epoch-making innovations in either the methods or the means of public lighting during the past twelve months, great progress has been made in the direction of improving the illumination of the streets with the aid of the many devices for that purpose which have been evolved during recent years. The standard of illumination tends continually upward, largely, no doubt, due to the introduction of more efficient lamps and reflectors, as well as to the raising of the popular standard of indoor lighting, and to the incessant rivalry between the two chief competitors for public lighting contracts—gas and electricity. But though a marked improvement has been effected in the lighting of our large towns, much still remains to be done, especially in the illumination of the less important thoroughfares and in the general lighting of the smaller towns. The vast bulk of street lighting in this country is of course done by gas, and the number of gas lamps is steadily increasing, nearly 8,000 being added in 1910-11. The superiority of the incandescent mantle for this purpose is unquestioned, and it is employed in all modern installations. But, as Mr. Garrard pointed out in a recent paper (The Surveyor, January 5th), there still remains a very large proportion of flat-flame burners in use for street lighting, which are both costly and inefficient, and ought to be superseded by incandescent burners without delay.

AUTOMATIC LAMP-LIGHTERS.

A difficulty which has long hampered the lighting authorities has been the necessity of lighting the public lamps individually by hand—a process which not only involves expenditure on labour, but also entails considerable waste of gas, as it is necessary to commence lighting-up long before the light is really needed, and a similar loss occurs in extinguishing the lamps. Moreover, on the occurrence of a heavy fog it is impossible to light the lamps quickly enough to cope with the emergency adequately, and thus traffic is impeded and accidents are invited. This difficulty, however, is now no longer insuperable, for the numerous devices which have been developed for the purpose of dispensing with the human lamplighter bid fair to provide a satisfactory solution to the problem. Of the two leading types—namely, those operated by clockwork and those which are actuated by a wave of pressure from the gas-works—the latter appears to be most favoured; the clockwork controller obviously does not meet the case of fog, and it needs winding at regular intervals, whereas the pressure-wave controller is always ready for use. There are, however, cases in which the pressure-wave system is not available, as when a district is supplied from two or more works, or where wet meters are used, and as the frequency of fog is notably diminishing through the extending adoption of improved methods of heating and cooking, as

well as the reduction in the number of isolated steam plants using coal, this factor is perhaps of no great importance.

So successful have the automatic apparatus proved in experimental installations, that many authorities are adopting them in large numbers. At Newcastle, for example, where all kinds of controllers have been tried, the experience gained with an automatic pressure-wave controller which has been applied to 750 lamps has led the Lighting Committee to recommend the extension of the system to the whole city in the course of the next three years, requiring over 7,500 additional apparatus, at a total cost of £9,420. The Committee find as a result of their experiments that the clockwork type is not altogether successful in effecting the simultaneous lighting of the lamps, there being a possible difference of an hour between the first and the last, though all the apparatus are set for the same time. In the course of an action for infringement of patent it was stated that over 1,000 controllers had been in use in Folkestone for some years, with very satisfactory results, never more than two failures occurring in one night.

A drawback to the use of automatic pressure-wave controllers is that the street lamps have to be lighted before the general private lighting is fully on, lest there be difficulty in obtaining the extra pressure required to operate the apparatus; none the less, a marked saving results from their use. The greatest enemy to the successful operation of the system last year appears to have been the unusual frequency of stoppage due to the accumulation of naphthalene in the pipes. The cause of the trouble is not definitely known; but it has been suggested that the exceptionally high temperature of the summer enabled the gas to carry more naphthalene into the mains. The use of vertical retorts is said to mitigate the trouble from this cause.

IMPROVED LAMPS.

Even where incandescent mantles have been installed in the public lamps finality has not been attained, for in most cases the upright type was originally adopted, and experience has shown that the inverted mantle is far superior to the former in its ability to withstand the effects of high winds. Perhaps a more uniform illumination is obtained from the upright type, when combined with a suitable reflector, as the inverted mantle throws a strong light downwards, too near the post; but this is of less consequence than the breakage of mantles.

While the high-pressure system of gas lighting has come into extended use for the illumination of important streets and open spaces where high-power units are necessary, the inconvenience due to the employment of high-pressure gas has spurred on inventors to improve the low-pressure types, and material advances have been made in this direction by several well-known manufacturers. Low-pressure lamps of 1,000 candle-power are now available, giving more than 40 c.p. per cubic foot per hour: so that, taking the extra cost of high pressure gas into account, there is not much to choose between the two. Considerable progress has been made in this direction abroad; in Budapest, for example, 2,000 low-pressure lamps of 1,000 c.p. each are being installed, and a large number in Berlin. The increased efficiency obtained is mainly due to a system of pre-heating the gas and air, so as to secure the perfect combustion upon which the high-pressure type depends for its efficiency.

ELECTRIC LIGHTING.

Turning to the rival illuminant—electricity—we find that very effective use is being made of the metallic-filament lamp in the battle with gas, which in most cases has the advantage of being in possession of the field, and is therefore not easily displaced. There is no doubt that the efficiency and longevity of the tungsten lamp, combined with the facility with which the whole of the public lighting can be turned on at once, and the possibility of adopting the most efficient reflectors, so as to obtain a high degree of uniformity of illumination, are strong points in its favour, and place electric lighting approximately on an equality with gas in point of cost and efficiency. In small towns and villages especially, where the price of gas is high, electric lighting is being very widely adopted. In the Metropolis the boroughs of Marylebone and Hampstead have completed the conversion of the whole of the public lamps to electricity, and Poplar and Shoreditch have decided to follow the same course. The estimated cost of the process in Hampstead, unfortunately, was greatly exceeded, leading to something of a scandal, with serious results to the responsible officials. Norwich is changing over one-third of the lamps each year, and Barnsley, Stafford, and Lewes are among the towns which are adopting electricity throughout. In the larger towns, and several of the metropolitan boroughs where electricity is already in use to a greater or less extent, further progress has been made. In many cases arc lamps are being superseded by groups of tungsten lamps, with advantage in point of both cost and efficiency. A formal competition between the latest systems of gas and electric lighting has been initiated in Manchester, but the results have not yet been made known.

COMPROMISE IN LONDON.

Perhaps the most interesting decisions have been those of the corporation of the City of London and the borough council of Holborn during the latter portion of the year. In both cases the public lighting was divided between the gas and electricity companies which tendered for the work. In February the Holborn council obtained tenders for greatly improved lighting, which showed a saving of £925 per annum on a ten-years' contract in favour of electricity; nevertheless, the Works Committee recommended that the tender for gas-lighting should be accepted, but the matter was referred back to them by the council for reconsideration. Eventually fresh tenders were called for, when the rival companies unexpectedly joined hands and came forward with a joint tender, which practically left the council with no option but to accept it. The new offer, however, was a fair one, giving about three times the illumination that was obtained in 1909, at almost the same cost. The lighting units range from 90 c.p. in the side streets to 1,800 c.p. in the principal thoroughfares, and stringent conditions are laid down to ensure the maintenance of the illumination at a high standard.

The City of London has for many years been a trial-ground for improved systems of lighting, but hitherto the experiments have not borne fruit in proportion to the work done, for the illumination of the streets leaves much to be desired. However, as the result of the visit of a deputation to the Continent in 1908, and the experiments which have been carried out by the gas and electric companies since that date on the lines of the report submitted by the deputation, a decision has at last been reached which will settle the question for ten years to come.

It will be remembered that the report was in favour of high-pressure gas-lamps with inverted burners where possible, and open or flame electric arc lamps elsewhere, the lamps to be centrally suspended over streets, and mounted on standards in open spaces, with lowering gear in either case. Since February, 1910, the City of London Electric Lighting Company and the Gas Light and Coke Company have lighted Cheapside and Cannon-street on this system, with very satisfactory results. It was stated at a meeting of the Court of Common Council last month that the public unanimously favoured the centrally hung lamps, which cast no shadows on the roadway. Neither company was willing to tender for the lighting of the whole of the City, on account of the cost of laying mains; to instal high-pressure gas in some of the most important streets would have meant breaking up the roadway, which was regarded as almost impracticable. Thus, for reasons quite different from those which led to the amicable division of the con-

tract in Holborn, the two companies agreed to share the work, practically on the basis of the *status quo*, but with a saving of £6,800 a year to the City, almost equally divided between the two, while the illumination provided will be increased by over 600,000 c.p.—that is, the present lighting will be nearly doubled—and the whole of the City streets will share in the improvement. The annual cost will be reduced from £20,873 to £14,041, and the whole of the capital outlay required will be borne by the companies. As at present, the Electric Company will light twelve miles of streets, and the Gas Company forty-four miles; the principal streets will have lamps of 2,000 c.p. or more, and the side streets from one to three inverted gas mantles of 90 c.p. in each lantern. The Corporation obtained powers in the Act of 1900 to affix wires and pipes to the walls of buildings for public lighting, and the lamps will be centrally hung in all the main streets except Queen Victoria Street and New Bridge Street, which are too wide.

The experimental centrally suspended lamps of the Gas Light and Coke Co. had flexible connections, and were lowered lighted. A newer pattern is made with iron barrel, and the lamp comes down extinguished, being tested with a subsidiary service at the street level, after which, when hauled up, it makes connection by means of a cup and ball joint.

The difficulty of drawing up a satisfactory specification for street lighting, in view of the keen rivalry of the two illuminants, and the stringent tests with which they are nowadays required to conform, has led to the formation of a joint committee by the Illuminating Engineering Society, the Institute of Gas Engineers, and the Institution of Electrical Engineers to prepare a standard specification for general use; it is hoped that this will have the result of putting an end to recrimination and disputes regarding the efficiency of illumination, and will afford a reliable guide to the authorities responsible for the public lighting, who are often at a loss to appraise at their true value the merits of the respective claimants for their patronage.

## TRAMWAYS.

The even tenor of the tramway has been rudely disturbed during the past year by a series of strikes and continual agitation to a degree hitherto unknown in this connection. The spirit of unrest which pervaded other branches of the transportation industry attacked the tramway employés also, and led to serious disorganisation of the services in several important centres, while in many other cases the trouble was only averted by prompt action. The employés of the London County Council, disregarding the existence of the Conciliation Boards which had been established with their co-operation to avoid disputes, demanded that the Council should receive a deputation with regard to increased wages, more rapid "rise" of pay, the adoption of an eight-hour day, and pensions. The Highways Committee refused the application, and stated that the men's demands, if granted, would involve an increased annual expenditure of no less than £110,000 a year. Eventually, however, the Highways Committee received a deputation, and the agitation died out. At Manchester the men also demanded an eight-hour day and a minimum wage of 26s., but no strike took place. At Oldham the men were out for a few days, and much discontent was manifested in other Lancashire towns; a strike was threatened at Newcastle, and one took place at Leeds for one day only. Some of the Liverpool men came out with the other strikers in August, but the great majority remained loyal to the Corporation. At Glasgow, judging by a report of the general manager, Mr. Dalrymple, to the Corporation, the tramway employés work under particularly favourable conditions, and are better paid and provided for than in almost any other city; none the less they struck for shorter hours, longer holidays, and increase of wages, and emphasised their demands by riotous conduct, which led to more than 100 men being arrested. The strike, however, only lasted three days, and the service was resumed on the old terms.

There can be no doubt that in some respects the lot of tramway employés is arduous, owing to the division of their hours of labour, but in other ways they are comparatively well off, and it seems probable that the outbreaks which have marked the past year arose rather from the wave of agitation which swept over the whole country in the summer than from any deep-seated and genuine grievances.

### RAILLESS TRACTION.

Next to the strikes the most noteworthy feature of the year, perhaps, has been the opening of the first railless trolley system that is now in operation between Leeds and Bradford. The system, which is often mentioned "trackless tramway," though it has a track, but is certainly not a tramway, has been mooted for years, and numerous projects have been prepared, only to be timorously dropped, as though each of the promoters was afraid to be the first to make the plunge. Yet railless trolley systems had been in successful operation on the Continent for years, and various deputations from British municipalities had toured abroad ostensibly to satisfy themselves as to their existence and working results. Now, however, that Yorkshire has led the way, we have no doubt that the adoption of the system will receive a marked impetus. Since the opening of the route innumerable deputations have visited it for the purpose of inspecting the system, and many authorities have expressed their intention of employing it in connection with their tramways. Bradford has already resolved to extend the system by nine miles.

Although, as we have mentioned, it is not a tramway system, it differs from a motor-omnibus service essentially in that the route is rigidly fixed, and power is supplied from without the vehicles, and therefore we feel justified in dealing with it in this section.

The paper recently read by Mr. H. Boot before the Institution of Municipal Engineers having been reprinted in this journal, our readers need no further explanation of the system or its advantages. No doubt questions will arise as to the wear of the road surface resulting from the new system of transport, but as the vehicles are rubber-tyred, and weigh about the same as petrol motor buses, there is no obvious reason why greater damage should be done than by the latter. The cost of the equipment is, of course, very low—about £1,250 per mile—and if a route is found to be unprofitable the overhead construction can be removed to another route without material loss, while, on the other hand, if the traffic proves to be sufficient to justify the laying of a tramway, the overhead line can be adapted to the use of the latter. Thus there is really little risk in carrying out a railless trolley scheme, and already eight municipalities—including those of Birmingham, Sheffield and West Ham—have lodged applications to Parliament for powers to run trolley omnibuses, besides a number of companies. These are in addition to others which passed through Parliament during the previous session.

### TRAMWAY DEVELOPMENT.

Numerous extensions of existing systems are being carried out, though but few entirely new tramways have been started during the year. Birmingham Corporation, in addition to considerable extensions, decided to purchase the whole of the undertaking belonging to the City of Birmingham Tramways Co., at a cost estimated at £1,451,500. Coventry has similarly resolved to buy the local company's tramway system. At West Hartlepool a curious attitude

was assumed by the Corporation, which had agreed to purchase a portion of the undertaking of the Hartlepool Electric Tramways Co. for £12,963, but refused to complete the transaction on the score that the tramways did not legally belong to either the original promoters or the company, and therefore there was no one to whom the money could legally be paid. On the matter coming before the Court it was decided that the promoters were the legal owners, and the Corporation was ordered to pay the price to them. On appeal this was confirmed, and the Court passed severe comments upon the unreasonable action of the Corporation, remarking that the latter desired only to purchase a part of the undertaking—the right to run tramcars—without paying for it, and that the failure of the action was in the public interest. Another purchase which has caused considerable difficulty and much expense is that of the Cavehill and Whitewell tramways by the Belfast Corporation. The latter assumed possession of the system in June, but the terms of purchase are not yet settled. Trouble arose at Scarborough last winter through the refusal of the company to keep the cars running at a loss in the dead season, and the Corporation urged the Board of Trade to compel the company to run the cars, or to determine their powers. The Board was unable to accede to the request, and the matter went no further.

WORKING RESULTS.

Some very good results have been shown during the year. Manchester, with a system aggregating 182 miles of single track, carried nearly 166 million passengers, and received a total income of £810,000, out of which £85,000 was allotted to the relief of the rates. The parcels business has made very satisfactory progress, nearly a million parcels being carried, at a profit of £2,484. Liverpool tramways carried over 125 million passengers, and received nearly £600,000, of which over £98,000 was net profit, £32,755 being paid to the rates. Leeds did well also, making a profit of £175,098 out of total receipts £370,402, and handing over nearly £52,000 to relieve the rates; but Glasgow surpassed them all with 238 million passengers and receipts of almost a million sterling, of which nearly £70,000 was devoted to the "common good."

As all these undertakings have a substantial reserve, there is no doubt some justification for allotting considerable sums to aid the rates, though it is questionable whether this should be done in preference to lowering the fares. The London County Council tramways, of course, far outclass all others in this country in respect of the magnitude of their operations. The total length of single track amounts to about 286 miles, and more than five hundred million passengers are carried annually—colossal figures indeed. The cars ran 48 million miles, and the receipts amounted to more than two millions sterling. Unfortunately the capital expended is more than proportionately large, being over nine millions, and when the capital charges had been met the whole of the remaining surplus—about a quarter of a million—had to be allotted to the renewals and reserve funds, the former now amounting to half a million. It has been pointed out that the traffic receipts per car-mile have fallen because, of course, the most remunerative routes were the first to be taken in hand, and as the tramways are extended more and more the falling-off is certain to increase; there is no prospect, therefore, of the London tramways contributing large sums to the relief of rates. Moreover, it is stated that the all-night services maintained by the County Council and the low workmen's fares involve an annual loss of £70,000. Workmen are carried three miles for a penny, and as the population is dispersed more widely over the suburbs the proportion of workmen's fares will tend to increase, further reducing the available surplus. The Council is employing overhead construction instead of the conduit wherever possible, and this will reduce the average cost of the system. Had the whole of the tramways been constructed on the trolley system the revenue would have yielded a large surplus. The central depôt at Woolwich is to be enlarged so as to deal with 1,800 cars annually, and will eventually have cost £283,000.

THE TROLLEY PREFERRED.

In the spring Bournemouth Corporation converted the conduit section of the tramways to the trolley system, thus leaving London the sole user of the conduit. The fact that in so beautiful a town the objections to the overhead conductor have been proved to be less weighty than the inconvenience caused by the use of the conduit is indeed a striking victory for the former. At Wolverhampton the Lorain surface-contact system and at Lincoln the G.B. system are working satisfactorily, but the Dolter system has been replaced by the trolley at Torquay. A deadlock obtains at Oxford, where the tramway company refuses to install the surface-contact system, and the Town Council will not consent to the use of the trolley.

CHEAP FARES.

The question of fares is one which is never settled, as demands are constantly being put forward for reductions, though in many cases concession has been carried much too far. An interesting experiment has been conducted at Glasgow in connection with what are known as "two-stage fares," the principle being that for 1½d. a person is allowed to travel two consecutive halfpenny stages on one car and a similar distance on another car, the special ticket issued to the passenger being available either as a transfer or a return ticket. A considerable falling-off in revenue was anticipated, but it was found that the traffic increased sufficiently to compensate for the reduction in fares. In December a still more drastic experiment was put in force for three months' trial—doubling the length of the halfpenny stages. The manager estimated that the result would be a loss in revenue of £130,000, and that, as the cars were already fully loaded, additional cars would have to be provided, while the conductors would have great difficulty in collecting the fares. There has already been an immense turn-over from penny to half-penny fares, and the result of the trial will be awaited with interest. The manager of the Croydon tramways, reporting against the introduction of halfpenny fares, showed that where they had been adopted they had been found to be unremunerative, and that the great majority of tramway managers were strongly opposed to their adoption; similarly at Dundee, the manager stated that over seventy of his colleagues whom he had consulted were unanimously opposed to the issue of season tickets, and most of them to discount tickets also.

DEPRECIATION.

The necessity of an ample provision for renewal of track is not always adequately recognised by municipal authorities, though experience shows that under modern conditions the life of the rails is comparatively short. Mr. Dalrymple, for example, reported to the Glasgow Tramways Committee that the average life of the track was not more than ten or eleven years, and that an annual allowance of at least £1,000 per mile of double track was absolutely necessary. In view of this fact, the allocation of large sums to the relief of rates is a very questionable policy, unless full provision is first made for depreciation. Bradford paid £22,000 and Sheffield nearly £34,000 to the rates, but Walsall allotted the whole of the surplus to reserves; at Hull the Chairman of the Tramway Committee resigned because the Committee allowed £12,000 to be given to rate aid, though the profits had fallen £19,000 in three years, and at Newcastle also the Chairman resigned, because the Council appropriated part of the reserve fund.

At the Municipal Tramway Association Conference, Councillor J. H. Rodgers stated that out of 88 Corporations working their own tramways, 58 were barely paying their way or actually running at a loss, and 26 had no reserve at all.

An important question was raised at Glasgow regarding the rating of the tramways, which, in the opinion of the Tramway Committee, should be assessed like railways on only one-fourth of their value. On appeal to the Sheriff the case was decided against the Committee, it being held that the tramways could not be regarded as similarly circumstanced to railways.

ECONOMY OF ENERGY.

The use of meters on tramcars to check the consumption of energy has greatly extended during the year: there appears to be no room for doubt that a material saving can be effected by their employment—sometimes attaining to nearly 25 per cent. In the great majority of cases ampere-hour meters are used, the fluctuations of pressure being disregarded, and as a rule the results are very satisfactory. A few tramways have installed watt-hour meters, and a few others use time-meters, which merely record the total time during which the cars have been taking current from the line. Apart from the information thus obtained as to the skill of the different drivers and the inducement offered to them by bonus or otherwise to economise energy, it is found that the meter affords a valuable indication as to the condition of the car and its equipment, and thereby enables a saving in wear and tear to be effected.

An important report was issued in October by a joint committee appointed by the Municipal Electrical and Tramways Association, laying down the broad principles that should be adopted as the basis for charging for electrical energy supplied for traction purposes from combined stations.

No great progress has been made in the design or equipment of cars during the year. The covered car has everywhere proved a success, and is practically becoming universal. At Liverpool the adoption of "first-class" cars on nearly all the routes has proved very successful, about 10 per cent. of the cars being of this type. Blackpool has found open "toast-rack" cars very popular in the summer months, and is increasing its stock of them. The discussion on brakes has temporarily subsided, though the matter cannot remain in abeyance for long; fortunately but few accidents have been reported in 1911.

## MUNICIPAL AND PUBLIC BUILDINGS.

A general review of municipal building works throughout the country shows that in the erection of important public buildings London occupies a more prominent position than was the case a few years ago, when so many of the large provincial towns were building themselves town halls and municipal offices in keeping with their increased importance. While there now seems to be less work of this nature in country districts, there are several important enterprises in hand in London. The new County Hall, of course, takes precedence in point of importance, although there is not anything particularly fresh to chronicle in regard to it. The erection of a building of this size takes many years, and although work has now been steadily proceeding for some considerable time, the County Council's staff have hardly yet commenced to speculate on their ultimate removal to the south side of the river. Next in importance to the erection of the County Hall is the rebuilding of the Middlesex Guildhall. The old building had for some time been unsatisfactory both as regards the accommodation provided and its suitability for its important site. Early in the year the Middlesex County Council decided to go ahead with a scheme of reconstruction at a cost of about £80,000, and it is to be expected that before very long a new building will have arisen which will be more suitable as the headquarters of one of the most important administrative authorities of Greater London, and as a near neighbour to Westminster Abbey and the Houses of Parliament. Architectural circles in London have been much interested in the competition recently held for Marylebone town hall. The number of designs submitted was exceptionally large, and it is to be anticipated that in the winning design the Marylebone authorities have got a building which, when erected, will compare very favourably with those of the other metropolitan borough councils. The fourth municipal work of importance in London consists in additions and alterations to Hampstead Town Hall, which work is estimated to cost about £12,000.

Considering the provinces, one of the most interesting projects of the year is that for Coventry town hall. Here the usual competition was held, but the competitors were given a broad hint as to the character of design required, by the statement that the authorities felt strongly that the new buildings should harmonise with the old. As a result, the winning design is in the Gothic manner, and is an interesting contrast to most modern buildings of this kind, in which the classic style for the most part predominates. Another competition held during the year was that for a new town hall at Chadderton, an area lying between Oldham and Manchester. Council offices have been completed at Newburn, and a town hall and pavilion are being erected at Torquay. In the North, new county buildings are being erected at a cost of £21,000 at Dumfries, and Council offices are in hand at Dunfermline. Several buildings to which we have referred in previous years are now completed. Among these are the Glamorgan county hall at Cardiff, the Berkshire County Council offices at Reading, and the town hall at Burslem. New buildings have also been erected at Knaresborough and Stanley. At Hull, the second portion of the large additions to the town hall has been completed, and the Council, having concluded presumably that the old work did not compare too favourably with the new, have decided to pull down the old front portion and rebuild it at a cost of about £25,000.

SCHOOLS.

As has been the case during the past two or three years, the buildings erected for educational purposes are more important in point of numbers than any other class. Among the numerous localities in which new elementary schools have been erected are West Bromwich (£13,800), Leytonstone (£12,300), Eastleigh, Plymstock (£4,000), Dorchester, Teignmouth (£4,100), Stowmarket, Romford (£5,600), Chelmsford (£13,500), King's Lynn, Tottenham (£21,000), and Northampton (£20,000). Also, of course, a considerable amount of work has been done in the half-dozen premier towns of the kingdom, where the erection of a new school is such a frequent occurrence that no one except those immediately interested are in any way acquainted with the event. The prominence now given by municipalities to secondary education makes the list of secondary schools almost as long as that of elementary ones.

A welcome feature in these secondary schools is the lack of deadly uniformity met with in the other class. An elementary school is an elementary school, wherever it is found, and it may be said to be State-warranted to turn out pupils all exactly finished or more correctly half finished—to pattern. Secondary schools, although both State and rate supported, are of various kinds, and the diversity shows in such different directions as the character of the buildings required, and the type of student produced. Of the class of secondary schools most akin to the elementary

type—a school, that is to say, of recent formation, and known only by the name of "the secondary school"—there have been several erected during the year. Among such schools recently completed are Bury (£14,000), Darlington (£11,800), Chester-le-Street (£10,000), Jarrow (£25,000), Bromley, and Harrogate.

In Scotland "higher grade" schools have been constructed at Leven, and at Bearsden, near Glasgow, and schools of similar class are in hand at Edinburgh and Wick.

Coming to the schools of older foundation where the name of the school varies according to the sex of the pupils, and giving the weaker sex the usual precedence, "High Schools" for girls have been erected at Wellingborough and Chesterfield, and schools of this description are nearing completion or are practically completed at Wolverhampton, Leytonstone, and Kidderminster. Dealing with secondary education for boys, a new grammar school has been completed at Wolsingham at a cost of about £11,300, additions have been made to the grammar school at Hulme, a new school of this description is in hand at Preston, and the award has been made in a competition for a large grammar school at Brighton. Schemes for training colleges are under consideration in several parts of the country, particularly in Scotland, where considerable attention appears just now to be given to the subject.

### CONSTRUCTION OF SCHOOL BUILDINGS.

An Act which will have very great influence on the design and construction of school buildings received the Royal Assent on December 16th last. This Act is presumably the outcome of a report issued by a departmental committee of the Board of Education early in the year, which dealt with the cost of school buildings, and which contained recommendations that, in the interests of economy in construction, school buildings should be exempted from by-laws as to construction. The new Act, which goes by the title of the Education (Administrative Provisions) Act, 1911, gives effect in Section 3 to the recommendation of the departmental committee. The section is so important that we quote it in full as follows:—

> 3. The provisions of any by-laws made by any local authority under section one hundred and fifty-seven of the Public Health Act, 1875, as amended by any other Act, with respect to new buildings (including provisions as to the giving of notices and deposit of plans and sections), and any provisions in any local Act dealing with the construction of new buildings, and any by-laws made with respect to new buildings under any local Act, shall not apply in the case of any new buildings being school premises to be erected, or erected, according to plans which are under any regulations relating to the payment of grants required to be, and have been, approved by the Board of Education.

The extent to which local authorities will avail themselves of these new powers in regard to the erection of schools seems rather open to question. Many authorities will doubtless be somewhat chary of carrying out construction of a character that would be contrary to the by-laws if such applied, and will thus avoid being open to criticism in enforcing constructional rules which, in the erection of their own buildings, they do not think it necessary to observe.

### LIBRARIES, BATHS, HOUSING, ETC.

Public libraries appear to show a somewhat bigger muster than has been the case of recent years. Libraries have been erected during the year at, among other places, Blackpool, St. Albans, Knaresborough, Manchester, Farnworth, and in the North at Dundee and Inverurie. Several competitions have been held during the same period. Among such were those for libraries at Penistone, Deptford, Glasgow, Clydebank, and Stafford. The Deptford competition was limited to twelve selected architects, the authorities considering that in this way they were likely to get better designs than if the competition were thrown open, in which case many capable architects would consider it too much of a lottery and would not be inclined to compete.

Several authorities have in hand schemes for public baths. Willesden is proposing to expend about £16,000 on work of this description. At Liverpool the large sum of £70,000 is to be expended; at Bangor a design for baths at a cost of about £7,000 has been approved, and extensions are in hand at Eccles. New baths have been erected at Wood Green, an interesting feature of which is a sliding roof; buildings of this description have been opened at Cullercoats, and at Sale, near Manchester, a competition has been held.

The last few years have on the whole, shown a remarkable freedom from serious epidemics, and in consequence few new isolation hospitals have been erected. The preventive measures of better drainage and sanitation are having their effect, and it is almost possible to anticipate the time when it will be no longer necessary for local authorities to provide such expensive establishments as small-pox hospitals; the comparatively small number which may in time to come be required may very conceivably be provided by the State. The housing question hardly seems to be such a serious problem as it appeared a dozen years ago. Increased traffic facilities have had their effect in distributing the population over a greater area, and with less congestion better sanitary conditions and cheaper rents have resulted. Thus, although there is a good deal of work yet to be done, very large new schemes appear likely to be of comparatively rare occurrence, and will principally be concerned with the demolition of slums in the centres of large towns.

### TOWN PLANNING.

There appears to be ample evidence that most municipal authorities are recognising their responsibilities under the Part II. of the Housing and Town Planning Act, 1909. The present condition of affairs is very well summarised in a recent memorandum of the Local Government Board. From this we see that the Board have given authority for the preparation of schemes in eight districts, and although at the time that the memorandum was prepared only two applications were before the Board, from information obtained by the Board it would appear that in thirty-three districts what practically amounts to a decision to proceed with a scheme had been made, and that in twenty-eight other districts some consideration was being given to the matter. It is emphasised by the Board that the process of preparing a scheme is one not to be proceeded with in a hurry, that numerous preliminaries are involved, and that friendly conferences with local estate owners and their surveyors are much to be desired.

Although there are doubtless many districts where the probable development is so limited that the preparation of a town planning scheme is uncalled for, there are quite an equal number of areas where such a scheme is a distinct necessity, and it is to be hoped that all municipal engineers will see that, where a scheme is really needed, the local authority shall have this fact brought home to them. The particulars given in the memorandum as to the approved applications for authority to prepare schemes constitute interesting reading. Both large and small schemes are included, the largest being that of Ruislip-Northwood, with an area of over 5,900 acres, and the smallest that of Rochdale, where the area is only 43 acres. It should be noted that the Ruislip-Northwood urban district council have taken advantage of the right to go outside their boundary, and their scheme includes a portion of the parish of Rickmansworth in the rural district of Watford.

GENERAL ITEMS.

Among the odds and ends of municipal building work throughout the year are an Art Gallery at Swansea, costing £10,000, a pavilion at Burnham, and a pavilion and winter garden at Margate. These structures in Margate provide sitting accommodation for 2,500 persons in the pavilion, 1,200 persons are accommodated in an open arena, and balconies overlooking the sea give provision for an additional 500. The work has been carried out from the designs of the borough engineer, Mr. E. A. Borg, at a cost of £23,000. The Scarborough town council have under consideration a scheme to spend about £7,000 in laying out several acres of the undercliff and to erect bathers' bungalows and shelters. Prominent seaside places, it will be seen, still continue to compete one with another in municipal works calculated to attract visitors. This is beginning to apply also to the north of the Tweed, for Aberdeen has under consideration the spending of about £2,000 in the erection of a refreshment kiosk. At Glasgow there is a scheme for an art gallery, to cost £20,000, and competitions have been held for a large library and art gallery at Manchester, and for new police courts at Stockport. Weston-super-Mare is to the front with a scheme for the erection of a cattle market, an abattoir, and a refuse destructor, and it will be interesting to see whether that portion of the scheme which concerns the abattoir comes to immediate fruition. Although the arguments in favour of the general erection of public abattoirs are almost unanswerable, it seems to be a very general occurrence for an abattoir scheme to find an ultimate position on the shelf. Apparently vested interests are too strong.

The year shows an increased use of reinforced concrete in building work, although it is still unlawful to erect an ordinary building with reinforced concrete enclosures in London. The reinforced concrete regulations of the County Council which, when in force, will bring about a very desirable change in the situation, have reached the stage of being ready for the consideration of the Local Government Board. The County Council in framing these regulations has been in constant consultation with the principal professional societies, and the regulations may be considered to represent the mean of the various conflicting views on this subject. It is to be hoped that this aspect of the case will be taken into account by the advisers to the Board, and that the regulations will be allowed without any material alterations being required. Having regard to the great care which has been taken in their preparation, it may be assumed that they will be treated as general rules for reinforced concrete work throughout the country.

**A New Engineering Society.** In the Town of Wednesday [illegible] Trade [illegible] an [illegible] to be formed under the name of The British Engineers' Association for the purpose of [illegible] the general interests of British manufacturing engineers. The [illegible] Messrs. Crosby & Wellington, solicitors, 15, Duke Street, St. James's, S.W.

**Whaley Bridge and District Joint Sewerage Scheme.** The [illegible] dealing with the sewerage [illegible] portions of the districts of Yeardsley-cum-Whaley Urban District Council, Mellor Rural District Council, Chapel-en-le-Frith Rural District Council and Disley Rural District Council [illegible] Government Board inquiry [illegible] Whaley Bridge Council Offices [illegible] The principal [illegible] sewers to serve [illegible] Furness Vale. A joint board has been formed consisting of representatives of the four councils [illegible] The total estimated cost of the scheme is £30,000. The engineers for the scheme are Messrs. Burdett, Parkinson & Tate, Hall Chambers, Faith [illegible] are prepared to receive tenders for all the district [illegible]

## LONDON'S WATER SUPPLY.

### A £50,000,000 PUBLIC SERVICE.

In the *Evening News* of the 19th instant Mr. Frank Le Couteur gave, in most readable form, a number of interesting facts as to the magnitude of the system under which the Metropolitan Water Board supplies the needs of London with water.

Recalling the fact that it was in 1902 that the board was substituted for the eight water companies and two district councils who were then supplying the water, their undertakings being bought for £47,000,000, the author says that the network of pipes measures about 7,000 miles, and that, bent out straight, it would span the Atlantic at its greatest width and double nearly half the way back again.

Over half the supply comes from the Thames, the source of about a quarter of the total being the river Lea, and some 19 per cent. comes from wells and springs. The intake from the Thames is just above Staines, and here the water is imprisoned for thirty days in the board's largest reservoirs. Together they hold 3,338,000,000 gallons, and are nearly 40 ft. deep in parts. From all sources the Gargantuan total drawn is 82,170,000,000 gallons in twelve months, the daily consumption being 225,000 gallons.

Under the board's control is a staff of about 4,000. For administrative purposes the board's area is ruled out into five districts, each under a district engineer, who works under the general direction of the chief engineer, Mr. W. B. Bryan, M.Inst.C.E., at the headquarters in Savoy House. Part of their task is checking unnecessary waste. "Judging from the statistics of bulk, every man, woman and child among us consumes 31½ gallons of water a day. Leakages occur mainly in the pipes connecting our households with the main. It might make you and me more careful if we would realise that a lead pipe with a hole only ⅛ in. in diameter will allow 10 tons of water to escape in a day under average pressure." To guard against these happenings the board have instituted a body of "waste detectors." Their work saves London about 10 gallons per head per day in the East End alone, sufficient to supply 400,000 people. Speaking of the use of the stethoscope for locating leakages, the author notes that "sometimes an inspector will hold his stethoscope between his teeth instead of to his ear, the sound of traffic being then unlikely to interfere with the noise of the water's hiss. One man always works thus, because he is deaf, but false teeth, curiously enough, are non-conductors of sound. Each man who discovers a leak is granted a bonus of 1s."

As to the future, the author notes that London has storage for about 7,000,000,000 gallons, but will have to increase this by another 2,000,000 gallons. A new reservoir is to be built at Staines, and two at Lalebarn, and a million of money will have to be spent.

**Diesel Oil Engines for Kingston-on-Thames.** Diesel oil engines, the extending use of which in this country is referred to in our special article on "Electricity Supply" this week, are, by a decision of the town council arrived at on Tuesday, to be adopted in connection with an extension of the Kingston-on-Thames electricity undertaking. The total expenditure on the work in question is estimated at £13,500, of which the tender for two Diesel horizontal engines—which are to be supplied by the Maschinenfabrik Augsburg-Nürnburg Company—will account for £8,328, this including, however, a sum of £2,358 for the alternators to be manufactured by Messrs. Siemens, of Stafford. The auxiliary items are: Main fuel pipe line from wharf to works, with meter pumps, fuel tanks and cooling water pipes, foundations for two generating sets, and buildings, £2,280; switchboard, machine, and feeder panels, £1,600; extensions to substations and kiosks, £671; and for contingencies, £627. In an [illegible] report [illegible] on a careful investigation of the best systems of electrical generation in the country and in Germany, Mr. J. E. Edgcome, M.I.E.E., the borough electrical engineer, says: "Diesel engines are especially suited to the Kingston conditions of working on account of their high efficiency at low loads, and owing to the long hours during which the plant runs on light loads. This is a particularly desirable feature in the case of [illegible] undertaking. The all-round fuel cost of Diesel engines are lower than those of any other type of plant in use there [illegible] for reserve [illegible] they are self-contained; they are very reliable, and free from risk of breakdown." The advantages of the horizontal as compared with the vertical type of Diesel engine are also discussed by Mr. Edgcome.

# Ponte del Risorgimento, Rome.

By W. NOBLE TWELVETREES, M.SOC.C.E. (FRANCE).

A very interesting work completed last year in Rome is the Ponte del Risorgimento, a ferro-concrete arch across the Tiber with the clear span of 328 ft. and the rise of 32 ft. 10 in. It is the first ferro-concrete bridge of such importance in Italy, and embodies the longest span arch in the same material hitherto constructed in any country of the world. In this case, as in many previous notable structures, the Hennebique system is to be credited with the successful results attained. Fig. 1 is a view of the completed bridge.

Thanks to the simplicity and safety of the design, the contractors were enabled to overcome all the difficulties which were encountered during construction, and, furthermore, they possessed the advantage of the aid furnished whenever necessary by M. Hennebique, whose experience in the construction of important engineering works is not less valuable than the system bearing his name.

Having served last year as a means of communication between two sections of the International Exhibition, the structure remains as a permanent addition to the series of bridges of Rome.

On the recommendation of Signor Bentivegna, the city engineer, designs were invited from several Italian firms undertaking ferro-concrete work. The project submitted by La Societa Porcheddu, the Italian representatives of M. Hennebique, was accepted after some discussion by a Technical Commission, composed of the following engineers: Commendatore Ceradini, Commendatore Rinaldi, Prof. Parvopassu, and Signor Bentivegna.

After approval of the scheme by the city authorities and the Ministry of Public Works, the works were commenced early in November, 1909, at the contract price of £50,000, the bridge to be completed and ready for traffic in sixteen months. It should be mentioned, however, that the type of foundations originally intended was abandoned in favour of "Compressol" foundations, recommended by M. Hennebique in consequence of the instability of the subsoil as ascertained by trial borings, and it was after this alteration had been agreed that the contract was signed by Signor Bentivegna, representing the Mayor and City Council of Rome, and Signor G. A. Porcheddu, director of La Societa Porcheddu.

In Fig. 2 is a longitudinal section of the bridge, where some of the "Compressol" piers can be seen under the abutments, the conical weights used for ramming holes for the concrete being indicated in the same drawing. Seventy-two holes were rammed and filled with concrete rammed with similar weights, the result being to compress the soil around the concrete, while the latter constituted a series of immovable supports for the abutments. The latter consist of caissons divided into compartments by longitudinal counterforts and transverse interior walls, as shown.

From the longitudinal counterforts springs the vault forming the intrados of the arch, connected with the decking above by continuous spandrel walls.

Fig. 2 also includes various other sections, which will enable the reader to gather a good idea of the general design of the bridge. Fig. 3 is a half plan, showing the reinforcement of the abutments and counterforts; and Fig. 4 is from a photograph taken during the construction of the haunches.

In a recent editorial on the subject an American engineering journal expresses surprise at the slenderness and boldness of the design. It is quite true that the work is slender, but experience in the design of many similar bridges, including one over the Dora in Turin, and that over the Bienne at Saint-Claude (France), with the clear span of 205 ft., enabled M. Hennebique to proceed with the confidence assured by practical data.

Ponte del Risorgimento, Rome.
(Fig. 1.)

The first foundation piers were commenced in January, 1910, but the piers were not finished until the following July in consequence of floods which covered the contractor's yard and stopped work for a considerable period.

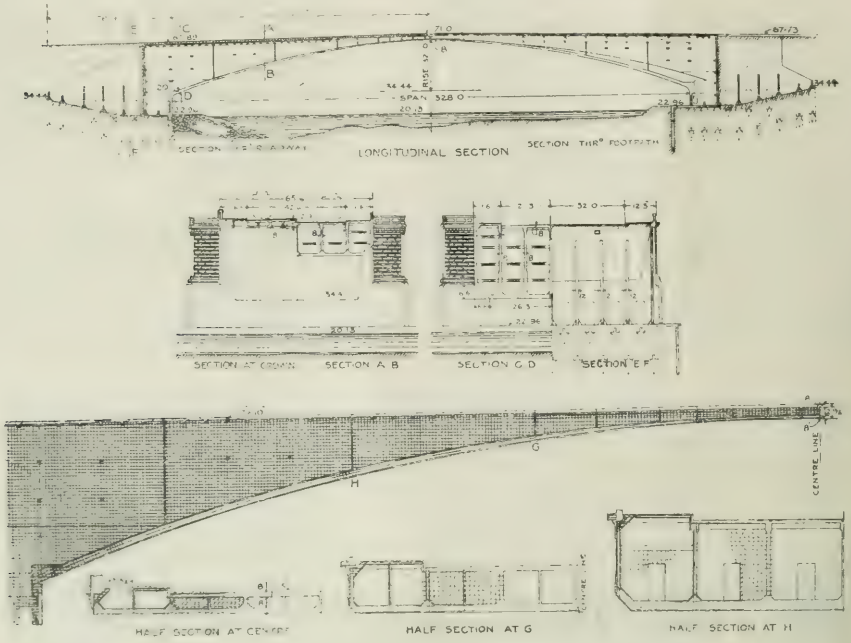
As a safeguard against erosion of the foundations on the left-hand bank of the river where the ground would be very easily washed away, a barrier of ferro-concrete sheet piles has been driven for the length of 165 ft. in front of the abutment, the piles having been sunk by the water-jet method.

In order to protect the works from injury by the spring and autumn floods in the Tiber, the contractors decided to build the staging for construction of the arch in ferro-concrete instead of timber.

As may be seen by reference to Fig. 5, the staging is carried on piles, which are connected by beams, and provide a secure foundation for the vertical members,

The whole of the work is suitably braced and in monolithic connection throughout. In the middle is an opening of 50 ft. wide for navigation purposes, as required by the regulations of the city authorities.

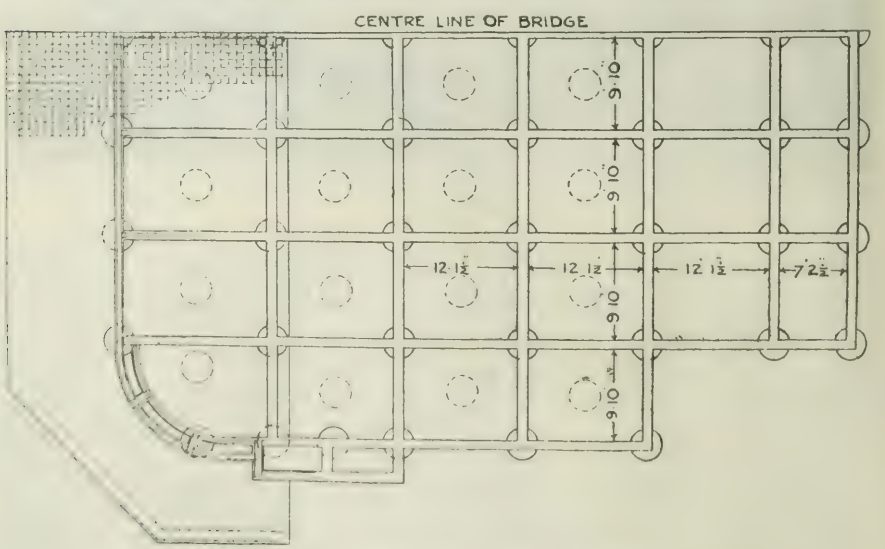
striking and unexpected manner in December, 1910, when a steamship ran into one of the piers in consequence of the failure of the steering gear. The vessel was seriously injured, but the only damage to the




PONTE DEL RISORGIMENTO: SECTIONS.
(FIG. 2.)

The type of staging here adopted saved a considerable sum in wages by rendering unnecessary the employment of skilled carpenters, and by enabling the concreting hands to set up their timbering as

pier was the cutting away of three pileheads, leaving part of the pier projecting in cantilever 10 ft. beyond its supports, as represented in Fig. 6. As half of the main arch had only been moulded a few days before




PONTE DEL RISORGIMENTO. HALF PLAN OF ABUTMENT.
(FIG. 3.)

requested, and we are informed that the amount of time saved was largely responsible for the completion of the works within the contract period.

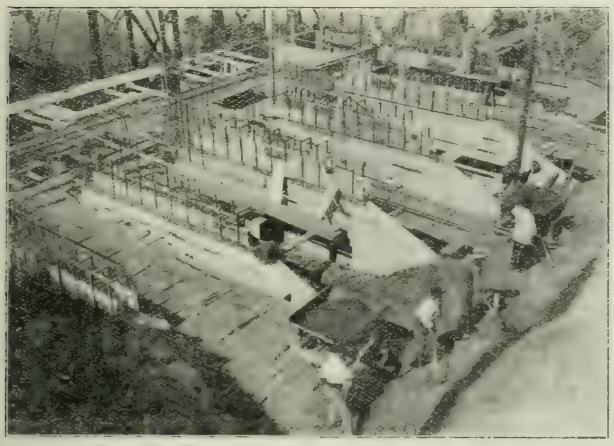
The great strength of the staging was shown on a

this mishap, a serious disaster would have resulted had the staging been of timber as usual.

In constructing the centering for the deck, ferro-concrete beams, moulded in advance, were put in

place on top of the spandrel walls and utilised for supporting the shuttering on which the concrete was deposited. This novel method enabled the contractors to execute the work rapidly and to effect a considerable saving in timber.

Notwithstanding the delays caused by the preliminary alteration of the foundation design, and the more serious delays arising from flood, the structural part of the bridge was finished on February 27, 1911, when



PONTE DEL RISORGIMENTO: CONSTRUCTING HAUNCHES.
(FIG. 4.)

nothing remained to be done but erection of the parapets, paving of the roadway and footpaths, and the execution of decorative details.

The finish of the completed structure is well shown in Fig. 1, and we are informed by those who have inspected the work that the surface finish of the concrete is so fine that it has the appearance of dressed masonry.

In order to permit the bridge to be used on April 21, 1911, for the opening of the Exhibition, the contractors struck all the centering by the 11th of that month, and ran a 19-ton steam roller across as a preliminary test. They subsequently carried out a more severe test by passing over the bridge seven steam rollers close together, and a lorry carrying a large tree trunk drawn by sixteen horses. The total moving load was 150 tons, and as the maximum deflection at the crown was no more than 5½ millimetres, the contractors had no hesitation in placing the bridge at the disposal of the city authorities. Fig. 7 is from a photograph taken after the centering had been struck, but before removal of the staging.

Before the bridge was formally taken over, a series of official tests were conducted on May 8th to 11th, under the direction of a commission, consisting of Commendatore Ceradini, Director of the Engineering College, Rome; Commendatore Rinaldi, Assistant-Director of the Italian State Railways; and Cavaliere Guidi, Professor of Construction at the Polytechnic School, Turin.

The following is a brief summary of the results obtained, as stated in the report of the commission:

*Test No. 1.*—Load: 620 kilograms per square metre over the left-hand half of the arch. The deflections were as follows:—

| | |
|---|---|
| Crown ... ... ... ... | 15·1 millimetres. |
| Right-hand haunch ... ... | 1·0 .. |
| Left-hand haunch ... ... | 13·7 .. |

*Test No. 2.*—Load: 1,240 metric tons distributed over the entire structure. The deflections were:—

| | |
|---|---|
| Crown ... ... ... ... | 32·2 millimetres. |
| Right-hand haunch ... ... | 16·2 .. |
| Left-hand haunch ... ... | 19·1 .. |

*Test No. 3.*—Load: Three steam rollers, one 13-ton, one 16-ton, one 17-ton, driven abreast across the bridge, and distributed load of 620 kilograms per square metre on footpath. Deflectometer reading:—

| | millimetres. |
|---|---|
| Crown ... ... ... ... | 1·95 |
| Right-hand haunch ... | 0·65 |
| Left-hand haunch ... | 0·80 |

As the contract conditions permitted the maximum deflection of 67 millimetres under the static load of 500 kilograms per square metre, it is particularly satisfactory to note that the maximum deflection recorded was only 32 millimetres under the static load of 620 kilograms per square metre. Thus the bridge showed a larger margin of security over and above the safety-factor demanded by the specification.

At the opening ceremony, which took place after completion of the official tests, there were present: The Conte di San Martino, Signor Nathan, the Mayor of Rome, Signor Sheriff Ballori, Signor Bentivegna, the city engineer, Signor Cerrute, the Agent-General of the International Exhibition, M. François Hennebique, Signor Porcheddu, and others interested officially in the construction and future utility of the new bridge.

PONTE DEL RISORGIMENTO. CONSTRUCTING FERRO-CONCRETE AND TIMBER FALSEWORKS.
(FIG. 5.)

**Acton Infectious Diseases Hospital.**—With reference to the article in our issue of the 12th inst., descriptive of the new pavilion at the Acton infectious diseases hospital, we are given to understand that in each of the two large wards there is fixed a powerful Shorland's patent warm air ventilating open fireplace, double-fronted Manchester hospital stove with descending smoke flues, supplied by Messrs. E. H. Shorland & Brother, Limited, of Failsworth, Manchester.

## ROAD IMPROVEMENTS IN SURREY.

### SIR GEORGE CIBB AND THE LAYING OUT OF BUILDING LAND.

With reference to the suggestions which have been made for improving the Shalford-Reigate road and for constructing a new road from Kingston Hill to Esher, we are authorised to publish the following letter from the chairman of the Road Board to Alderman Parr, the chairman of the Highways Committee of the Surrey County Council:—

Dear Mr. Pain,—I have just seen a newspaper report of the Surrey County Council meeting on the 9th instant, and I write you at once to remove any impression you may have that I am in favour of widening the Shalford-Reigate road to 100 ft.

I cannot imagine how I can have conveyed that impression to you at our recent interview, unless it be that it is our general rule.

I alluded to the desirability of new buildings alongside trunk roads in the neighbourhood of large cities being placed 50 ft. or more from the centre of the road, so as to facilitate future widenings as and when required. But that part of our conversation had no reference to the Shalford-Reigate road. I should be entirely opposed to anything that would substantially alter the character and appearance of that road. No extensive widenings or alterations are required. For such a road I think from 21 ft. to 32 ft. width of metalled carriageway, reducing even to 18 ft. if at any point a greater width involves the purchase of costly buildings, would suffice except in the immediate approaches to small towns, where of course as much extra width as can practically be obtained is desirable.

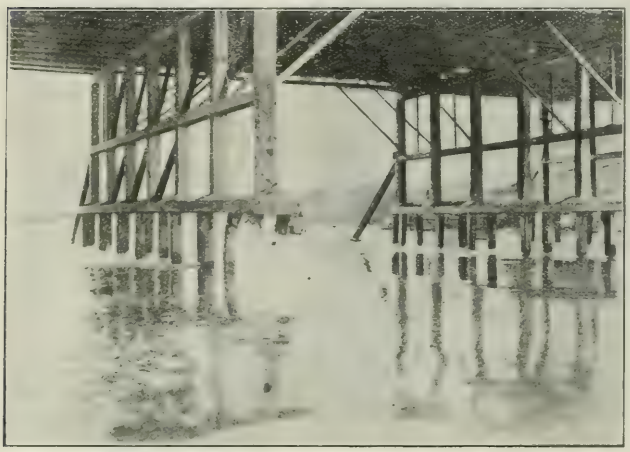
While the above width of metalled carriageway is, I think, sufficient, it would no doubt be most expedient and wise even if it were possible, by the influence either of public opinion or of law, to secure that new buildings should not be erected close up to the roadway. The possibility of the need for future widening of the highway should always be taken into consideration in laying out land for building.

The suggested road from Kingston Hill to Esher could require different treatment. If that road were made [illegible] the greater part of it would rapidly spring up, and as the conditions almost throughout its whole length would be suburban, and not rural, a greater width of land should be purchased, or covenants against building secured, although in the first instance the metalled carriageway need not in many parts exceed 40 ft. The width to be purchased should depend on local circumstances and financial possibilities, and absolute uniformity of width need not be aimed at, but just what is practicable at each point.

I am glad to see that your council have authorised the preparation of schemes, towards which, as I told you, the Road Board, subject to Treasury sanction, will be prepared to contribute, so far as the funds at their disposal may enable them to do so, and I will be glad at any time to discuss the plans with you and your surveyor while they are in course of preparation.—Yours very truly,

(Signed) George S. Gibb.

January 20, 1912.



Ponte del Risorgimento: Part of Staging Damaged by Collision. (Fig. 6.)

Ponte del Risorgimento before Removal of Staging. (Fig. 7.)

**Development of the Turbine Pump.** In a paper on the evolution and present development of the turbine pump, read last Friday before the Institution of Mechanical Engineers, Dr. Edward Hopkinson and Mr. E. L. Chorlton said it would appear that the age of the reciprocating engine, for the various duties of mechanical engineering, was passing, and that the rotary engine of the turbine type was steadily taking its place. In that of steam prime-movers it had, perhaps, already taken the lead over the reciprocating type, and the engine of Watt must now be relegated to second place. In other fields and duties its progress to date was so great as to warrant the surmise that at no distant time a similar comparison of pre-eminence would be made. In no domain, perhaps, had the turbine rotary principle achieved greater success in the last few years than that of high-lift pumping, though the realisation of its possibilities for such duties, by some, was perhaps as old or older than the steam-turbine itself. Still, its general acceptance as correct engineering practice is only a matter of the last five years. At, the present time the use of the turbine pump had become so extended that it was difficult to find services to which it could not be advantageously applied.

# The Legal Precedents of 1911 in Relation to Municipal Engineering.

By J. B. REIGNIER CONDER, a Solicitor of the Supreme Court.

Litigation during the past year has not been very prolific in matters pertaining to municipal engineering, and there have not been many decisions of first-class importance. Among the Acts and sections considered may be mentioned the Bristol Waterworks Act, 1862, the Public Health Act, 1875 (secs. 66 and 233), the Highways and Locomotives Amendment Act, 1878 (sec. 23), the Public Authorities Protection Act, 1893, the London Building Act, 1894 (sec. 88), the Metropolitan Water Board (Charges) Act, 1907, the Public Health Acts Amendment Act, 1907 (sec. 30), and the Housing and Town Planning Act, 1909 (sec. 17).

Among the localities interested are Abertillery, Billericay, Bingley, Bournemouth, Bradford, Bristol, Carshalton, Chelsea, Chorley, Doncaster, Droylsden, Hendon, Hexham, Lewes, Limehurst, Midsomer Norton, Stepney and Torquay.

## Buildings and Building By-laws.

Although the London Building Act, 1894, bristles with definitions, various words and expressions to be found in its provisions have from time to time been referred to the Courts for interpretation. Sec. 88 of the Act gives a building owner the right to repair a "defective" party structure. In *Minturn* v. *Harvey. Same* v. *London County Council* (vol. xxxix., p. 563), the question arose whether a party wall which was so damp as to render some of the basement rooms of No. 14 Chelsea-embankment uninhabitable was "defective" within the meaning of the Act. The Court answered the question in the affirmative.

In *Doncaster Corporation* v. *Johnson* (vol. xl., p. 388) Mr. Thomas Henry Johnson, architect, was fined for contravention of the corporation's by-laws in erecting a building contrary to approved plans, with walls of insufficient thickness, and also in making additions to the building without previously submitting plans.

## Borrowing Powers.

The decision of the King's Bench Divisional Court in *Rex* v. *Looke, ex parte Bridges* noted in vol. xxxviii., at p. 54), was reversed by the Court of Appeal (vol. xxxix., p. 75). It may be remembered that in this case the Bournemouth Corporation, with the sanction of the Local Government Board, borrowed £600 from the Wilts and Dorset Bank on a mortgage of the rates. The amount was subsequently paid off by a loan from the National Provincial Bank, but no transfer of the mortgage was executed, nor was any further security given. It was held by the Court of Appeal that the National Bank's loan was not unauthorised, the transaction being in substance a transfer of the old debt, and not the creation of a new debt. A surcharge by the auditor of £2 12s. 5d. paid to that bank for interest was accordingly quashed.

## Closing Order.

A case under the recent Housing and Town Planning Act, 1909, affords an interesting illustration of the principle that enactments of a penal nature will always be construed strictly where the penalty is sought to be enforced. In *Rayner* v. *Stepney Borough Council* (vol. xl., p. 156) the council served the plaintiff with two closing orders under sec. 17 of the Act. At the foot of the form of closing order prescribed by the Local Government Board there is a note setting out sub-sec. (3) of the section, which gives the owner a right of appeal to that board. No such note appeared on the closing order served on the plaintiff. Mr. Justice Neville held that the note was an essential part of the form, and that its omission rendered the proceedings irregular. An injunction was therefore granted to restrain the council from acting on the orders.

## Highways.

An interesting contribution to the law as to dangerous places near a highway is the decision in *Barker* v. *Herbert* (vol. xxxix., p. 408). The defendant was the owner of premises with an area, fenced by railings. The day after he had made a weekly inspection of the property one of the railings was broken away by boys playing football. Three days later the plaintiff (a small boy) stepped through the gap, and began clambering along a slate ledge inside the railings. The ledge broke and the boy fell. Mr. Justice Lush held that the plaintiff was not lawfully using the highway, and that the defendant was not liable.

This decision was affirmed by the Court of Appeal on the ground that the defendant had not created or continued the danger constituting the nuisance, and was not aware of its existence at the time of the accident.

The next case shows the importance of providing screens when stones are being broken in frequented localities (*Brunt* v. *Midsomer Norton Urban District Council*, vol. xxxix., p. 439). A workman of the council was breaking stones in front of the plaintiff's house, when a chip flew into the latter's eye as he was entering his gateway. No screen or guard was provided to prevent accidents to passengers from flying chips, and the jury found that the council had been guilty both of a nuisance and of negligence, and awarded the plaintiff £75 damages.

The next decision is an important one under the Public Health Acts Amendment Act, 1907 (*Carshalton Urban District Council* v. *Burrage*, vol. xxxix., p. 373). The defendant was the owner of a strip of land lying between a highway and an old chalk pit belonging to another landowner. It was held that the pit was "in a situation fronting, adjoining, or abutting on" the highway, within the meaning of sec. 30 of the Act, and was dangerous to persons lawfully using the highway. The defendant was restrained by injunction from pulling down a fence erected round the pit by the council, and ordered to pay the cost of its erection.

In *Andrews* v. *Abertillery Urban District Council* (vol. xxxix., p. 474) the plaintiff was the owner of a hotel, and of houses on each side thereof set back a few feet from a parish road. In 1898 he conveyed the "surface" of the strips of land in front of the houses (but not including that in front of the hotel) to the council for widening the highway. The latter strip, though not included in the conveyance, was also used as part of the highway. The council, having obtained a Provisional Order for supplying electric light, erected a standard on each of the two purchased strips, and a third on the strip in front of the hotel. It was held by Mr. Justice Warrington that the council were within their rights, because (1) the strips included in the conveyance had become vested in them (subject only to the reservation of minerals), (2) they had power under the Electric Lighting Acts to erect the standard in the other strip, as forming part of the street; and (3) the standards did not constitute a nuisance.

A novel point as to highways repairable *ratione tenuræ* was decided in *Re Earl of Stamford and Warrington's Settled Estates, Payne* v. *Grey* (vol. xxxix., p. 623)—namely, that rural district councils can enter into agreements with the person liable for the repair of such highways to take them over in consideration of a lump sum. In this case Mr. Justice Warrington upheld an agreement by the Limehurst Rural District Council to take over certain *ratione tenuræ* roads on the Lancashire estates of the late earl in consideration of a payment of £500 by the trustees.

An important decision in connection with the subject of road widening is that of Mr. Justice Eve in *Attorney-General* v. *Bradford Corporation* (vol xl., p. 294). The corporation, with the sanction of the Treasury, bought 53 acres of land at about half its market value, subject to a condition that 40 acres should be appropriated as a public park. The 40 acres were so appropriated accordingly, the remaining 13 acres being also used by the public as part of the park. The corporation subsequently proposed to throw part of the 13 acres into the road. This was objected to as *ultra vires*, but the Court held that there was nothing to prevent the corporation from carrying out their proposal.

Only one case of alleged extraordinary traffic has been noted, and it was one in which the claim of the highway authority did not succeed (*Billericay Rural District Council* v. *Poplar Union and Keeling*, vol. xl., p. 78). Some slight damage had been done to certain roads by the haulage, by the defendants' order, of trucks of manure drawn by traction engines. The cost of repairing the roads during the year in which

this traffic took place, however, was very slightly in excess of the average annual cost of repair during the preceding five years. It was held that this slight excess in cost above the average did not amount to "extraordinary expenses," and that, therefore, the traffic was not "extraordinary traffic," and the defendants were not liable to make any payment in respect thereof.

### Laying Out a New Street.

The question what amounts to laying out an old road as a new street is one to which no general answer can be given. It is, in fact, one of those problems of which the law evades the solution by dubbing them "questions of fact," and dealing with them in the concrete rather than in the abstract. There are several reported decisions, for instance, to show that what a particular individual did (or did not do) to a particular road was not laying it out as a new street, and *vice versâ*. Among the former may be reckoned *Attorney-General* v. *Dorin*. The defendant built a row of houses facing a footpath which he made as the principal means of access thereto. At the back of the houses was an old 19-ft. road. The Hexham Urban District Council having given him notice that under their by-laws the footpath must be constructed as a 36-ft. carriage road, he removed it, and made gateways for the houses in the hedge dividing his land from the back road, which thereafter became the sole means of access to the houses. It was held that he had not laid out the back road as a new street.

### Personal Injury.

In *Batt* v. *Metropolitan Water Board* (vol. xxxix., p. 373) the plaintiff sustained injuries through catching her foot in a defective stop-cock box constructed by the board's predecessors in connection with a communication pipe between the main and a private house. It was held by the King's Bench Division that sec. 8 of the Metropolitan Water (Charges) Act, 1907 (which makes communication pipes and their appurtenances repairable by owners or occupiers) was not retrospective, and that the board were liable. This decision, however, was reversed by the Court of Appeal (vol. xl., p. 304), who held that the section was retrospective.

The decision of Mr. Justice Grantham in *Dawson* v. *Bingley Urban District Council* (vol. xxxviii., p. 774) was reversed by the Court of Appeal (vol. xxxix., p. 474). A fire-plug in a street not repairable by the council had got covered, without their knowledge, with 6 in. of soil, and the indicating plate was about 7 ft. out of position. Owing to the delay occasioned by the difficulty of finding the plug, a fire on the plaintiff's premises did greater damage than would otherwise have resulted. It was held by the Court of Appeal that the council were guilty of misfeasance in the neglect of their statutory duty to indicate the position of fire-plugs, under sec. 66 of the Public Health Act, 1875, and were liable for the damage. The judgment of Mr. Justice Grantham in favour of the council was set aside and judgment entered for the plaintiff for £512, the amount awarded by the jury.

### Public Authorities Protection.

A technical, but none the less an important, point was decided in *Gregory* v. *Torquay Corporation* (vol. xl., p. 57), (a county court action for damages for alleged negligence). The corporation, in their notice of special defence, alleged that "the claim for which the defendants are summoned is barred by a statute of limitations." It was held by the High Court (reversing the county court judge's decision) that it was open to the corporation, under this notice, to rely on the public authorities Protection Act, 1893, which is rightly described as a "schedule of limitations."

### Rating.

In *Liverpool Corporation* v. *Chorley Union* (vol. xxxix., p. 373) the corporation bought an area of moorland as a gathering ground for their waterworks. They planted 300 acres with trees and used 50 acres as a nursery for young trees. The rest of the land was only used for sporting purposes, the farm thereon being either pulled down or closed. The sporting rights were let to a tenant, who was separately rated for them. It was held that the corporations were in beneficial occupation of the whole of the land and were rateable in respect thereof.

### Sewage Disposal.

The Courts have frequently been exercised on the question whether a natural stream into which sewage has been discharged for a long period has become so polluted as to fall within the definition of a "sewer." In *Attorney-General and Another* v. *Lewes Corporation* (vol. xl., p. 304) a stream known as the Winterbourne was held to have fallen into the category. The plaintiff Eckford was accordingly awarded £499 damages for the inundation of his lands by black slime from the stream, and the corporation were restrained by injunction from keeping it in such a state as to be a nuisance or injurious to health.

### Water Supply.

There are few subjects with respect to which greater anomalies exist than that of the meaning of "domestic purposes" as applied to water supply. In *Metropolitan Water Board* v. *Colley's Patents, Limited* (vol. xxxix., p. 373) it was held by the Court of Appeal that a supply of water to a factory for the use of workpeople for drinking and washing and for cleansing lavatories was a supply for "domestic purposes."

The King's Bench Division had taken the contrary view of the matter (vol. xxxix., p. 306). The decision of the Court of Appeal was affirmed by the House of Lords (vol. xl., p. 652). The main ground of the decision was that water used for the mere personal convenience of workpeople in a factory cannot be said to be water supplied for trade purposes. On the other hand, water supplied for sanitary conveniences, &c., at a railway station has been held not to be a supply for domestic purposes (*Metropolitan Water Board* v. *London, Brighton and South Coast Railway Company*, 26 T.L.R., 676).

In *Bristol Guardians* v. *Bristol Waterworks Company* it was held by Mr. Justice Eve that a workhouse is not a "private dwelling-house" within the meaning of sec. 68 of the Bristol Waterworks Act, 1862, so as to entitle the guardians to a supply for domestic purposes at the rates specified by that section. The effect of this decision is that the guardians will have to continue to pay by meter, as they have hitherto done.

### Workmen's Compensation.

In *Droylsden Urban District Council* v. *Hargreaves* (vol. xxxix., p. 538), a workman in the employ of the council, while cleaning setts on the highway, was knocked down by a lorry belonging to the defendant and injured. The council, having paid him £45 12s. in weekly sums of 12s. (being half his wages), claimed payment of the amount from the defendant, and also a declaration that he was liable to indemnify them from any further sums they might be called upon to pay. Judgment was given in favour of the council.

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**The Road, Past and Present.**—A lecture on this subject will be delivered at the Royal Institution on February 16th by Sir John H. A. Macdonald.

**Public Health Law.**—This manual* summarises in very useful fashion the law of public health. There has been a decided want for a handy, practical manual and work of reference on a small scale, and this want the present volume acceptably fulfils. The law of public health is so diversified and complex that few lawyers even thoroughly understand its ramifications; very often those who believe they know it best are most easily upset on one of the many points that constantly arise. Take, for example, the old familiar crux of "sewer or drain," compulsory connection of the drains of a house when it exceeds 100 ft. away from the main sewer, and the conditions necessary to give power for such compulsory connection; the points arising where the house *is* within 100 ft. of the main sewer, but is already supplied with an independent system sufficient for the effectual drainage of the premises, and so on. Such cases can only be dealt with as they occur, and by means of reference to decided cases. Mr. Turner's work is well arranged and easy of reference. The table of statutes includes practically every statute concerned with the administration of public health, not merely the various "Public Health Acts." It is thoroughly up to date, too, and deals fully with the new Public Health Amendment Act of 1907, a measure not so generally known or made use of in this country as it should be, as it confers many valuable powers upon the local authorities. The book likewise contains a pretty good list of decided cases, very useful for reference.—*Irish Builder and Engineer.*

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By Sydney G. Turner, Barrister-at-Law, Associate Institute. 10s. 6d. nett. London: St. Bride's Press, Limited, 25 Bride lane, E.C.

# The Legislation of 1911 in Relation to Municipal Engineering.

The past year will no doubt rank in history as epoch-making for many reasons, not the least being the character of some of its legislation and the methods by which that legislation has been brought about. The very fact, however, that so much of the time of Parliament has been devoted to measures so unprecedented in kind, and so far-reaching in effect, has militated against the more humdrum (though perhaps in some aspects more useful) spade-work of a normal session.

A conspicuous feature of the small modicum of ordinary legislation is the presence of several amending Acts, correcting (or, at all events, altering) provisions contained in Acts of previous recent sessions. Thus we have the Revenue Act, containing various amendments and explanations of the Finance (1909-10) Act, 1910, the Old Age Pensions Act (amending the Act of 1908), and the Factory and Workshop (Cotton Cloth Factories) Act. These amending Acts are unavoidably perhaps framed on the referential method, which renders our statute law such an intricate maze. Much has been done from time to time in the way of codifying the statutory provisions relating to particular subjects by Consolidation Acts (the Perjury Act of last year is an example), but much remains to be done, and meanwhile the arrears are added to each session.

The Acts likely to be of special interest to our readers are few, and require but brief notice.

## By-laws.

The title of the *Education (Administration Provisions) Act* gives no hint that it contains anything affecting the powers of local authorities with respect to by-laws made under the Public Health or Local Acts. Nevertheless, such is the case. The Act is short, and deals with various miscellaneous matters. The only clause with which we are concerned is sec. 3, which enacts that the provisions of any by-laws made by any local authority under sec. 157 of the Public Health Act, 1875, as amended by any other Act, with respect to new buildings (including provisions as to the giving of notices and deposit of plans and sections) and any provisions in any local Act dealing with the construction of new buildings, and any by-laws made with respect to new buildings under any local Act, shall not apply in the case of any new buildings being school premises to be erected, or erected according to plans which are under any regulations relating to the payment of grants required to be, and have been, approved by the Board of Education.

## Expiring Laws Continuance.

The *Expiring Laws Continuance Act* continues until December 31, 1912 (among numerous others) the following "temporary" Acts—*viz.*: The Locomotives Act, 1865, the Locomotives Amendment (Scotland) Act, 1878, Part II. of the Highways and Locomotives (Amendment) Act, 1878 (Parts I. and III. being permanent), the Locomotives on Highways Act, 1896, the Locomotives Act, 1898, the Light Railways Act, 1896, the Motor Car Act, 1903, and the Unemployed Workmen Act, 1905.

## Public Works Loans.

The *Public Works Loans Act* provides for grants from the National Debt Commissioners of £5,000,000 to the Public Works Loan Commissioners, and £3,000,000 to the Commissioners of Public Works in Ireland. The commissioners are also (as usual) empowered to write off certain outstanding balances on former loans.

## Public Libraries (Ireland).

The *Public Libraries (Art Galleries in County Boroughs) (Ireland) Act* contains provisions amending the Public Libraries (Ireland) Acts, 1855 to 1902. County boroughs are empowered to spend up to 1½d. in the £ for library purposes, and the county borough of Dublin is authorised to take over and maintain the Municipal Gallery of Modern Art.

## Highways and Locomotives (Ireland).

The *Public Roads (Ireland) Act* introduces into Ireland legislation with respect to extraordinary traffic similar (with certain modifications) to that which has long prevailed in England under the Highways and Locomotives Amendment Act, 1878, sec. 23. The Act also contains provisions with respect to the use of locomotives on public roads in Ireland.

Sec. 1 provides that where, by a certificate of their surveyor, it appears to the county council or urban district council liable to repair any public road (whether a main road or not) that, having regard to the average expense of repairing that road, extraordinary expenses of repairs have become necessary by reason of the damage caused by excessive weight or extraordinary traffic, the council may recover from any person by or in consequence of whose order such weight or traffic has been conducted the amount of such expenses as may be proved to have become necessary by reason of the damage. But a person against whom expenses are recoverable under this clause may enter into an agreement with the council for the payment of a composition in respect of such weight or traffic.

Subject to the provisions contained in the Act (to be referred to directly) in relation to road contractors and to regulations to be made by the Local Government Board for Ireland, any expenses recovered under the foregoing clause by the council of any county, not being a county borough, are to be applied in aid of the expenses of repairing the road, and any composition received by such council is to be applied in aid of the expenses of repairing the road or roads affected. All sums so recovered or received are to be credited to such accounts as may be prescribed in the regulations of the board.

Where any damage, in respect of which expenses are recovered or a composition is received by a council, is done to a road during the continuance of a contract to keep it in repair, if the contractor, in accordance with the terms of the contract, repairs the damage, the council (in the absence of any stipulation to the contrary) must pay to the contractor such sum as the surveyor may certify to have been expended by the contractor in repairing the damage (not exceeding the amount received by the council and applicable to that damage). If in consequence of the failure of the contractor to repair the damage the council do so, then, in calculating the amount to be deducted from the sum payable to the contractor, or recoverable from him or his sureties, credit is to be allowed for the amount received by the council under the Act and applicable to the repair of the damage.

Extraordinary traffic expenses may be recovered, if not exceeding £250, in a county court, and, if exceeding that sum, in the High Court.

Proceedings for their recovery must be commenced within twelve months of the time at which the damage was done, or, where the damage is in consequence of any particular building contract, or work extending over a long period, not later than six months after the completion of the contract or work.

The use on any public road of a locomotive constructed otherwise than in accordance with the following provisions is prohibited, viz.:

- A locomotive not drawing a wagon, and not exceeding in weight 3 tons, must have the tyres of its wheels not less than 3 in. in width, with an additional inch for every ton or fraction of a ton above the first 3 tons.
- A locomotive drawing a wagon must have the tyres of its driving wheels not less than 2 in. in width for every ton in weight of the locomotive, unless the diameter of the wheels exceeds 5 ft., when the width of the tyres may be reduced in the same proportion as the diameter of the wheels is increased, but in such case the width of its tyres must not be less than 14 in.
- A locomotive must not exceed 9 ft. in width or 14 tons in weight, unless specially authorised by the county or district council.
- The driving wheels of a locomotive must be cylindrical and smooth-soled, or shod with diagonal crossbars of not less than 3 in. wide nor more than ¾ in. thick, extending the full breadth of the tyre, and the space intervening between each crossbar must not exceed 3 in. But these requirements may be varied by order of the Local Government Board for Ireland.

The owner of a locomotive used contrary to the above provisions is liable to a fine not exceeding £5. But a county or urban district council may, on the

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application of the owner of a locomotive exceeding 9 ft. in width or 14 tons in weight, authorise its use on any public road which they are liable to repair under such conditions as to them may appear desirable.

Moreover, the owner of a prohibited locomotive is not to be deemed guilty of an offence if he proves that it was constructed before the passing of the Act, and that the tyres of its wheels are not less than 9 in. wide.

Section 3 of the Locomotive Act, 1861, and the first and second paragraphs of sec. 3 and the whole of sec. 5 of the Locomotives Act, 1865, are repealed, so far as Ireland is concerned.

Sec. 3 of the Act of 1861 and sec. 5 of the Act of 1865 contain more stringent requirements with respect to the wheels, size and weight of locomotives, than those introduced by the new Act. The latter are similar to those which have been in force in England since the passing of the Highways and Locomotives Amendment Act, 1878, which repealed the earlier provisions so far as concerns England. The first paragraph of sec. 3 of the Act of 1865 required at least three persons to be employed on a locomotive, and four if more than two wagons were attached. The second paragraph required an advance guard with a red flag. These paragraphs were repealed so far as regards England—as to the latter by the Act of 1878, and as to the former by the Locomotives Act, 1898.

The new Act makes fresh regulations as to Ireland in place of those repealed.

> When a locomotive is passing on any public road two persons must be employed in driving or attending to it, one of whom must, when required, give assistance to persons with horses or horse-drawn vehicles meeting or overtaking it. When a locomotive draws more than three wagons a third person must be employed to attend to the wagons, and he must remain at or near the rear of the last wagon so as to observe and be able to give assistance to persons with vehicles, horses, or other animals, and must give such assistance when required.

So long as the fires of a locomotive are alight, or it contains sufficient motive power to move it, one person must remain in attendance while it is on any public road, although it is stationary.

Lights must be carried on a locomotive, whether stationary or not, between one hour after sunset and one hour before sunrise during the six months beginning April 1st, and between sunset and sunrise during the six months beginning October 1st, including red light on the rear of the locomotive, or, if it is drawing wagons, on the rear of the last wagon.

The lights must be fitted with shutters or other contrivances to enable the light to be temporarily screened.

Default in compliance with any of the provisions entails a fine not exceeding £10.

Every locomotive used on a public road must be constructed on the principle of consuming its own smoke, and fitted with apparatus to prevent the escape of sparks and the dropping of live embers and cinders, and any person using a locomotive not so constructed, or not consuming, so far as practicable, its own smoke, or not fitted with such apparatus, is liable to a fine not exceeding £5 for every day during which the locomotive is used on a public road.

County councils may make by-laws for granting annual licenses to locomotives used in their county, and the fee (not exceeding £10) to be paid for a licence, and the extent of a locomotive's weight a licence is required when used on a public road.

Any person using a locomotive on a road in contravention of any by-law is liable to a fine not exceeding £5, for every day on which it is so used.

Fees received for licences are to be applied in aid of the expenses of repairing the public roads in the county in such manner as may be prescribed.

The provisions of the Public Health (Ireland) Act, 1878, relative to by-laws, are, with the necessary modifications, to apply in the case of by-laws made under this Act.

These clauses as to by-laws are not, however, to apply to agricultural locomotives.

Offenders under the Act, or by-laws, may be prosecuted and fines recovered in the manner provided by the Summary Jurisdiction Acts.

Where an offence under the Act or by-laws, for which an owner is liable has in fact been committed by a servant, workman, or other person, the latter is liable to the same penalty as if he were the owner. And where an owner is charged with an offence, he may have any other person brought before the Court, and if the Court is satisfied that the owner had used due diligence to enforce the execution of the Act, and that the other person had committed the offence without the owner's knowledge, consent, or connivance, the real offender is to be convicted, and the owner is to be exempt.

The following definitions are given:—

> "Road" includes "bridge."
>
> "County" includes a county borough, and "county council" includes the council of a county borough.
>
> "Locomotive" means a locomotive propelled by steam or other than animal power, but does not include a light locomotive or motor car within the meaning of the Motor Car Acts, 1896 and 1903.
>
> "Agricultural locomotive" includes—
>
> A locomotive used solely for threshing, ploughing, or any other agricultural purpose; and
>
> A locomotive, the property of one or more owners or occupiers of agricultural land, employed solely for the purpose of their farms and not let out on hire.
>
> "Wagon" includes truck, cart, carriage, or other vehicle.

Nothing in the Act is to affect or derogate from the provisions of any local Act dealing with the licensing of, or otherwise relating to, locomotives; or to authorise the use of a locomotive which is a public nuisance; or to affect the right of anyone to recover damages for injury sustained in consequence of the use of a locomotive.

The Act applies to Ireland only.

## Public Health (Scotland).

The Public Health (Scotland) Act (1897) Amendment Act provides that the powers conferred by the Public Health (Scotland) Act, 1897, upon a local authority under that Act, enabling such local authority to carry sewers within their district may be exercised by any body of trustees or commissioners authorised to supply water by any local Act, within the limits of water supply under such Act, in the same way and subject to the like restrictions in relation to water mains as they may be exercised in relation to sewers under the Act of 1897 by the local authority within the district of such authority.

The powers of such local authorities to carry sewers are contained in sec. 103 of the Act of 1897, and are similar to those of local authorities in England under sec. 16 of the Public Health Act, 1875.

Nothing in the present Act is to exempt such trustees or commissioners from the provisions of the Waterworks Clauses Act, 1847, with respect to the breaking up of streets for the purpose of laying pipes, excepting the provisions of sec. 29 of that Act (which contains a saving of the rights of owners of private streets), and subject to this exception those provisions are incorporated with the present Act.

"Local Act" includes a Provisional Order, and the Act confirming such order.

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**Salford Town Hall Extensions.**—The new municipal offices built as an annexe to the Salford Town Hall were opened by the Mayor of Salford (Mr. Alderman Linsley) last week. The total cost of the building and the alterations made to the town hall and the health and water offices was £13,416, or only £51 over the amount estimated.

**Lighting of Unrolled Metal at Night.**—The county surveyors of Staffordshire and Warwickshire have informed the Midland centre of the Roads Improvement Association, in response to its representations respecting the lighting of unrolled metal at night, that instructions for this to be done have been given. The county surveyor for Worcestershire promises to bring the matter before his Highways Committee.

**Roads Improvement Association.**—At the last monthly meeting of the council of the Roads Improvement Association the reports and correspondence received respecting the alleged slipperiness of tar-treated roads were considered, and a general discussion took place in regard to the matter. It was resolved that arrangements should be made to inspect various tar-treated roads, and a further report respecting this proposal will be issued shortly. The proposal of the London County Council to obtain Parliamentary powers to run trailer and coupled tramway carriages was considered, and the council unanimously decided to oppose any scheme for the coupling of the large double-deck tramcars as now used by the county council.

# Works Projected by Local Authorities for 1912.

We have to express our cordial thanks to the numerous readers who by their kindly co-operation have made possible the preparation of our seventeenth annual forecast of works projected by local authorities. Taken as a whole the returns with which we have been favoured would seem to indicate a year of average activity in municipal engineering circles, no diminution at all events being apparent in the number of important schemes of road construction, sewerage and sewage disposal, water supply, refuse disposal, public lighting, building and so forth, reported. The accuracy of the information is, we need hardly say, amply guaranteed by the fact that it emanates entirely from official sources, and it may accordingly be accepted as a thoroughly reliable guide to the immediate intentions of public bodies in the directions referred to. It may not be out of place, perhaps, to mention that we are glad at all times to receive from surveyors particulars with regard to works which they may have in prospect. Our acknowledgments are due to those who already assist us in this connection, but there are many others from whom we would occasionally also be glad to hear, not only as to matters in contemplation but as to undertakings which have been completed and of which a description in our columns, particularly if accompanied by a few explanatory plans and sections, is always acceptable to municipal engineers, whether the scene of their labours be in Great Britain or in the many other countries reached by THE SURVEYOR.

**Abergele and Pensarn** (MR. M. R. JONES, surveyor to the urban district council).—The works proposed to be carried out this year are as follows—*viz.*: Improving the sea-front, which includes the construction of a dwarf sea-wall, a raised asphalted promenade, carriage drive, shelters, sanitary conveniences, and a jetty into the sea, and road widening and general improvements to the approach of the cemetery. It is also proposed to introduce galvanised ashbins throughout the district, and to arrange for the weekly removal of contents in new covered scavenging carts.

**Abersychan, Mon.** (MR. EDWARD WHITWELL, engineer and surveyor to the urban district council). An exceptionally progressive year appears to be before the council, for they have decided to embark upon a housing scheme and to build 300 dwellings. They have proceeded so far as to approve of the designs of their surveyor, and instructed him to bring the scheme before the Local Government Board for loan purposes. The council are negotiating for land for the purpose of a public park. A swimming bath for the South Ward is to be constructed as quickly as possible. The council have also decided to erect the refuse destructor designed by the surveyor, and are considering the question of dealing with the refuse from Pontypool. Plans for road improvements, estimated to cost £7,000, have been prepared, and an application is being made to the Road Board for a grant. The question of displacing the brake service by trolley omnibuses is likely to be dealt with, the power to be partly derived from the destructor works. In December last the council purchase the "Old Nag's Head" public-house, Talywain, for the purpose of effecting a road improvement; this is to be carried out at once. The council have also decided to widen George-street, Pontnewynydd, for which purpose the surveyor is preparing plans and estimates.

**Abertillery, Mon.** (MR. LIONEL D. LEWIS, engineer, surveyor and water manager to the urban district council).—The Abertillery Urban District Council are again anticipating a very busy year. It is hoped to finish the subsidiary drainage scheme which was started last year, at an estimated cost of £12,000, and thereby complete the drainage of the whole district. A refuse destructor, estimated to cost £6,000, and capable of destroying 60 tons of refuse per twenty-four hours, will be erected; for this the council are now applying to the Local Government Board for sanction to raise the necessary money. The construction of a road 36 ft. wide between Abertillery and Blaina is also contemplated. An underground convenience in Abertillery will be erected, and the laying out of two open spaces and the continuation of the improvements in the public park by the erection of a bandstand, &c., will be undertaken. The coming year will also mark the commencement of the construction of the Abertillery and District Water Board's new reservoir at Gwyn Fawr, the estimated cost of which amounts to over £300,000. The council are also making preparations for the erection of a new fire station and the purchase of a new petrol motor fire and fire engine, the estimated cost of which is £1,000. The year will also mark the completion of the nineteenth dwellings erected under the Housing of the Working Classes Act, and it is expected that during the year another 100 houses will have been commenced. A large extension of the council's gas undertaking will be completed during the year, and the council are also now considering the matter of raising another loan for the extension of their electricity undertaking. The above-mentioned works, together with other minor street improvements, promise another busy year in municipal affairs of the above town.

**Aberystwyth** (MR. REES JONES, M.I.MUN.E., borough engineer and surveyor). — The principal works which the corporation will be engaged upon during the next twelve months include the completion of a 3,000,000-gallon service reservoir, at an estimated cost of £7,275, and the completion of an isolation hospital now in course of erection, at a cost of £1,200. The old Militia Barracks are to be converted into workmen's houses, and application is to be made to the Local Government Board for their sanction to a loan of £2,800 for the purpose. The council have instructed the borough surveyor to prepare plans for additional artisans' dwellings, a site for about fifty houses on the Corporate estate having been allotted for the purpose. Several private streets are now being made up under compulsory powers, and will be taken over by the council shortly. The laying down of a system of storm-water drainage to relieve the present sewers is contemplated.

**Acton** (MR. F. SADLER, M.INST.M. AND CO.E., M.R.SAN.I., engineer and surveyor to the urban district council).—The works that will probably be taken in hand by the council this year include: (1) New administrative block at the isolation hospital, Wales Farm-road. (2) Culverting in the western boundary brook in reinforced concrete. (3) Large extensions of surface-water sewers in the northern part of the district, necessitated by recent building operations. (4) Erection of reinforced concrete footbridge over the North and South-Western Junction Railway near Willesden Junction. (5) Resurfacing several roads in the district with tarmacadam, and paving with granite setts Warple-way. (6) Erection of new elementary school in Rothschild-road, with accommodation for 860 children. (7) Laying sewers and widening Friars Place-lane and East Acton-lane (old highways) to a width of 50 ft. for about a mile in length. The laying out and planting of Southfield-road Recreation Ground is another work projected. A plan showing the laying out of the undeveloped land in the northern part of the district is being proceeded with. A considerable area of this land is owned by the Goldsmiths' Company, who will develop it on garden city lines. Streets are being laid out, and sewers constructed, and there is little doubt that with the many facilities for reaching the heart of London this part of Acton will develop rapidly in the near future.

**Aldershot** (MR. FRED T. [illegible], M.INST.C.E., surveyor to the urban district council). Private street works, £2,000; a new outfall sewer and [illegible] drain, varying in size from 18 in. to 24 in. diameter, £3,000; extensions to the boiler house and pumping plant at the sewage outfall works, £1,700; new sewage purification beds, public street improvements and widenings, and experimental road work with asphaltic compound

binders, comprise the works proposed to be undertaken at Aldershot.

**Alfreton** (Mr. R. F. Ward, surveyor and water engineer to the urban district council).—Sanction to a loan of £9,000 for water mains and filters has been given by the Local Government Board, and the work will be put in hand early in 1912. A scheme for providing additional water storage and for installing a bore-hole pump is under consideration. Pentrich-lane, Swanwick, will be widened to a minimum of 36 ft. The Birchwood and Pye Bridge sewage disposal works will be modernised, and two plots of land will be laid out as public gardens.

**Alsager** (Mr. H. V. Lynam, surveyor to the urban district council).—Local Government Board inquiries have been held in connection with the new sewage disposal scheme, and an experimental boring for a new water supply, and both schemes are to be proceeded with as soon as the necessary sanction is obtained. Tar-macadam work, and, if possible, tar-spraying will be undertaken on the main roads, and every effort will be made to bring the by-roads to a greater standard of efficiency.

**Alton** (Mr. G. B. Hartfree, P.A.S.I., surveyor to the urban district council).—This year's undertakings include the construction of a 9-in. iron sewer and 9-in. and 6-in. stoneware sewers, private street improvements, waterworks improvements, tar surfacing, and other highway work. Possibly alterations will be carried out at the isolation hospital.

**Ambleside, Westmorland** (Mr. C. Watson, surveyor to the urban district council).—Among the most important works which will receive the attention of the council this year will be the carrying out of a new sewage disposal scheme, designed by Mr. Baldwin Latham, of London, the laying of new sewers, and the erection of a small public convenience. Inspections are being carried out under the Housing and Town Planning Act, and the question of erecting workmen's dwellings is receiving the attention of the council. The main and other roads will be tar-painted as in previous years.

**Ammanford** (Mr. David Thomas, M.INST.C.E., engineer and surveyor to the urban district council).—The works to be carried out in 1912 will be large extensions to the water supply, retaining walls on the bank of the river Amman, underground public conveniences, and about three miles of private street works. It is proposed to tar-spray some of the roads during the summer.

**Bakewell** (Messrs. Brady & Partington, consulting engineers to the rural district council).—The district of Grindleford Bridge, Eyam Woodlands, inaugurated its first water supply thirty years since by tapping springs about a mile from the village. Since then the population has considerably increased, and as there was no storage accommodation, the supply of water in dry seasons became insufficient for the requirements of the district. The Bakewell Rural District Council took up the question, with the result that a Local Government Board inquiry was held in January, 1911, and sanction was obtained to a scheme prepared by the council's engineers, which included new supply [illegible], storage reservoir, spring chambers, and other contingent works. The construction of these is nearing completion, and a good supply of water is available, with storage sufficient to tide over a period of drought even longer than that experienced during the summer of 1911. [illegible] [illegible] Brady & Partington, of Chapel-en-le-Frith. The engi- [illegible]

**Barnoldswick** [illegible]

making good of a batch of streets under the Private Street Works Act. Owing to the erection of a large weaving shed it will be necessary to extend the main sewer under the canal. The council are making an application for an extension of the boundary, which, if granted, will mean a large extension to the sewerage scheme.

**Barnsley** (Mr. J. Henry Taylor, M.INST.C.E., borough surveyor and waterworks manager).—The works which are in contemplation here within the borough of Barnsley during the current year are as follows: First of all, the corporation have applied to the Local Government Board for their sanction to be made a county borough. The population now exceeds 51,000, and the authorities are of opinion that they are quite competent to manage their own affairs without so much intervention from the West Riding County Council. Hitherto they have worked remarkably well with the county council, who have shown them a good deal of consideration, but in several matters they think they have scarcely dealt fairly with them, and they also want greater freedom in matters of self-government which they do not enjoy at the present time. The beginning of this year sees the completion of the town's new grammar school, at a cost of over £20,000, and of new sewage works which have cost £38,000 in round figures. A considerable number of private street works are in contemplation for the making and completing of streets for about 1 mile in length, at an estimated cost of from £7,000 to £8,000. It is probable that the Dearne Valley sewerage works will be undertaken this year, at a cost of about £4,000, and then the whole of the borough will be on a complete modern sewage system. Tar-spraying and improvements in the maintenance of the main roads and district roads will be continued this year. Last year over 9 miles of roads were tar-sprayed, to the great satisfaction of the residents of the town and of those who had to pass through it either by ordinary vehicles or motor cars. The chief event in the current year will probably be the railway improvements, by which it is hoped that the four railway companies, namely, the Midland, the Great Central, the Lancashire and Yorkshire, and the Hull and Barnsley, will unite to have one joint station, and by connecting the railway lines for about 1 mile in length to join the Midland Railway up to the Lancashire and Yorkshire Railway, the Hull and Barnsley Railway and the Great Central Railway, Barnsley may be placed on the main line between London, Sheffield, Barnsley and Bradford. At present great inconvenience is suffered in this part of Yorkshire from the bad railway connection, but the design which has recently been prepared by Mr. Taylor, the borough surveyor, and submitted to the general managers of the Midland Railway and Great Central Railway, will remove this inconvenience at a very moderate cost. The works necessary to carry this scheme out are of importance, and include the raising of Queen's-road, so as to do away with the existing level crossing in that road. It is estimated that the total expenditure necessary by the railway companies (towards which, no doubt, the Barnsley Corporation will contribute) will not exceed £100,000, and this will make Barnsley very busy after the preliminary negotiations have been successful and the necessary Parliamentary powers obtained. The corporation have recently obtained designs by public competition for additional swimming and slipper baths. The designs were submitted to Mr. W. J. Morley, of Bradford, as assessor, who awarded the first prize to Mr. Harold Burgess. The original estimated cost of the baths was £7,500, and it is hoped that within the next six months a scheme to [illegible] swimming bath will be commenced. There are considerable improvements taking place in the sanitary condition of the town, chiefly by the conversion of [illegible] the borough.

**Barnstaple** (Mr. E. G. [illegible], surveyor to the rural district council).—During the coming year an [illegible] amount of public work will probably be under consideration. The parish of Combe Martin [illegible] contemplating a scheme of water supply at a cost of £12,000 [illegible], and will also consider a [illegible]

cost of £5,000 or £6,000. A water supply scheme is under consideration by the parish of Georgeham, as well as the proposed extension of the sewerage scheme and outfall, which it is hoped to treat on septic lines, with automatic distributors. The latter scheme is now before the Local Government Board for their consideration and approval.

**Barnstaple** (Mr. E. Y. SAUNDERS, M.R.S.I., P.A.S.I., borough surveyor).—During the coming year the town council will concentrate their attention chiefly upon matters of sanitation and improvement generally of the premises in the poorer and most crowded districts of the borough. It is suggested to construct an 18-in. storm-relief drain for the Derby district, to discharge into the Mill leat. The sewers of the borough generally are to be further ventilated with 6-in. vent shafts in desirable positions. The completion of the wood-blocking of High-street will also be carried out this year, at an estimated cost of £480.

**Barrowford** (Mr. G. W. HEWES, A.M.I.MUN. AND C.E., surveyor to the urban district council).—Private street works in the Carr Hall district, for which Local Government Board sanction has been received, are to be carried out at an estimated cost of £2,500. A dangerous corner on the Wheatley-lane-road is to be removed. A further length of macadamised road will be tar-painted, and improvements in the lighting of roads effected.

**Barrow-in-Furness** (Mr. ARTHUR RACE, borough engineer and surveyor).—The erection of a new fire station and houses for the superintendent and engineers will be completed, at a cost of about £7,500. A new branch storeyard on the Island of Walney will be commenced, at a cost of about £500. The question of erecting new police buildings and court is still engaging the attention of the corporation, and a decision may be come to on the matter early. The corporation are also considering the question of the erection of new central baths. The Education Committee are considering the question of erecting new schools, and it is expected that at least one new elementary school will be built during the year. Two new overground conveniences and extension to an existing convenience will be carried out during the early part of the year. In connection with small holdings the corporation will commence, as early as possession can be obtained, to adapt the Bridgegate estate for the purpose of small holdings; seven cottages will also be erected for the small holders. The corporation have proposed four town planning schemes for various undeveloped parts of the borough, which will be carried through in accordance with the procedure regulations of the Local Government Board. The conversion of the whole of the flat-flame burner gas lamps to incandescent will be completed during the year. The electrification of the plant at the sewage pumping station will probably be carried out during the year. Main drainage improvements will also be carried out at a cost of about £1,500. The conversion of water-bound macadam roads to tar-macadam will be continued during the year; various streets will be made up under the statutory powers for private improvements, and one or two small road improvements will be carried out. A scheme for completing the public park will be prepared, and the erection of a new pavilion at Biggar Bank or the enlargement of the existing taken in hand.

**Barry** (Mr. J. C. PARDOE, ASSOC.M.INST.C.E., surveyor to the urban district council).—Sanction has been received for a loan of £1,700 for works in connection with a central depot, and the contract is in hand. The council are considering a further scheme for the erection of stables and other works. A loan has been applied for in connection with proposed underground conveniences for both sexes, at an estimated cost of £1,450. Sanction has been received for a loan of £500 for public improvements, walling, and steps at Cadoxton. The work will be tendered for during the coming year. Private street improvements in connection with Sweets street and lanes will also be carried out locally. Various improvements are being carried out in the three public parks. Bowling greens are being re-laid with sea-washed turf and tennis courts and croquet greens are also being put down and returfed. The whole of the main roads and several miles of highways are to be tar-sprayed during the year.

**Basingstoke** (Mr. F. REGINALD PHIPPS, ASSOC.M.INST.C.E., borough surveyor and waterworks engineer).—The principal work in view during the year is the carrying out of an additional cemetery of 11¼ acres, with chapel, lodge, &c. A scheme for completing the surface-water drainage system in the borough, and for relaying existing defective surface-water drains, has been passed by the council. A loan for this and for completing the channelling in the district roads will be applied for. The purchase of a second steam roller and scarifier has been approved by the council, and the purchase of another tar-sprayer is being recommended owing to the large amount of tarring in view. The corporation is also negotiating for the purchase of adjoining property, with a view of ultimately enlarging the town hall and municipal offices.

**Batley** (Mr. OSCAR J. KIRBY, ASSOC.M.INST.C.E., borough engineer).—The Local Government Board have sanctioned the Hey Beck district sewerage scheme, and the work, which consists of 3 miles of sewers and 1½ miles of surface-water drainage, has been commenced. There will also be substantial additions made to the electricity generating station, and streets repaved, at an estimated cost of £6,400. Several works of street improvement are also at present under consideration.

**Belper** (Mr. ROBERT C. CORDON, engineer and surveyor to the Rural District Council).—The following works are projected in this district in addition to the maintenance of 162 miles of highways: The carrying out of a sewerage and sewage disposal scheme for Crich, estimated to cost £10,260. This has received the sanction of the Local Government Board. Abutments and piers of a girder bridge over the river Derwent, 120 ft. long, estimated cost £600; superstructure to be erected the following year. A water supply scheme for the parish of Duffield, estimated cost £3,630. Construction of a storm-water culvert, Kilburne, estimated cost £140. During the course of the year several improvements to highways by the removal of dangerous corners will be effected.

**Bexhill** (Mr. GEO. BALL, ASSOC.M.INST.C.E., borough engineer and surveyor). The borough engineer and surveyor's department is looking forward to a very busy year. The purchase will shortly be completed of about 12 acres of land for park extensions and recreation grounds. Contracts have just been entered into, and will be commenced at once for the construction of a surface-water culvert, 4 ft. diameter, with iron pipes across the foreshore (estimated cost, £1,000), and a new sea-wall extension, about 900 ft. long, with slipway and promenade improvement, to cost £4,184. In addition to the general routine work, maintenance of about 36 miles of highways and private street improvements, the council have approved of the following schemes, to be carried out as soon as the necessary plans have been prepared and sanction to loans obtained: The enlargement of storage tanks at the sewage outfall, £1,350; storm-water overflow, with cast-iron pipes, 2 ft. 6 in. diameter, across foreshore, £1,400; enlargement of trunk sewers from and to new storm-water relief drain, 15 in. diameter, £1,400; construction of a new road, 40 ft. wide, £3,800; new footpath and road improvement, £375; and the improvement of the approaches to footbridge over London, Brighton and South Coast Railway, £300. It is intended to tar-spray many of the macadamised roads in the town and district, and about 4½ miles of main roads.

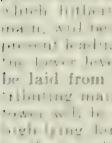
**Bilston** (Mr. VINCENT TURNER, ASSOC.M.INST.C.E., A.M.I.MECH.E., water engineer and surveyor to the urban district council).—Contracts are to be let at once for the new fire station and sanitary depot, and the removal of house refuse by direct labour under the surveyor's control will commence in June, when the present contract expires. A scheme for new sewers (about £9,000) is now before the Local Government Board, and it is hoped that it will be possible to commence the works in a few month. The Hickman Park, which was recently presented to the town, is rapidly approaching completion, the laying out being in the hands of the surveyor's department. The Road Board have been approached for assistance in tar-spraying the main thoroughfares, and the council have approved extensive tarring works for

next summer on the other roads. An order has just been placed for a 50-gallon spraying machine. The council have under consideration a scheme for duplicating the trunk water main, and it appears probable that some extensive works in this direction will be required very shortly.

**Birkenhead** (Mr. Chas. Brownridge, M.Inst.C.E., borough engineer and surveyor).—During the year the laying out and drainage of the recreation grounds on the Arno Hill will be completed, and new recreation grounds will be laid out on land recently purchased for this purpose in Birkenhead Park. Important works of street widening and improvement will be carried out, and it is anticipated that the erection of public baths at the south end of the borough, and the reconstruction of old and construction of new intercepting and main outfall sewers as necessitated by the recent development and building up of certain parts of the borough, will be undertaken.

**Birmingham** (Mr. Henry E. Stilgoe, M.Inst.C.E., city engineer and surveyor).—River Improvement and Sewerage Works.—The final contract of the Rea Valley flood relief scheme is in progress, and research work is now being undertaken in connection with the Hockley Valley flood prevention scheme with a view to ascertaining the percentage of rainfall which reaches the brook and culverts in this valley. Sewers.—A contract has been let to Messrs. Johnson & Langley, of Leicester, for the sewerage of Bromford-lane area; estimated cost £11,860. A contract has been let to Messrs. Lowe & Sons, of Burton-on-Trent, for the construction of storm-water culverts and sewers in Cotterill's-lane; estimated cost £7,335. A sewage sewer is being constructed in Shaftmoor-lane; estimated cost £254. An extension of the Cole Valley sewer (Yardley) from near Sare Hole-road to Highfield-road, Hall Green, is projected. The following works will also be put in hand in the near future: Storm-water sewer, Shaftmoor-lane, Yardley (estimated cost £294); reconstruction of Merritt's Brook main sewer (Bournville); sewerage of Stechford-lane (estimated cost £340); surface-water sewer, Edgbaston-road (estimated cost £190). Street Improvements.—Improvements are in progress, or will shortly be put in hand, in the following streets: Bell Barn-road, Cotterill's-lane, Wood End-lane (Erdington), Bromford-lane (Erdington), Station-road (Erdington), Bunbury-road (Northfield), Musgrave-road, Benson-road, Sandwell-road (Handsworth), St. Margaret's-road, Lancaster-street (widening and erection of wall), War-lane, Alum Rock-road, Treaford-lane, Bridge-road widening (bridge widening). Buildings.—New police station, Digbeth; additions to police station, Moseley-street; new offices for the city analyst; new lamp depot, Cambridge-street; new courts at the Victoria Law Courts. The corporation are proceeding with two town planning schemes in districts in the east and west of the city. Tramways.—The corporation are applying for Parliamentary powers to construct tramways in various parts of the city.

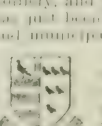
**Bishop's Stortford** (Mr. Robert S. Scott, A.M.Inst.C.E., engineer and surveyor to the urban district council).—The principal work to be carried out during the coming year will be an improved water supply. The district, which hitherto has been supplied from one leading main, will be divided into three zones of supply. The present leading main to the town will in future supply the lower levels of the district, a new 7-in. main will be laid from the pumping station to supply the distributing mains on the higher levels, and a high-level tower will be erected at the waterworks to supply the high-lying land, which cannot be adequately served by the high-level mains. The erection of a new bridge in place of the present old wooden structure carrying the main London and Cambridge road over the Stort Navigation, at Southmill, which has been under consideration for some time past, will, it is hoped, be proceeded with during the year.



**Blackpool** (Mr. John S. Brown, M.Inst.C.E., borough engineer and surveyor).—The corporation on buying up the old water undertaking in 1900 obtained a Special Act of Parliament giving them the necessary powers, and have initiated a scheme of public baths on a somewhat extensive scale, and the Cocker-street baths, which the corporation purchased from a private company in 1910 under the powers of their Act, will be almost entirely refitted with marine hot and cold water and other special baths, on the most approved and up-to-date principles. Special swimming baths will also be provided for the children attending the elementary day schools in the borough, while further provision is intended to be provided in the way of swimming baths both in the northern and southern districts of the borough. Works in connection with the extension of the outfall sewer 200 yds. further seawards, and the purification of the sewage at the northern sewer outfall are also being carried out, and it is hoped will be completed before the commencement of the next season. About a mile and a half of double tramway track is also being taken up and relaid. Extensive additions to the tramway sheds and electricity works are now being carried out by the surveyor's department. An extended ornamental verandah on the promenade opposite the west front of the Hotel Metropole is being carried out in reinforced concrete, at a cost of over £2,000. A new higher elementary school is being built for the Education Committee by the surveyor's department, at a cost of about £18,000. Certain districts within the borough are being considered as town planning schemes, which it is hoped will reach practical shape in the course of the next few months. Extensions to the town hall premises are now being carried out by the surveyor's department, at an estimated cost of about £2,000. A further extension of the promenade southwards, from near the Victoria Pier to the southern extremity of the borough, about 1¼ miles in length, is also under consideration, which, with the works already completed, will raise the length of sea defence and promenades to a total of 4½ miles of sea front. Several open spaces are being formed within the borough, at a cost of about £1,000. Extensions to the sea-water distributing mains are also being carried out, which will practically complete the sea water distributing mains over the whole of the borough. About five miles of private street works are in hand, and will probably be completed before the end of the present year.

**Blandford** (Mr. P. C. Woodhall, borough surveyor). The town council have under consideration a sewerage scheme involving an expenditure of about £25,000. The drainage and paving of the cattle market, now in hand will be completed, and twelve additional pens are being erected. The improvement of Alexandra-street, under the Private Street Works Act, 1892, will be carried out. Dorset-place improvement, now in hand, will be completed. The borough surveyor has been instructed to prepare a scheme for alterations to the town hall, and decorative repairs and new ventilation at the Corn Exchange. A flood prevention scheme is being carried out by direct labour, including the laying of a 9-in. surface-water sewer in Salisbury-street. The corporation have also under consideration the extension of the borough, and in all probability they will apply to the Local Government Board for a Provisional Order for this purpose during the year. The whole of the main roads in the borough will be tar-painted, and a grant from the Road Board for this purpose will again be sought. During the year the question of the housing of the working classes will receive the attention of the town council, and the public lighting of the town is being extended and improved.

**Blyth** (Mr. Robt. Greaves, surveyor and water engineer to the urban district council).—Application has been made for power to borrow £1,500 for sewerage works, construction of main culverts, and the drainage of Cowpen Cemetery proposed extension. It is proposed to improve about 1 mile of main road, at an estimated cost of £5,000, to which the Road Board will contribute £2,050. A number of road and private street improvements will be carried out during the year at a cost of about £3,700. A new elementary school is to be built at a cost of about £8,000, by the urban district council, who are the education authority. It is expected that pumping plant in connection with the water supply will be put down at a cost of some £3,000. The boundary of the district will be extended by the inclusion of New Delaval Colliery, and portion of the parish of Horton. A site has just been secured for the erection of a town hall and municipal offices.



**Bognor** (Mr. Charles A. Burnett, M.Inst.C.E., engineer and surveyor to the urban district council). During the coming year the principal work in Bognor is likely to be very heavy. No town in the South Coast has had a more prosperous career than Bognor. A line by the railway company, traffic returns each

year, it has leapt into popularity by leaps and bounds as a family resort, and the town has behind it an up-to-date council who are ever ready to cater for the wants and comforts of the visitors, who have helped to make Bognor what it is. The sewage outfall question is still unsettled. It is a question whether the outfall shall remain where it is (but taken out further to sea) at Felpham, or taken 1¼ miles eastwards and discharge at Hannah's groyne. Whichever scheme is undertaken it will cost £8,000. Float tests have been taken, and the town is now awaiting the result of the Local Government Board inquiry, held last summer. The first twelve out of sixty-four cottages are now about to be erected under the Housing of the Working Classes Act, 1890. The site is in Sheepwash-lane, and is an ideal one, facing south-west, and is close to the town. The refuse destructor is nearly completed, and will be capable of dealing with all the house refuse from the town. The work has been carried out by Messrs. Manlove, Alliott & Co. The council are also contemplating a scheme for the improvement of the Marine Pleasure Gardens by constructing a sunken bandstand, which they hope to have ready by this summer. The cost is £1,200. Several roads are to be reconstructed under the Private Street Works Act, 1892. With the introduction of a new town clerk in the person of Mr. Joseph Tubb, from Herne Bay, better control of the sea front is anticipated.

**Boston, Lincs** (Mr. G. E. CLARKE, ASSOC.M.INST.C.E., borough surveyor).—The works proposed to be carried out during the year are as under: Resewering part of the east side of the town on the automatic ejector system. New covered sale-ring and improvement of the beast market. New steel bridge, 86 ft. span, over the river, in place of the existing cast-iron one erected in 1803. Pulling down and rebuilding outbuildings at Kelsey House Farm, and setting back boundary wall, so as to improve the Boston-Spilsby main road. Repaving several streets. The new building by-laws will come into operation during the year. The usual amount of tar-macadam will be laid down. Harbour and Dock (Mr. G. E. Clarke, harbour and dock engineer). A contract has been let for constructing additional sidings on the dock to hold 3,000 tons of coal, with run round roads and shunting spurs to meet the steadily increasing trade. A new deep-water channel has been buoyed out from surveys made by the engineer. The general upkeep of the harbour work is heavy, as the Harbour Trust have control of 300 square miles. Additional electric light mains are to be laid at the dock, and extensive repairs carried out to one of the hydraulic coal hoists. Additional warehouse accommodation is to be provided for the Grangemouth service.

**Brackley** (Mr. ARTHUR A. GREEN, M.INST.M. AND C.E., A.R.SAN.I., borough surveyor).—There will be nothing beyond the ordinary routine work during this year.

**Bristol** (Mr. LESSEL S. MCKENZIE, ASSOC.M.INST.C.E., city engineer and surveyor). Works in progress or contemplated include a new refuse destructor (eight cells); 3 ft. 6 in. diameter brick flood relief sewer (in tunnel); ferro-concrete storage tank in a low-lying district subject to flooding; a new bowling green; the repairing of sundry streets (under loan); an extension of Avonview cemetery, and various street improvements.

**Bridlington** (Mr. E. R. MATTHEWS, ASSOC.M.INST.C.E., F.G.S., borough engineer and surveyor). The principal works which the corporation will be carrying out during this year will be as follows: (1) The erection of fifty workmen's dwellings. Plans are now being prepared for these, and it is expected that the houses will be erected during the year. (2) The completion of the widening of St. John-street. It is hoped that this large improvement will be out of hand by not later than June. It will have cost altogether over £30,000, and will have included the demolition of between fifty and sixty houses, a public-house (the Royal Hotel), and a Congregational chapel. (3) The new lavatories and shelter on the Marine-drive are to be completed by Easter. The estimated cost of these is £2,300, and the works are of special interest, as reinforced concrete is being used so largely in connection with this improvement. (4) The remodelling of the Hilderthorpe sewerage system will also be completed before Easter. (5) The extension of the borough cemetery. (6) A new ward block, and the extension of the administration block at the Sanatorium. (7) A number of minor improvements are to be carried out, such as street widenings, improvements on the Royal Prince's-parade and sea front, &c.

**Brownhills** (Mr. J. H. SHAW, engineer and surveyor to the urban district council).—Among works that will be taken in hand during the coming year are the completion of the laying of a steel-tube rising main, about 2 miles in length, from the Mosspits pumping station to the sewage farm, the duplicating of a 16 B.H.P. gas suction plant, engine and vertical treble-ram pump, and the underdraining of the remaining part of the sewage farm. A joint scheme with the Lichfield Rural District Council for laying sewers and disposal and treatment by bacteriological means of the sewage of Watling-street will receive attention, and a scheme for sewering and dealing on bacterial lines with the sewerage of part of the parish of Norton is also being prepared. In addition to the annual maintenance of about 100 miles of roads, application is being made to the county council for a grant under the Development and Road Improvement Fund Act, 1909, for the tar-spraying of about 2½ miles of main roads. It is also probable that some private street works may be carried out.

**Buckinghamshire** (Mr. R. J. THOMAS, M.INST.C.E., county surveyor).—In addition to ordinary maintenance of main roads there will be an extensive use of tarred macadam on the trunk roads, and, if funds permit, an extension of the surface treatment of numerous roads with tar. A 100-ft. span bridge, probably in reinforced concrete, will be erected over the river Colne at Wraysbury, and police buildings provided at Buckingham, Newport Pagnell, Stony Stratford, and Slough.

**Buckingham** (Mr. R. CURTIS CORDON, M.I.MUN.E., surveyor of highways to the rural district council). In addition to the works of road maintenance of 140 miles of highways, improvements are contemplated as follows: Taking off dangerous corners at Adstock and Lillingstone Lovell, building of new bridge at a ford near Chackmore, and works of surface-water drainage at Marsh Gibbon, Poundon, Water Stratford, Chackmore, Thornborough and Thornton. A small amount of road reconstruction and tar-macadamising will probably be carried out.

**Burgess Hill** (Mr. E. BROWN, M.R.SAN.I., surveyor to the urban district council).—The council have been considering an extension of the sewage disposal works, including the provision of new sedimentation tanks and percolating filters. This work will probably be carried out during 1912. Further surface-water drainage works will also be executed. The council are also about to acquire ground for an extension to the St. John's Park. The whole of the most important roads will be tar-painted, and a further section laid down on the "Gladwell" system.

**Burnley** (Mr. G. H. PICKLES, M.INST.C.E., borough engineer and surveyor).—Summarised, the principal items of municipal work in this borough during 1912 are as follow: New road at Lane Head, with tramway extension; new road near Ship Hotel, between Finsley-gate and Parker-lane; extension of tramway depot; laying out Ightenhill Park and erection of three shelters therein; extension of cart sheds at health depot; erection of twenty-four dwelling-houses in connection with housing scheme; road widenings in central part of the town; erection of mortuary chapel, registrar's house, &c.; and extension of cemetery; completion of ferro-concrete road bridge over canal at Lowerhouse; street works and extensions to sewers; construction of retaining wall at Altham sewage works; footbridge over river Calder.

**Burnley** (Mr. HAROLD PRITCHARD, engineer and surveyor to the rural district council).—It is expected that during the coming year a large amount of important work will be carried out in connection with engineering and highway work, which will include the construction of sewers and sewage disposal works for the township of Foulridge, estimated to cost £5,200; the laying of 6-in., 4-in. and 3-in. cast-iron mains in connection with the water supply scheme

for the township of Higham, at an estimated cost of £1,500; the construction of a service reservoir; the laying of additional 4-in. cast-iron mains, and possibly the installation of a water-softening plant, at an estimated cost of £900. It is hoped that about 5 miles of *ratione tenuræ* roads (being the last of a very big length) will be taken over, properly drained, and put into first-class order, which work will involve the construction of at least two bridges, having a span of 20 ft. in each case. The use of Rocmac, which in the past has given much satisfaction in the district, is likely to be continued in the maintenance of the more important roads, while tar-painting will also be continued on the roads through the villages. Several important road improvements are contemplated, including the widening and improvement of part of the Red Lees main road, subject to the approval of the county council, and the widening of the Padiham to Barrowford secondary road, at an estimated cost of over £1,000. The completion of the construction of a highways depot at Briercliffe, at a cost of £800, and the paving of Burnley-road, Hapton Nook, with granite setts, at a cost of £1,500 (which work has been already commenced), will be an accomplished fact in the near future.

**Burton-upon-Trent** (Mr. GEORGE T. LYNAM, M.INST.C.E., borough engineer and surveyor).—Bridge-street and the west approach to the Burton Bridge over the river Trent are to be widened and improved on the line of the proposed widening of the bridge on the north side. This widening involves the pulling down of a considerable amount of old property. The approach to the Midland Railway Company's hay wharf will also be widened and improved at the same time. A number of old cottages in Park-street, which have in recent years been used as a lodging-house in a locality known as Screw-yard, are to be pulled down and the street widened. The tramway track is to be overhauled and sections of the wood paving in Station-street and Horninglow are to be relaid. Trials are being made upon the boilers at the sewage pumping station with the "Ross-Schofield" circulators. Inquiries are being made into the applicability of the "Schulthess" patent lime-slaking machine to the sewage liming works at the pumping station. A further sum of £10,000 is to be borrowed for the conversion of streets in the town to the 3-wire earthage system. The electric power station is to be extended under the supervision of the electrical engineer, and a number of mains relaid and extended. The corporation are also obtaining power to extend their electrical supply to an outlying district on the overhead wire system.

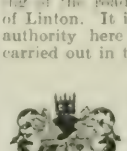
**Bury** (Mr. J. AINSWORTH SETTLE, borough engineer and surveyor).—The work projected in Bury comprises the relaying of a length of brick sewer (5 ft. in diameter), the completion of a housing scheme, and granite paving on concrete foundations. A large amount of sewering and private street works will also be undertaken during the year.

**Bury St. Edmunds** (Mr. WALTER D. HARDING, ASSOC.M.INST.C.E., borough surveyor and water engineer).—The main road scheme recently adopted by the West Suffolk County Council will come into operation on April 1, 1912, and 9 miles 7 furlongs of the borough roads are to be dealt with as main roads under that scheme. The repair of certain bridges is to be undertaken, the practice of tar-painting secondary roads is to be extended, and 200,000 sq. yds. of surface treated. Several roads will probably be made up with tar-macadam instead of granite, and schemes estimated to cost £2,960 have been prepared for private street works. Stormwater overflows are to be constructed, the storm-water tanks at the sewage farm will be extended and underdrained with concrete pipes, and a scheme for dealing with the storm water from one section of the borough is under consideration. The new additions to the cemetery, including provision of roads and footpaths, are to be completed during the early months of the year, and schemes in connection with the extension of prevailing water-mains and laying down a water-softening plant may also be considered. The borough surveyor has prepared a report dealing with the housing of the working-classes and extensive improvements to existing dwellings will be undertaken. A considerable area of the cattle market is to be paved with cement *in situ*, and the Education Committee are considering the advisability of erecting a bath-house and disinfecting station for children.

**Buxton** (Mr. FRANK LANGLEY, C.E., M.S.E., surveyor and water engineer to the urban district council.—During the year the chief and foremost works will be in conection with the natural mineral waters, for which Buxton has long been famous, and upon which its prosperity and popularity as a health resort has been established. In December last the surveyor was instructed to inspect the natural baths and springs, and make such investigations, excavations, &c., as might be necessary, with the result that near to the existing baths and pump-room a strong spring of mineral water of higher temperature than those at present in use has been discovered and laid bare. This water is to be conveyed to the present pump-room, and the latter is to be enlarged and improved for the convenience and comfort of the thousands of annual visitors to this fashionable health resort. Schemes for promenade wings to the pump-room, with alcoves and other features, have already been prepared, and it is hoped to proceed with this work in the near future. The council have also decided to put down Bell's mechanical filters at Lightwood reservoir, for which purpose application for sanction to a loan of £2,350 is to be made to the Local Government Board. The restoration and completion of Stanley Moor reservoir is to be taken in hand this year. An application is to be made to the Local Government Board for sanction to a loan of £400 for highway plant, including additional horses, watering vans, tar-spraying machines, &c. Tobogganning.—The new "Swiss" ice runs (the first in England) have been completed, and, given suitable weather, will be available for the public in the early and latter portions of the year. Short sewer extensions, the usual road maintenance, street improvements, extensive tarring of roads, together with general painting and horticultural work usual in towns of this character will form the bulk of the routine work of the surveyor's department during the year.

**Calverley** (Mr. WILLIAM WALKER, surveyor and waterworks manager to the urban district council).—The whole surface of the Leeds and Bradford main road is to be excavated 18 in. deep, 12 in. of pitching put in, and the surface relaid with tar-macadam. This work is to be done under the supervision of Mr. F. G. Carpenter, surveyor to the West Riding County Council. With regard to district roads, it is intended to complete an extensive improvement in Woodhall-road, if suitable terms can be come to with the landowners. Tar-spraying was done for the first time in this district in July last. The council and public generally were so satisfied with it as a solution of the dust problem that all the district roads will be done early in the coming year. All the necessary resurfacing will be done with tar-macadam or other dustless method. The council are now in negotiation with the landowners with a view to widening about 300 yds. of the Shipley and Bramley road.

**Cambridgeshire** (Mr. J. E. BLACKWALL, B.A., ASSOC.M.INST.C.E., county surveyor).—It is intended that the work on the main roads in this county during the coming financial year will be in accordance with the usual scheme for maintenance. Improvements include the intended reconstruction of the 21 miles of road between Royston and Newmarket, and the demolishing of buildings, and improvement and widening of the road at a dangerous corner in the village of Linton. It is a matter of interest to the highway authority here that the Army manœuvres will be carried out in the autumn.



**Cambridge** (Mr. JULIAN JULIAN, borough surveyor).—It is anticipated that the work of laying 2 miles of 24-in. rising main from the pumping station to the sewage farm will be commenced within the next two or three months. Plans have been prepared and a tender accepted for the erection of a new school to accommodate 820 scholars. Other work for the Education Committee includes the provision of a cookery and laundry centre. The Local Government Board order in connection with the extension of the borough boundaries comes into force on April 1st next, which will entail a considerable amount of extra work in most departments. Plans

are in course of preparation for additional settling tanks at the sewage farm. It has been decided to erect two blocks of workmen's cottages from plans which have already been prepared. Additional ward pavilions are meditated by the committee at the borough sanatorium.

**Carmarthenshire** (Mr. R. WILLIAM JONES, county surveyor).—The works proposed to be carried out, apart from the maintenance of 314 miles of main roads, 339 county bridges, fifteen police stations, and the two shire halls, include the completion of the new court house at Ammanford, the completion of several bridges now in course of construction, and the erection of two new bridges near Ammanford and Llangadock. The Road Board scheme for surfacing the roads within the county will be continued, and also various road widenings, while it is proposed to carry out improvements to both roads and bridges.

**Carshalton** (Mr. WM. WILLIS GALE, ASSOC.M.INST.C.E., L.R.I.B.A., engineer and surveyor to the urban district council). — The present year will bring forth its annual crop of new works consequent on the growth of this pleasant and picturesque suburb *viz.*, extension of the main sewerage system in Stanley Park-road to drain the permanent council schools to be erected there; private street works in Park-avenue, Dalmeny-road, Woodstock-road, and Avenue-road. Public improvements, including widening to 50 ft. in Stanley Park-road, widening at Hungry Bottom and Oaks-road—in all of which cases the land has been freely given by the adjoining owners. Surface-water drainage.—Plans and report on the Wrythe and Nightingale-road district. A joint scheme in conjunction with the Croydon Rural District Council for a new bridge over the Wandle at Hackbridge will be carried out. Road Works.—An experimental length of bituminous-bound road will be laid in London-road for which a grant has been received from the Road Board. Town Planning.—Every advantage will be taken of the Act, and active preparations for the adoption of a scheme have been made in co-operation with the Croydon Rural District Council, Epsom Rural District Council, Epsom Urban District Council, and Sutton Urban District Council. Many joint meetings have been held, and the draft plans are practically agreed.

**Chapel-en-le-Frith** (Messrs. BRADY & PARTINGTON, consulting engineers to the rural district council).—Dove Holes, a portion of the rural district, situated near some of the most important limestone quarries and kilns in the country, has for some years been requiring an augmentation of its water supply. The storage capacity of its three existing reservoirs has not been equal to the demands made upon it by a growing population. The council therefore decided to abandon one of the old reserves, acquire additional land adjoining, and build a new concrete reservoir of 1,500,000 gallons capacity. The engineers have prepared the necessary plans and estimates, and application has been made to the Local Government Board for sanction to borrow £4,000 to carry out the scheme. The council have under consideration a scheme for the supply of water to the village of Peak Forest, from springs on Rusheep Edge, and Messrs. Brady & Partington are now preparing plans and necessary details.

**Chard** (Mr. E. W. HEARN, borough surveyor and waterworks engineer). The works that will probably be taken in hand during this year are as follow (1) The enlargement and improvement of the Town Hall and Corn Exchange, and the provision of public offices, a caretaker's cottage, and public conveniences on an adjoining site. (2) A road widening scheme at the corner of Combe-street and Fore-street. (3) The provision of a new water supply to be obtained by gravitation from Combe St. Nicholas, some 3 miles distant. (4) A considerable area of main roads to be surface-tarred. Last year about 30,000 sq. yds. were so treated.

**Chelmsford** (Mr. PERCIVAL T. HARRISON, ASSOC.M.INST.C.E., borough and water engineer).—The principal matters engaging the attention of the council are (1) housing of the working classes, and (2) additional water supply. With regard to the former, the council have purchased 6½ acres, and have adopted the borough engineer's scheme for laying out the area with houses at a cost of £24,000. The first portion, approximating £7,000, is to be put forward at once, and a loan has been applied for. With reference to the water supply, a loan has been obtained for a trial bore at Galleywood, which has already reached a depth of 400 ft. in the London clay. Should the yield warrant it, larger bores will be carried through and a pumping station erected. The borough engineer is recommending the adoption of suction-gas at the main waterworks pumping station, and an annual nett saving of from £400 to £500 is anticipated. Loans for public convenience, road widenings, &c., are being applied for, and the works will be put in hand shortly. Schemes for new depot, stables, and storekeeper's cottage, and for the enlargement of the fire station, are being prepared. New street works and extensions to sewers and water mains necessitated by the development of the borough will be carried out during the year. It is expected that the final arrangements for converting the borough into a cathedral town will be completed during the next few months.

**Cheltenham** (Mr. J. S. PICKERING, M.INST.C.E., borough surveyor and water engineer).—A further section of the sewage purification works, comprising precipitation tanks and filter-beds, will be carried out. The reconstruction of sewers in the Tivoli district of the town will be completed. Paterson mechanical filters for treating 1,000,000 gallons per day will be installed at the Tewkesbury pumping station, and an additional slow sand filter will be put down. Further progress will be made with the construction of waterproofed roads. A scheme of town planning will be prepared. Consideration will be given to the question of extending the borough. The Institution of Water Engineers will hold their annual meeting in June at Cheltenham.

**Chepping Wycombe** (Mr T. J. RUSHBROOKE, borough surveyor). —During the past year one length of tar-macadam, one length of granite tar-painted to replace flint, and setting back of a dangerous corner have been carried out, to which the Road Board are contributing. The main roads have been tar-painted with great benefit to residents and road users, and in some instances gravel paths have been similarly treated with advantage. It is usual in this borough to spend annually £400 to £600 on new footpaths, and the practice of using *in situ* concrete, the work being executed by corporation workmen, was continued this year. A public convenience for ladies and gentlemen is now in course of erection. The corporation have now under consideration an extension of the sewer outfall works and sewering of Wycombe Marsh, the estimated cost being £35,000. The waterworks extension scheme is now nearing completion. It has involved the laying of about 2 miles of 10-in. and 6-in. rising mains; the erection of a pumping station containing two suction-gas plants and engines driving two sets of 3-throw pumps (of 36,000 and 10,200 gallons per hour capacity); drawing water from an artesian tube well 218 ft. deep, and raising it either to the old reservoirs or to the new water tower, the respective heads being 160 ft., 350 ft., 440 ft. The water tower is constructed of ferro-concrete, is 50 ft. high, and 60,000 gallons capacity. Two 10-in. Venturi meters are provided on the rising mains, the recording instruments being in the surveyor and water engineer's office The well is 6 ft. in diameter for 25 ft. in depth, and is lined with cast-iron tubbing, below which is a 16-in. boring lined to a depth of 100 ft., the remainder of the boring being unlined. Service mains are now being extended in the water tower zone. During the past summer considerable inconvenience was experienced in this area owing to the drought. Tenders will shortly be invited for the erection of an additional elementary school, and designs are in course of preparation for a new secondary school for boys, which will be erected on a site within the borough, situated 560 ft. above sea level. This building will replace the existing Royal Grammar School, which is situated in the valley, and now is too small for the number of pupils. Earl Carrington has offered the corporation 2 acres of land near the site of the proposed new school as a recreation ground for the village of Terriers. The erection of houses for the work-

classes, and provision of a public abattoir, are now under consideration.

**Chichester** (Mr. Frank J. Lobley, assoc.m.inst.c.e., city engineer and surveyor, and water engineer).—Schemes to be carried out in Chichester during the year include the repaving of part of the cattle market, the extension of the Stockbridge sewer, and the improvement of the main London-Portsmouth road through the city. The council are also considering the question of new plant at the waterworks, embracing the use of internal combustion engines for pumping purposes, as the Crossley suction-gas engine installed at the sewage disposal works in 1911 is proving both satisfactory and economical. The question of additional reservoir capacity is also under consideration, but as these schemes involve a large expenditure, it may be some time before they are adopted. Chichester was one of the few towns where no curtailment of the water supply was necessary during the past dry summer.

**Chiswick** (Mr. Edward Willis, assoc.m.inst.c.e., f.s.i., engineer and surveyor to the urban district council).—The principal works anticipated during the year are as follows: (1) Relaying about 9,000 yds. of wood paving in the Chiswick High-road with 5-in. creosoted deal paving blocks. (2) Extensive widening and sewerage works along a circular route in the centre of the district. (3) The installation of a system of railless trams throughout that portion of the district which is at present inadequately served by railway and other transit facilities, Parliamentary powers having been obtained for this purpose during the past session. (4) The extension of the boundaries of the urban district, and a scheme of improvement in such extended area. (5) The laying out, as a public pleasure ground, of one of the commons with which the district is provided. (6) The extension of the surface-water sewerage scheme throughout the district. (7) The erection of a school for 420 boys at Strand-on-the-Green. (8) The completion of the scheme of hydrants for fire-extinction purposes throughout the district. (9) The extension of the dressing-room accommodation at the open-air swimming bath. (10) The preparation of plans for an additional ward block at the isolation hospital. (11) The preparation and laying of tarred-clinker roadways for secondary streets.

**Church** (Mr. W. E. Wood, i.a.m.c.e., surveyor to the urban district council).—The proposed new offices for the council in Market-street and Blackburn-road are expected to be erected in the spring. A gravitation sewer 1 mile in length is to be constructed connecting Altham, and doing away with their small filter-beds. This sewer will sewer the whole of the north-east side of Church, which is extending of late with new property being erected. New public convenience will shortly be erected above ground on Blackburn-road. Tar-spraying of roads will be carried out on the secondary roads in the spring, the surveyor using his own matrix "Read-need" for the purpose.

**Clayton-le-Moors** (Mr. Arthur Dodgeon, m.inst.c.e., surveyor to the urban district council).—The projected works here for 1912 consist of the carrying out of a number of private street works, raising a portion of the main outfall sewer, necessitated by subsidence due to mining operations, erection of public conveniences, street improvements in Barnes-street and Lower Barnes-street, repaving of portions of the main roads, tar-painting of main roads and other highways, and the construction of a footbridge across Hyndburn River conjointly with the Great Harwood District Council. The new Mount Pleasant council school, erected under the direction of the county architect, is nearing completion, and will be opened during the year. The laying of cables for the supply of electrical energy for public and private purposes will be proceeded with, the council having granted permission to the Accrington Corporation to apply to the Board of Trade for a Provisional Order, the sanction of Parliament there to being expected at any time.

**Chorley** (Mr. Wm. Leigh, borough surveyor).—Under sec. 150 of the Public Health Act, 1875, the council proposed to undertake the completion of thirty-one streets to be paved and made good, at an estimated cost of £8,833, and nine back passages, at an estimated cost of £1,742. The completion of ten additional filter-beds at the main outfall works, and contingent work, at an estimated cost of £5,020, is another work, others including a small underground convenience on the market-place for men and women, small sewage works for south portion of town (Bolton-road and Red Bank district), and the construction of about 960 yds. of 18-in. and 15-in. sewers, the laying out, draining, fencing, and equipment of a recreation ground off Lyons-lane and Brook-street, about 5 acres in extent, and a council school, the site for which is occupying the attention of the Sites and Building Committee of the education authority at the present time.

**Clevedon** (Mr. Geo. W. Knowles, assoc.m.inst.c.e., engineer and surveyor to the urban district council).—The council intend removing the existing timber landing stage at the pier head, and erecting in place thereof a new structure in Hennebique ferro-concrete, for which purpose the Local Government Board have sanctioned a loan for £2,842. The Salthouse Fields, 11 acres in extent, are to be partially laid out with unemployed labour as a pleasure and recreation ground. The town is to be lighted with electricity by a private company.

**Colne** (Mr. T. H. Hartley, borough surveyor).—During the year the following works will probably be proceeded with by the town council, under the supervision of the borough surveyor, in addition to the ordinary routine work: Main Sewers and Sewage Disposal Works.—Likely extensions and enlargements of main sewers, also a new sludge-pressing plant at the sewage works, to be carried out at a cost of £2,200. Private Street Works.—Thirty or forty private streets are scheduled to be paved during the year. New Main Road.—Proposal to construct a new main road in continuation of the North Valley-road, estimated to cost £7,400, and other widenings and road improvements, to cost £1,800; also the diversion of a secondary road, to cost £1,200. Water-carriage System.—The scheme for conversion of all the privies and pail-closets in the town to water carriage is to be continued during the year, at an estimated cost when completed of about £4,000. Several new sewer extensions will be required in connection with this work. Tar-spraying, Tar-painting and Tar-macadam.—A large amount of tar-spraying will again probably be done; also tar-macadam work, granite paving, and other forms of road construction.

**Colwyn Bay** (Mr. William Jones, assoc.m.inst.c.e., surveyor and water engineer to the urban district council).—The growth of "The Welsh Arcadia" has been so rapid during the last decade that it is now the largest town on the North Wales coast, having a population (Census, 1911) of 12,630, and an area of 5,541 acres. The boom in the building trade still continues, and plans for the erection of over 170 new buildings, ranging in rentals from £20 to £60 per annum, were approved of by the local authority, thus necessitating the laying down of long lengths of water, gas and electric mains, together with very important extensions of the public sewers. A number of private streets are now being made up under the provisions of the Private Street Works Act, 1892, and several more are under consideration. The Local Government Board have granted the council a Provisional Order to carry out the extensions of the promenade at Rhos-on-Sea at an estimated cost of nearly £3,000. The detailed report of the engineer with reference to the sewering of the village of Mochdre and the westerly part of the district has been considered by the council, and will no doubt be adopted during the forthcoming year with slight modification. The cost of this work is estimated to be close upon £9,000. When this important sanitary work has been accomplished the whole of this extensive district can then be connected with a water-carriage system of sewers. A special sub-committee of the council has been appointed to report on the desirability of purchasing the Victoria Pier and Pavilion, but the matter has been deferred for the present. The policy which has been carried out by the council for some years now of widening the main road which runs through the town is to be continued, and it is expected that an

expenditure of several thousand pounds will be incurred in this work during the next few years. The council have also under consideration the widening of Beach-road, Colwyn, the principal approach road to the promenade at the easterly end of the district. The necessary land has been given, and application is to be made to the Local Government Board for borrowing powers for the carrying out of this improvement. Owing to the rapid growth and development of this attractive seaside resort, other important public requirements are under consideration by the council, the first of which is the provision of a refuse destructor, and the surveyor has already reported on two or three sites which he recommends as suitable for the installation, and negotiations have been entered into for acquiring one of these sites. In addition to this procedure, some very interesting and useful data respecting destructors has been laid before the council by the surveyor, and it is expected that before the end of the current year the erection of the plant will be well in hand. Owing to the scarcity of a smaller class of dwellings in the district, some difficulty is being experienced in the housing of artisans, and the council are now considering the advisability of erecting a number of houses for the working classes. The surveyor has made inquiries in various towns as to the steps which have been taken by them in this direction, and he now gratefully acknowledges the assistance given him in this matter by his *confrères*. Another sanitary improvement under consideration by the council, which the present hygienic age demands in every growing locality, is the provision of a public slaughter-house, and the council are contemplating erecting an abattoir on a site which will adjoin the site of the refuse destructor. Another requirement which is under consideration by the water engineer and surveyor is the construction of a storage balancing reservoir. A site has been selected, and negotiations are pending to acquire the ground, and it is hoped that the work may be pushed on with very soon. It is intended to adopt more extensively the process of tar-spraying the public highways and the bituminous construction of road surfaces.

**Coventry** (Mr. J. E. SWINDLEHURST, M.INST.C.E., city engineer and surveyor and water engineer).—From the number of proposed works for the coming year, it is evident that the city engineer's department will be extremely busy. Owing to the abnormal growth of the city, and the large number of new streets which have been laid out and buildings erected during the past twelve months, much work in the nature of improvements, new main sewers, water mains, &c., has had to be executed, and at present there are no signs of abatement in this building-trade activity. The following street improvements are either in hand or will be carried out in the course of the next few months: Cash's-lane, Mile-lane, Hearsall-lane, London-road, Folly-lane, Narrow-lane, Earlsdon-lane and many smaller ones. Surface-water sewers in Brays-lane, Binley-road and Bull's Head-lane. Work in connection with the extension of the sewage farm, and the under-drainage thereof, is now proceeding, for which a loan of £18,270 has been obtained. Preliminary work is now in progress with regard to a scheme of town planning, and extensions are being made to the 1/500 Ordnance Survey plan of the city in connection therewith. Among other schemes to be carried out during 1912 are: New bridge over canal, Cash's-lane; conveniences in all public recreation grounds; widening of Leicester-street; construction of new street off Narrow-lane, while a scheme is in preparation for dealing with the surface water in separate sewers from a large and growing district (Earlsdon and Chapel Fields), situated to the south-west of the city. In connection with the architectural work which the city engineer will be called upon to execute may be mentioned: Extensions to the isolation diseases hospital consisting of new two-storey ward block for forty beds, together with additions to the administrative block, new public mortuary, branch slipper baths (thirty-five baths and other accommodation); artisans' dwellings (extension of existing scheme); public abattoirs; three branch libraries; extensions to market hall, consisting of four shops and certain stalls. The following schemes are contemplated, and will most likely be started upon during the year: General depot for highways department; extensions to public baths, new technical institute, and model lodging-house. In addition to the above, it is intended to improve the street surfaces in the city by the introduction of tar-macadam paving, &c., on a somewhat large scale. It is also proposed to lay out further recreation grounds, and to erect an open-air swimming bath. It is hoped that the street footpath paving scheme, which has been in operation during the last twelve months, will be completed during the coming year.

**Cromer** (Mr. ROBERT CROOME, surveyor to the urban district council).—The works include the erection of a Dawson & Manfield refuse destructor, at an estimated cost (including land, tipping platform, and approach road) of £1,500; also the widening of a portion of the coast road between Cromer and Mundesley, including the necessary surface-water sewer, at an estimated cost of £1,026, is proposed.

**Croydon** (Mr. GEORGE F. CARTER, M.INST.C.E., borough engineer, surveyor and water engineer).—An extension of the sewage works is being completed by the addition of four more percolating filters, and in a few months there will be a total of fifty-seven percolating filters in operation. A tender for a new disinfecting station and slipper baths has been accepted, and will be carried through during the year. The Surrey-street pumping station will be reconstructed, and Lancashire boilers installed to supersede the existing six Cornish boilers. A start has been made with unemployed labour in the excavation for a new service reservoir to hold 6,000,000 gallons, and this, as well as other matters in connection with the waterworks, involving a large expenditure, it is hoped to get fairly launched during the coming year. Arrangements have been made for the purchase of land for the erection of a fire station and branch library in Thornton Heath district. An interesting work is a contract just let to Messrs. McAlpine & Sons for the construction of a circular subway, 9 ft. 6 in. in diameter, in reinforced concrete, for making means of communication under a wide portion of the London, Brighton and South Coast Railway at Norwood Junction Station.

**Cudworth, Yorks** (Mr. W. T. LYNAM, surveyor to the urban district council).—The council is proceeding with the extension of the disposal works, which extensions will be completed during the present year. The works have been designed, and their execution is being superintended by Messrs. Fairbank & Son, M.INST.C.E., Lendal, York.

**Cumnock** (Mr. THOMAS SMALL, burgh surveyor). The principal contract to be carried out during the year is the proposed extension of the reservoir to about double its present capacity, to provide against another season like last.

**Derby** (Mr. JOHN WARD, M.INST.C.E., borough surveyor and waterworks engineer).—The principal works to be taken in hand or completed during the coming year are the carrying out of drainage works in a certain area to divert surface and subsoil water from sewers, the probable laying out of land for recreation ground, the preparation of a scheme under the Town Planning Act, the completion of the works necessary for the reception of water from the Derwent Valley waterworks, the making up and completion of various private streets, and the execution of several street improvement schemes. The Education Committee have several council schools in hand.

**Doncaster** (Mr. F. OSCAR KIRBY, M.SC., ASSOC.M.INST.C.E., borough surveyor and water engineer).—New works already in hand or under consideration this year consist of the provision of a refuse destructor, the preparation of a scheme of sewerage and sewage disposal for 1,106 acres of the borough which is in course of development, and the building of a technical school and additional swimming and slipper baths. Application has also been made to the Local Government Board for sanction to borrow £32,600 for purposes of a housing scheme, and £8,000 for waterworks extensions. Alterations to the race stands and course are in progress, and the Royal Agricultural Show will be held on the Town Moor from July 2nd to 6th, when Doncaster will be honoured by the presence of His Majesty King George V. Extensive paving works and tar-macadam surfacing will be undertaken during the year.

**Dorking** (Mr. WILLIAM A. CLEGG, surveyor to the urban district council).—The works for the year, as

far as now arranged for, are principally in connection with sewage disposal, it being intended to construct additional bacteria beds departmentally. The council are considering a proposal to provide a recreation ground, and several important road widenings and street improvements are contemplated.

**Dorchester** (Mr. H. D. STRANGE, M.I.MUN.E., borough and water engineer).—The council have under consideration a scheme for laying out about 36 acres of land, south of their sewage farm, for broad irrigation purposes. This will necessitate pumping the screened sewage through a culvert a distance of about 800 ft., and a lift of 85 ft. In connection with this scheme a refuse destructor will probably be constructed. Other works anticipated are the construction of an underground public convenience, consisting of five urinals and two water-closets, the making up of private streets, erection of sheep pens at the cattle market, and extensions to sewers, &c. Works for relieving the surface-water from the existing storm water sewers, by means of driving a heading in the solid chalk, are being carried out, at a cost of about £1,200, and will probably be completed early in the year. A large amount of tar-spraying, &c., to macadamised roads is hoped to be carried out during the summer. Electricity for power and light is expected to be placed at the disposal of consumers.

**Douglas, Isle of Man** (Mr. FRANK COTTLE, borough engineer and surveyor).—A large concert hall is in course of erection at Villa Marina Park, which has recently been purchased by the corporation for the sum of £60,000, and extends in area over 9 acres. The hall which is being carried out is to cost £20,000; this includes the laying out of the grounds, also bandstands, shelters, fountains, &c. Other projects include the laying out of a new park and playgrounds recently presented to the town, and covering an area of 25 acres—tennis courts, cricket pitches, football pitches, and croquet lawns are being laid out. The matter of electrification is under consideration, both for lighting and traction. Messrs. Hancock & Dykes have presented a report upon the scheme, and this is at present under consideration. The town improvement scheme is being carried out, and a considerable amount of slum property has been purchased for pulling down, and making a new street from the pier to the railway station. Artisans' dwellings are being carried out similar to those recently completed. These are on the self-contained flat principle, and are to cost £4,000. A further extension of the private slaughter-houses is being carried out, at a cost of £500. A considerable amount of private street work is in course of construction, owing to the recently added area. There is a proposal to include in the borough the district of Onchan, which includes a thickly-populated district of considerable area. A new service reservoir to hold 1,000,000 gallons is in course of construction; also the completion of the bulk and district meters, which have considerably reduced the waste of water. The ventilation of the town sewers is being carried out, in addition to the general work of the borough, for which the usual amount will be allowed in the estimates.

**Dover** (Mr. W. C. HAWKE, ASSOC.M.INST.C.E., borough engineer and surveyor and water engineer).—The following works are projected during the current year: Two elementary schools (now in course of erection); additions to St. Martin's schools; widening of Crabble Hill; waterworks (new high-pressure main); doubling tramway track (Bench-street); viaduct (pier district); Corporation Bill for general and street improvements in the pier district. Among other important work to be carried out during the year, although not by the corporation, are the following: New quay railways and improvements by the Harbour Board, also a new water-front, a new road from Dover to St. Margaret's by a private syndicate, and a new number in the Admiralty Harbour by the Government.

**Driffield, Yorks** (Mr. T. C. BEAUMONT, [illegible] the rural district council).—The council are engaged in the construction of a [illegible] for Nafferton and these will be completed during the present year, and the water turned on to the consumers. The works have been designed and are being superintended by Messrs. Fairbank & Son, M.INST.C.E., of Lendal, York.

**Droitwich** (Mr. HY. HULSE, borough engineer and surveyor).—Works now under consideration, or are likely to be carried out, by the town council in 1912, are as follows: Surface treatment by tar-spraying of ordinary macadam roads, coating one or more streets with bituminous-grouted macadam, some short extensions of sewers, construction of a footpath with surface-water drains on a section of one of the main roads, and the provision of a fire-escape shelter. The reconstruction of a section of main sewer may be taken in hand, and a sub-committee is now considering the advisability of providing dwellings suitable for the labouring class.

**Dudley** (Mr. JOHN GAMMAGE, borough engineer and surveyor).—The sewering of the Harts Hill district will be carried out, and the reconstruction of the main southern intercepting sewer for a length of about 500 yds. will be undertaken. Several additions and extensions to subsidiary sewers will also be carried out

**Dukinfield** (Mr. S. HAGUE, borough surveyor).—The work to be carried out during the ensuing year, in addition to the ordinary work of the borough, includes the making up of five new streets, at an estimated cost of £3,740. Application for this amount has been made to the Local Government Board, and an inquiry is to be held shortly. The lighting of the borough is receiving great attention, most of the lamps having been converted to the incandescent system. The administration of the sanitary arangements under the Housing Act is proceeding vigorously. Electrical extensions, both for power and lighting, are being carried out; large extensions are in progress at the sewage works, in connection with which a Local Government Board inquiry was held some short time ago, and the necessary sanction obtained.

**Dunfermline** (Mr. W. R. MAXWELL, C.E., F.I.S.E., M.I.H., burgh engineer, surveyor and master of works).—Instructions have been given to prepare working plans and procure offers for the construction of a large outfall sewer, about 6 miles long, from Dunfermline to the sea, the work being estimated to cost £135,000. Several proposals are being considered by the town council as to lavatories, street improvements and new water mains.

**Durham** (Mr. JOHN T. PEGGE, city surveyor).—During the year a further trial length of Durax paving is proposed. Macadam repairs are in future to be by tar-grouting on the Northumberland plan. Premises have been acquired for a ladies' cloak-room for the west part of the city. Several important street improvements are contemplated. Plans are being prepared for a small block of workmen's dwellings which it is proposed to erect under the Housing and Town Planning Act, and if these are a success, similar work will be undertaken in other districts as the need arises. A further portion of ferro-concrete river wall is in hand. The roads at the sewerage works are to be laid with tar-macadam, and an additional sewage receiving and screening well is to be built. Several private streets are to be made up, and retaining walls constructed in connection therewith under the 1892 Act. Negotiations with the county council as to county road repairs are proceeding. A special committee is dealing with obstructive buildings under sec. 39 of the Housing of the Working Classes Act, 1890. The question of a refuse destructor, with bridge and weir at the "Sands," is still under consideration.

**Earby** (Mr. J. E. ALDERSLEY, surveyor to the urban district council).—The council propose to extend the sewers at Green End, at an estimated cost of £300. Extensions at the sewage works, consisting of humus pits and filters, are contemplated. Twenty-three streets are to be made up under the Private Street Works Act, at an estimated cost of £8,000. It is the intention of the council to widen Victoria-road, and erect a modern fire station, and provide stabling and a council's depôt, at an estimated cost of £1,500. Two public conveniences are also to be erected. Most of the roads within the town will again be tar-sprayed, and tarmacadam will also be laid

**Easingwold, Yorks** (MR. WM. SNOWDON, surveyor to the rural district council).—The rural district council is about to apply to the Local Government Board for a loan for the construction of a scheme of co-operative water supply for the high-level portion of their district. The source of supply will be certain springs arising on the Wass Bank. The supply would be a "gravitation" one, and would give supplies to Coxwold, Newburgh Priory, Oulston, and additional supplies to the towns of Easingwold, Crayke and Stillington. The council are also about to carry out schemes of sewerage for Sutton-on-the-Forest, Huby, Stillington and Tollerton. The whole of the foregoing, both waterworks and sewerage works, have been designed and will be superintended by Messrs. Fairbank & Son, MM.INST.C.E., Lendal, York.

**East and West Molesey** (MR. JOHN STEVENSON, surveyor to the urban district council).—So far as is at present known there are not likely to be any works of a special character carried out in this district during the year.

**Eastbourne** (MR. A. ERNEST PRESCOTT, borough engineer and surveyor, and surveyor to Education Authority).—Among the works which will be carried out during the coming year is the third section of the drainage scheme, the total cost of which is estimated at £80,000. Borrowing powers have already been obtained for £57,000, and the work of surface-water drainage this year, which will complete the third section, will include the laying of several miles of concrete sewer tubes, varying in size from 2 ft. in diameter to 4 ft. at the outfall. This work also includes the construction of a large iron pipe syphon under the railway bridge, at a depth of 50 ft., which will entail some heavy tunnelling. Application is also about to be made for sanction to borrow a sum of £8,300 for the construction of an additional ejector chamber and plant, to make provision for the development of a district known as the St. Anthony's estate at the east end of the town. The size of this sewer will be 24 in. in diameter, and it is proposed to discharge the sewage through a 14-in. diameter cast-iron rising main into the outfall sewers. The public shelter at the Redoubt has to be extended. This work has been let by contract. A block of new underground conveniences for both sexes is to be erected in Gildredge Park, and a new scheme of drainage is to be designed for the new Hampden Park district, which was included in the borough last year, and additional pumping plant will be provided. A number of new roads will be laid out in the eastern portion of the town, and a big area of main roads will be laid with tarred macadam.

**East Dereham** (MR. FREDERICK L. BURCH, engineer and surveyor to the urban district council).—The works now in hand, and those to be carried out during the coming year, are: Eight new slate beds, two circular filters, and settling and humus tanks at the sewage disposal works (£2,500); extensions to sewers and surface-water drains (£170); two additional detritus sludge tanks, and the covering of existing tanks at the waterworks (£1,200); pulling down a portion of the Athenæum, re-erecting and converting into municipal offices (£2,000).

**Epping** (Messrs. TOOLEY AND FOSTER, of Buckhurst Hill, engineers to the rural district council).—The laying of sewers and construction of sewage works are now being carried out at Thornwood Common and North Weald Gullett, Messrs. W. & C. French being the contractors. The Local Government Board have sanctioned a loan of £9,600 for sewers and sewage works at Harlow, and tenders will be invited as quickly as possible, it is also anticipated that the long-delayed scheme for Roydon will be carried out during the coming year.

**Evesham** (MR. H. S. HARVEY, borough engineer and surveyor).—Additional tanks and percolating filters are to be constructed at the sewage works at a cost of about £9,000.

**Exeter** (MR. THOMAS MOULDING, M.INST.C.E., city engineer and surveyor).—The city engineer's and surveyor's department will during the coming year be forwarding the following works towards completion: Waterworks: New steam pumping plant as a stand-by to existing plant. Navigation: The purchase of a new dredger; repairing canal banks; dredging river and canal. Sewerage: The reconstruction of part of St. Thomas district. Tramways.—General repairs to track. General.—The completion of the Exe Bridge improvement by erecting a retaining wall, boat-house and landing stage. Provision of four public conveniences at various parts of the city. Further improvement of the cattle market by providing a run for horses. The purchasing of property for housing and street improvement schemes, for which orders were obtained this year. The above, together with the work of road making, scavenging, watering, cleaning and repairs to sewers, footpaths, &c., collection and disposal of house refuse, and other minor things which come under the surveyor's jurisdiction will keep the department busy.

**Exmouth** (MR. SAMUEL HUTTON, surveyor and water engineer to the urban district council).—The works to be undertaken during the year will be of a very interesting nature. The early part of the year will see the completion of the auxiliary water supply—viz., borehole capable of yielding 1,000,000 gallons a day, and costing about £16,000. The extension of the Beach Gardens, including sea-wall and underground convenience, will be carried out by the surveyor by direct labour. It is likely that important sea-defence work will be dealt with, the plans having already been prepared by the surveyor's department. A Marine-drive scheme, along with plans for underground conveniences in various parts of the town, will be considered. Extensions of the waterworks will be carried out, and street improvements and the private street works will be of an important nature. Altogether there is every prospect of a busy year for the staff.

**Falmouth** (MR. JOHN S. WALTON, borough engineer and surveyor).—It is expected that the Gyllyngvase sewerage scheme will be completed shortly. This scheme consists of septic tanks, which are being constructed under the direction of Mr. Fred. J. Commin, of Westminster, a contract having been entered into with Mr. R. J. May, of Hampstead, in the sum of £1,308. The sewers and outfall pipe are being laid by direct labour, under the supervision of the borough engineer, at an estimated cost of £1,550. An enquiry has been held by the Local Government Board regarding the laying out of gardens at Greenbank, together with a shelter and a ladies' convenience, at an estimated cost of £400, and the work will be commenced as soon as the sanction of the board has been received. The new road around the Gyllyngvase Marsh will be constructed, at a cost of £640. Other works contemplated are an art gallery, new cemetery, and railway cottages drainage, with pumping station. It is also hoped that a number of workmen's dwellings will be erected. A tar-sprayer is to be purchased and about 10 miles of road treated with tar.

**Felixstowe** (MR. H. CLEGG, ASSOC.M.INST.C.E., engineer and surveyor to the urban district council).—A considerable amount of work is anticipated in Felixstowe and Walton for the coming year. Application for sanction to a loan has already been made to the Local Government Board for widening over ½ mile of the promenade to double its present width, and also for laying out the common lands on the sea front, including the extension of a model yacht pond, and the erection of an additional bandstand. It is very likely that a ladies' and gentlemen's convenience will be erected in Walton, and the existing one in Sea-road enlarged. Considerable extensions will also be carried out to one of the sewage ejector stations, while the greatest of all undertakings for Felixstowe will be the purchase of the waterworks from the company, subject to the ratepayers' poll.

**Flaxton, Yorks** (MR. G. PACKER, surveyor to the rural district council).—The council have instructed Messrs. Fairbank & Son, MM.INST.C.E., Lendal, York, to investigate and report on a scheme of sewerage and sewage disposal for Heworth Without and the village of Huntington.

**Fleet** (MR. H. J. CHIVERS, surveyor to the urban district council).—Another private street will be taken in hand, making the fifteenth made up under the Private Street Works Act during the last few years. Considerable lengths of kerbing will be laid; some 3 or 4 miles of tar-spraying carried out by the council's staff on roadways, and a long length of gravel paths will also be tar-sprayed in continuation of that previously carried out, and which has proved very successful. It is probable that steps will be taken to acquire land

for a cemetery, and further progress made in connection with the proposed main drainage of the district.

**Foleshill** (Mr. A. E. Newey, engineer and surveyor to the rural district council).—The work to be undertaken includes new reservoir, Bedworth waterworks (£1,106), new recreation ground, Bedworth (£800), extension of sewers, Bedworth (£1,013), alterations and additions to Bedworth and Foleshill sewage outfall works, new sewage outfall works and drainage scheme for Walsgrave-on-Sowe, and various street improvements.

**Friern Barnet, Middlesex** (Mr. E. J. Reynolds, Assoc.M.Inst.C.E., engineer and surveyor to the urban district council).—This year promises, as usual, to be a very busy one for the engineer's department. New roads, sewers and culverts are being constructed, and building operations are proceeding in all directions. The council have acquired land, and are proceeding with widening works round the council offices. The Middlesex County Council are contributing about £500 towards the footway paving in the Friern Barnet-road on the works being done to the satisfaction of their engineer, Mr. H. T. Wakelam, M.Inst.C.E. Land has been purchased, and sanction for a loan obtained, for a new road 50 ft. wide between Sydney-road and Alexandra-road. The council have also applied for a loan for the purchase of some 5 acres of allotment land, together with a number of cottages. They are also again considering schemes for working-class dwellings. A further loan for £2,500 has been obtained for additional laying out at Friary Park, and the bowling green and works generally are proceeding. The widening of the Friern Barnet-road Railway Bridge to 50 ft., at an estimated cost of £5,600, should be commenced this year. It is hoped again to treat all the public roads with tar during the summer months, the council having now purchased two tar-spraying machines. All gravel roads are now being coated with granite as rapidly as possible. Many thousands of pounds' worth of private street works are being carried out. Among the other schemes that are under consideration are conveniences, buildings at depot, improved street lighting, watercourse straightening and culverting, and strong-rooms at offices.

**Frimley, Surrey** (Mr. T. Clement Jones, engineer and surveyor to the urban district council).—This district is still increasing rapidly, the population at the last census being 13,673, and at the previous census 8,409. Among the works to be taken in hand during this year are the following. Application has been made for powers to borrow £6,000 for extensions of sewers, and the work will be commenced in the early part of the year. The work of tar-macadamising the main roads, for which a grant of £5,192 was obtained from the Road Board, will be completed this year. Also, £2,500 is to be spent in strengthening and resurfacing a district road on which the traffic has greatly increased owing to building operations at the Royal Military College. A number of private streets will be made up during the year under the Private Street Works Act, at a cost of £4,500. Several footpaths are [illegible] to be tar-paved, at a cost of £1,430. The council have under contemplation several road widening schemes, and it is expected that these will shortly be carried out. About 9 miles of roads are to be surface-tarred in the coming season. Powers have been obtained for lighting the whole of the district by electricity, and this year it is proposed to adopt this method in one ward of the district.

**Frome** (Mr. Frederick W. Jones, Assoc.M.Inst.C.E., surveyor and waterworks engineer to the urban district council).—This council have a number of matters under consideration. It is proposed to join with the Rural District Council and the County Council of Somerset for the purpose of erecting an isolation hospital for the two districts named. The buildings will provide accommodation for twenty-four beds. Plans are being prepared for a new highway bridge across the river Frome, and the surveyor has been instructed to report upon the question of substituting steam haulage in place of team labour for delivery of materials and collection of refuse.

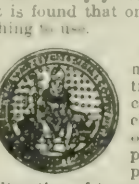
**Gainsborough** (Mr. S. W. Parker, waterworks engineer and surveyor to the urban district council).—The works proposed to be carried out during the year [illegible] to the reconstruction of Market-place with asphaltic and carriageway [illegible] with wood [illegible] one mile laid on concrete, estimated cost £700; (2) new public conveniences, (3) reconstruction of public slipper baths and roof of swimming bath, estimated cost £1,400; (4) open-air swimming pond adjoining the bank of river Trent, at a cost of £550; (5) erection of eighteen workmen's dwellings, to cost £3,900; (6) erection of four shelters for consumptives; (7) laying new 6-in. water main in Bridge-street, and afterwards reconstructing the surface with new footways and whinstone sett carriageway on concrete, estimated cost £900; (8) carrying out scheme for the protection of the town when the river Trent is in flood; (9) construction of new footways on main roads. Tar-spraying being so satisfactory, the council have passed a resolution to tar-spray all streets in the district that have macadam surfaces.

**Glastonbury** (Mr. George Alves, borough surveyor).—The corporation have in contemplation during the year the reconstruction of the outfall sewer with iron syphon for the higher levels, and pumping installation for the low-level system, including Northover, Beckery and Northload Bridge districts, and the laying out of works at the sewage farm, for which a scheme has been prepared by Messrs. A. P. I. Cotterell & Carr, civil engineers, of Bristol, and the Local Government Board sanction obtained for a loan of over £8,000. A movement is on foot, under the Co-operative Building Society, for providing increased housing accommodation, and operations will doubtless commence this year.

**Glemsford** (Mr. Herbert L. Taylor, surveyor to the urban district council).—This council do not anticipate carrying out any works other than those of ordinary routine.

**Godalming** (Mr. J. H. Norris, borough surveyor and waterworks engineer).—The first two works named in last year's forecast have been completed, but the last two—*viz.*, the repaving of the main streets and surface-water sewers in connection therewith, remain to be done. A length of the Portsmouth main road is to be reconstructed and surfaced with Trinidad asphalte material. It is also intended to carry out some further underdraining works at the sewage farm, other questions under consideration, but not yet far advanced, being provision for bathing, a new highways depot, and a new street lighting contract.

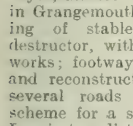
**Godmanchester** (Mr. C. Mayfield, surveyor to the urban district council).—The works in hand for the year are as follows: 220 yds. 15-in. pipes, 500 yds. 10-in. pipe sewers, with manholes at every 100 ft. to facilitate cleansing, as the falls are very slow. A 1,000-gallon flusher, with stone automatic valve, has been built. It is built of 9-in. brickwork in cement-mortar, and covered with a reinforced concrete slab, with Hy-rib reinforcement. One and a half miles of sewer ditches have been cleaned out with a hand dredger. For the periodical cleaning of the sewers in the flat part of the borough the Webb Lamp Company's dredgers are used. About 6 acres of road surfaces in the borough have been tarred, the materials used being Clare's Tarco, Tarvia B, Trinidad Lake asphalte, glutrin, and crude tar from the local gasworks. Trinidad Lake asphalte has been successfully used as a binder for newly-rolled macadam. The estimated cost of 13 miles of road in the borough is £775. A piece of road has been done with gravel dredged from the river Ouse in 1906, and mixed with a liberal quantity of local tar, and it improves every year. For cleansing the tarred surfaces it is found that one of the Hyde scrapers is the best thing to use.



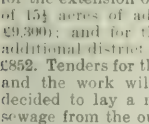
**Gosport** (Mr. Herbert Frost, engineer and surveyor to the urban district council).—The proposals of the council for the forthcoming year are chiefly as follows: The making up of a further batch of about a dozen private streets; several road improvements and widenings, including alteration of tramways, and an extension of the tramway at Privett, are contemplated. Under the Town Planning Act the surveyor is instructed to devise a scheme for the laying out of a large undeveloped area to the north of Forton, to complete the sewerage system (cost to date about £150,000); under the 1907 Amendment Act, to extend sewers, and disconnect old properties from drains which have been used as sewers but are to be retained as storm drains; and to improve the landing for ferry service over Portsmouth Harbour by providing pontoon and gangway, and a wharf in ferro-concrete for merchandise. Now that the council are equipped with destructor cells in duplicate, and increased their boiler power, it is proposed to increase

the efficiency of the air-compressing plant by providing compound engines; fix wrought-steel steam main to replace cast-iron one; to extend 3-ft. sewer outfall into deep water some 200 yds.; to improve conveniences, and provide children's shelter, swings, &c., at the park; and to increase the provision of public conveniences for both sexes. The many Government establishments in the district are to be increased by the new magazines at Bedenham, expected to be completed during the year, and a new elementary school is to be built from designs accepted in competition. The suburb of Anglesey is developing as a result of the sale of desirable land hitherto held by the War Department, and as the council come this year into possession of the Stokes Bay foreshore, it is probable that desirable improvements may be taken in hand.

**Grangemouth** (Mr. D. A. DONALD, engineer and surveyor, master of works, and water engineer).—Works in Grangemouth include a new burgh depot, consisting of stables, stores, sheds, workshops, refuse destructor, with railway siding, and other relative works; footway scheme (partly completed); widening and reconstruction of Glensburgh-road; resurfacing several roads with tar-macadam. Joint drainage scheme for a smaller portion of the burgh and the Laurieston district of Stirling county; report on the whole drainage system of the burgh; improvement of town hall buildings; renewal and alteration of water distribution pipes; in addition to several smaller undertakings.



**Grimsby** (Mr. H. GILBERT WHYATT, ASSOC.M.INST.C.E., borough engineer and surveyor). During the past twelve months no very extensive works have been carried out, but the following have been completed successfully: The extension of the destructor by the addition of two cells tender £810); the extension of the free library by the erection of a new room to be used as a lending department, and the conversion of the present lending department into a reading-room (amount of tender £1,092 17s. 6d.); the thorough overhauling and repair of the machinery at the sewage pumping station (amount of tender £440); the fixing of a new penstock and alteration of penstock chamber (amount of tenders £295 2s.); and the erection of a public convenience in Tunnard-street (amount of tender £93 8s.). During the year the sanction of the Local Government Board has been received for the extension of the police cell accommodation at the town hall, and the construction of cells at an estimated cost of £2,550, and this work is approaching completion, as are also the provision of baths in connection with the public convenience in Oxford-street, and the erection of a new school in Strand-street, the latter of which was opened on January 11th (the amount of the tender in this case was £10,046). The sanction of the Local Government Board has also been received for the extension of the new cemetery by the purchase of 15½ acres of additional land (amount of estimate £9,300); and for the ventilation of the sewers of an additional district of the town, at an estimated cost of £852. Tenders for the latter were accepted in December, and the work will start at once. It has also been decided to lay a new main sewer to deal with the sewage from the outlying part of Old Clee Village, the estimate being £550, and tenders will be invited in March so that the expenditure may come during the next financial year. The town council last year purchased certain property in Victoria-street for the erection of a council school, and plans for the new school will probably be put in hand during the current year.



**Guildford** (Mr. C. G. MASON, ASSOC.M.INST.C.E., borough surveyor and waterworks engineer).—The following are some of the works which will most probably be carried out in this borough during the year: Highways.—The widening of the main road to Farnham; a new bridge over the river Wey at Woodbridge; taking up, redressing and relaying the granite setts in the High-street; improving a thoroughfare known as Tunsgate; the making up of several undedicated roads under the Private Street Works Act, 1892. Sewerage.—The reconstruction of some existing filters at the foot of sewage tanks, together with an installation of sprinklers; the completion of a new sedimentation tank to hold 500,000 gallons of sewage; the construction of storm-water filters. Waterworks.—The duplication of borehole pumping plant; an extension of water mains in the outlying districts; waste prevention; the possible construction of a service reservoir on the Hog's Back. Twenty cottages for the housing of the working-classes will be erected, and it is proposed to make some additions to the municipal offices, and probably extend the fire station to house a motor engine. It is likewise intended to improve the lighting of the main thoroughfares of the town.

**Halifax** (Mr. JAMES LORD, ASSOC.M.INST.C.E., borough engineer and surveyor).—Main Sewerage.—The replacement of the main outfall sewer in the bed of the Hebble Brook, between the sewage disposal works and Water-lane, will be proceeded with after the sanction of the Local Government Board has been obtained to the borrowing of £24,000 for the purpose. A further section of Northowram sewerage will be commenced, while the treatment of sewage from the districts of Bradshaw and Mixenden will be considered. Sewage Disposal.—The sludge-pressing works will be extended and a lime precipitation plant added, together with gauge weirs and storm carriers, &c., at a cost of about £2,500, while the ten percolating filters at present being constructed will be brought into work in the early summer. Roads—Tar-spraying will be systematically carried on during the summer as before, and the Dudwell-lane improvement will be completed. Tramways.—Various doublings, for the construction of which powers were obtained in the 1911 Corporation Bill, will be carried out from time to time. Town Planning.—Two areas at Ovenden and Warley respectively have been scheduled for town planning, and permission is being obtained from the Local Government Board for the preparation of the necessary plans. A bowling green has been commenced at Shroggs Park, and this will be proceeded with during the year.

**Hampton** (Mr. SIDNEY H. CHAMBERS, surveyor to the urban district council).—The following is a short summary of the works, &c., which will be in progress during the coming year: (1) Extensions at the sewage disposal works to deal with the growing demands of the district, as well as the sewage to be received from Hampton Court Palace. (2) Extensions to the isolation hospital. (3) The existing scheme for the lighting of the district will probably be materially altered and improved. (4) Heating of the public offices. (5) Laying out of new allotments. (6) General improvements, &c.

**Harrogate** (Mr. C. E. RIVERS, ASSOC.M.INST.C.E., borough engineer and surveyor).—Among the principal works contemplated for the coming year are the installation at the Wetherby-road depot of a new stone-breaking and tar-macadam mixing plant to cope with the more extensive use of tar-macadam in road making, an important widening of a portion of East Parade, near the railway station, and the reconstruction of about ½ mile of the Leeds main road under a grant from the Road Board. A commencement will shortly be made with the first section of the new cemetery scheme, the estimated cost of this section being £5,000. Further additions are to be made to the various bathing establishments, including the remodelling and extension of the gentlemen's portion of the Starbeck baths, and the provision of more suitable accommodation for the mechano therapeutic treatments. The council are also considering further additions to the Royal and Victoria Baths. Additional lavatory accommodation is to be provided in various parts of the town. A sub-committee has been appointed to consider the application of the Town Planning Act to the borough.

**Haslingden** (Mr. J. SINGLETON GREEN, borough engineer and surveyor).—Application has been made to the Local Government Board for borrowing powers to purchase the Warner estate, containing some 14 acres, upon a part of which it is proposed to erect a new elementary school for 1,200 scholars, and to complete the Helmshore-road widening scheme by taking off a dangerous corner, adding 250 yds. of land to the road. It is anticipated that the Irwell Vale sewerage scheme will be completed early in the new year. This consists of the erection of a circular well 24 ft. diameter and 33 ft. deep, the lower part of which acts as a storage for sewage, and the upper part the engine and pump house. All the sewage gravitates to the well, and is pumped by a wind-mill into a 6-in. cast-iron rising main against a head of 35 ft. into the low-level inter-

cepting sewer. As a stand-by plant a set of 3-throw ram pumps, having a capacity of 4,500 gallons per hour, is installed, driven by gas engine. A separate sludge chamber is provided, and in this is fixed a sludge elevator which delivers the sludge into a tank cart. Rapid progress is being made with the Private-lane sewer, which is in heading for three-quarters of a mile, and this is expected to be finished by the end of March. The Stonefold sewer, which was sanctioned a few months ago, will also be commenced, and probably completed before the end of the year. The new electricity undertaking was inaugurated this month, and distribution cables are being laid in all the streets for the benefit of those wishing to take current. The extensions to the secondary and technical schools, designed by and erected under the supervision of the borough surveyor, at a cost of £20,000, will be completed in January. A number of private streets will be again dealt with as in former years.

**Haverfordwest** (Mr. W. BEVAN, borough surveyor, water and gas engineer).—Haverfordwest is an old town, and at present it has no tendency to grow, so there is very little in the way of new work to be carried out, but a fair amount of altering, improving and repairing calls for attention. The erection of fourteen houses under the Housing of the Working Classes Acts will be completed during the early months of the year, and in all probability the town council will consider schemes for providing more houses of a similar class in other parts of the town. It is hoped that the proposed scheme now before the Road Board for the demolition of eleven houses in Prendergast, and the widening of the main road at that point will be carried out this year; improvement is to be made in Horn's-lane and Lower Tower-hill by taking up the existing pebble paving and macadamising the roadways, and it is intended to lay down some new side pavements in various parts of the town, and to extend the use of Rocmac for road maintenance work. One or two short lengths of defective sewers will be reconstructed, and some old gas mains renewed. The town council will also consider the advisability of filtering the water from the old Scarrowscant reservoir so as to use it for dietetic purposes in conjunction with the fountain supply for the lower levels of the town, with a view to giving a more constant supply without increasing the expenses of pumping.

**Haverhill** (Mr. W. H. ELEY, surveyor to the urban district council).—The reconstruction of the contact beds will be completed, and probably a new set of pumps to duplicate the existing set will be installed at the sewage disposal works. The council have under consideration the laying of the main street with tarred-macadam. It is possible the recreation ground will be fenced with unclimbable wrought-iron fencing. The isolation hospital will be fenced around with an iron fencing 6 ft. 6 in. high. Fresh portions of the cemetery will be laid out for burials. The council will also consider the provision of a hose reel and escape ladders for the fire brigade. It is also anticipated that a large amount of tar-painting will be carried out.

**Hebden Bridge** (Mr. T. WADDINGHAM, surveyor and water engineer to the urban district council).—A further length of macadamised roadway on the Halifax, Todmorden and Burnley main road will be taken up shortly, and granite-sett paving laid on a concrete foundation, at an estimated cost of £1,400. A new road retaining wall will be built on this main road at the side of the Rochdale Canal for a distance of about 110 yds. It is expected that two widenings of the same main road will be carried out at an estimated cost of £4,500. These include the pulling down of buildings and the widening of one bridge over the river Hebden, and the building of a new steel girder bridge, to replace a stone-arched bridge over the Calder Water. Several streets will be repaved with Lancashire setts and many private streets will be made up principally with sett paving. A road-widening is proposed to be carried out at Wood-End on the Lees and Hebden Bridge main road: the roadway opposite this point will be paved for the full width. A new iron footbridge will be constructed over the river Calder at Fountain-street. The tar-spraying of roads will be continued, as it has proved such a great success. The sewage from a large portion of the adjoining rural district will be connected up to this council's system; this will necessitate the enlarging of the filtration accommodation at the outfall works. The conversion of the pail-closets into water-closets will, it is hoped, be completed this year. There are now less than 100 closets other than water-closets in the town. A sub-committee is now considering the question of providing additional public conveniences. Some action may be taken with regard to the erection of new stables for the council's horses. New sewers will be laid for surface and spring water, and an additional filter-bed is required at the waterworks which it is proposed to construct during the year. The erection of more electric street lamps is projected.

**Hayes** (Mr. D. C. FIDLER, M.S.E., M.I.MUN.E., surveyor to the urban district council).—1912 will prove to be one of the busiest years in the life of the council. Two and a half acres of land have been purchased and a scheme prepared for building thereon about fifty workmen's dwellings. A novel feature of this scheme will be the provision of a certain number of bungalows for old parishioners, which will be let at an inclusive rental of 3s. per week, and another will be the construction of avenue roads with a turfed space between the road and footpath, special by-laws having been provisionally sanctioned by the Local Government Board for this method of construction. New building by-laws, including several novel features, will be adopted during the year. Enlargements are to be made at the sewage disposal works, including new percolating filters, air compressing plant, rising mains, ejectors, &c. A town planning scheme is being prepared, and during the year the statutory notices will be served and inquiries held. The district is also to be divided into wards for electoral purposes.

**Hendon** (Mr. JAMES A. WEBB, engineer and surveyor to the rural district council).—Surveys are in hand for making up fifteen new streets, which will probably be carried out at Pinner during the year. The widening of two important corners is also in contemplation in Pinner, and several estates are in course of development. Additional humus tanks and improvements to one of the sewage farms will shortly be made. An addition to the isolation hospital at Stanmore, in the form of an observation ward, is in progress, and will be completed early in the year. Several lengths of road will be resurfaced by the tar-grouting system, which system will in time no doubt be adopted on all the roads throughout this district, which are subjected to heavy traffic. Two bridges will probably be constructed over the river Pinn, and widening of the highways and approaches will be completed.

**Herefordshire** (Mr. G. H. JACK, county surveyor).—The works which will be commenced during 1912 are as follows: Secondary school for girls at Hereford; domestic economy school, Hereford College; steam laundry, Hereford College; extensions to elementary school, Wellington; water supply, Orcop School; water supply, Adforton School; reconstruction of 2 miles of main roads; drainage of waterlogged roads; new bridge over the river Lugg at Sutton; and reconstruction of county bridge at Moreton.

**Hertford** (Mr. JOHN HY. JEVONS, ASSOC.M.INST.C.E., borough and water engineer).—The work to be taken in hand during the coming year in addition to the ordinary work will be sewage disposal work and works in connection with Hertford Castle, which has been acquired from the Marquis of Salisbury for the use of the inhabitants of the town.

**Heywood** (Mr. J. B. NUTTALL, borough surveyor).—During the year the work of paving with granite setts on concrete foundation will be further proceeded with. The Hopwood Recreation Ground, which has already been fenced off from roads and streets by wrought-iron railings, will have the internal work of laying out, erection of shelter, construction of bowling green, swings, &c., completed. The museum and art gallery just completed was expected to be opened about the same time as this issue appears. Private street works and sewering will, during the year, receive attention. Contracts for altering shop fronts to corporation pro-

perty are about to be let. Plans have been prepared for the construction of an underground convenience, and it is expected to be proceeded with during the year.

**Hessle** (Mr. WILLIAM COULSON, surveyor to the urban district council).—The Hessle Urban District Council will probably carry out in 1912 some street improvements, in addition to regular extensions of their sewerage system, and if the Local Government Board sanction the necessary loan they will also lay down an electric light and power system, including the lighting of the streets with electricity.

**Hinckley** (Mr. E. H. CRUMP, ASSOC.M.INST.C.E., surveyor and waterworks engineer to the urban district council).—The water supply of Barwell and Earl Shilton will be commenced early in the year, at an estimated cost of £11,500. Additions to the pumping plant at Snarestone pumping station will be carried out at a cost of £2,000. Further under-drainage and other improvements will be undertaken at the sewage outfall works. A scheme is in preparation for a new outfall concrete sewer, at an estimated cost of £4,500. The tar-grouting of main roads will be continued during next summer, and various private street works put in hand.

**Hindley** (Mr. OSWALD P. ABBOTT, surveyor to the urban district council).—A 21-in. cast-iron sewer, 1,800 yds. in length, will be commenced at an early date, this expenditure being necessary on account of mining subsidence. A 12-in. sewer, about 300 yds. long, at Hindley Green, is about to be commenced. The question of public conveniences is under consideration, and it is proposed to proceed with the construction of private streets. The council decided to erect a portion of the infectious diseases hospital, the sum sanctioned for which was £8,300.

**Honiton** (Mr. A. TILLOTSON, A.R.SAN.I., M.I.MUN.E., borough surveyor and waterworks manager).—Application has been made to the Local Government Board for sanction to a loan of £800 for works of sewerage and sewage disposal. Contracts have been made for extension of water mains during the present year. There is also a proposal to introduce electric light and power into the borough. The principal roads are to be repaired with granite, and afterwards tar-sprayed on a more extensive scale than hitherto.

**Horbury** (Mr. J. H. DREW, engineer and surveyor to the urban district council).—The following are the chief works which will be in hand during the coming year, which promises to be a busy one: New sewage disposal scheme (£10,000), private street works (£1,100), new elementary school (to be erected by the county council, £6,300), and also several road improvements, sewerage, and water-main extensions. The council will continue its policy of the past two years, and where the gradients are suitable the recoating of roads will be done with tar-macadam. Tarmac laid in this district has given excellent results. The council will purchase a tar-spraying machine, and the roads throughout the township will be treated where the gradients allow.

**Horsham** (Mr. R. RENWICK, surveyor and water engineer to the urban district council).—In connection with the surveyor's department no new works of any importance are in contemplation for the coming year.

**Horsham** (Mr. WM. DENGATE, surveyor to the rural district council).—During this year the Horsham Rural District Council are making up three streets at Crawley and three at Horsham, adjoining Horsham urban district, under sec. 150 of the Public Health Act. They are also using 30,000 gallons of Tarvia and distilled tar for tar-painting. The roads generally are receiving a widened surface of metalling, making them more suitable for the present-day traffic.

**Hove** (Mr. H. H. SCOTT, ASSOC.M.INST.C.E., borough surveyor).—The town council has decided to promote a Bill in the coming Session of Parliament to run trolley vehicles throughout the borough and to Shoreham-by-Sea. The length of the proposed routes is 11¼ miles.

**Hull** (Mr. A. E. WHITE, M.INST.C.E., city engineer).—The principal highway improvement is a widening of Cleveland-street and Stoneferry-road in connection with extension of tramways to Stoneferry-road to take the place of the present motor-'bus service. Powers have been obtained for tramways extensions on Hessle-road, Spring Bank, and Beverley-road, and a loop through Jameson-street to allow the Old Town cars to give a service between Paragon Station and the pier. The corporation are taking over the scavenging and cartage hitherto executed by contract, and have approved plans for extensive stables and cart sheds, and also for new blacksmiths' shops, and a sawing and creosoting plant for paving wood. Powers are being sought for a bridge to replace the present North Bridge. The new bridge will be built practically alongside the present one, and will be a bascule bridge of a span of 65 ft. and a width of 70 ft. The Madeley-street baths are about to be equipped with a continuous filter, and a steam pipe is to be laid from the west district destructor to supply these baths and the west district sewage pumping station. A site has been purchased 5 miles from the town for a new infectious diseases hospital, and the plans are in active preparation. It has been decided to establish an experimental dry-dust pulverising plant. Contracts have been let for a very large extension of the electricity works. New council schools and extensions and a teachers' training college are in hand. It has been decided to pull down the remainder of the old town hall, and to continue the new building over its site. The floating landing-stage, for which powers were sought last year, has been abandoned for the present in consequence of strong opposition from river interests.

**Hyde** (Mr. JAS. DIGGLE, ASSOC.M.INST.C.E., borough and water engineer).—During the present year it is expected to complete the construction of two new service reservoirs to meet the requirements of the high-level districts not hitherto supplied by the corporation. The town are also extending their pumping plant by the addition of a three-throw pump to lift 20,000 gallons per hour to a height of 400 ft., which will be driven by a 60 b.h.p. electric motor. Very shortly they will also be advertising for tenders for the extension of their municipal buildings by the addition of a public hall, police station, offices, cells and coroners' courts (estimated to cost £14,000). The council have also decided to extend the public baths by the addition of a large plunge bath, twelve slipper baths, and Turkish bath, at an estimated cost of £5,000. All this work the borough engineer estimates will be commenced this year.

**Jarrow-on-Tyne** (Mr. J. SCOTT WEIR, ASSOC.M.INST.C.E., borough engineer and surveyor).—Works and schemes in hand or proposed to be carried out during the year include public road improvements, a new road widening and improvement, raising this 10 ft. across a valley, reinforced concrete fresh water culvert, raising and reconstructing a road bridge, large public conveniences and lavatories, laying out the Drewett Playing Fields, sewerage works, extension of borough boundaries and additions to public baths.

**Kenilworth** (Mr. SHOLTO DOUGLAS, engineer and surveyor to the urban district council).—During the year the new cemetery scheme will be completed. Various road improvement schemes are in hand, including Odibourne-terrace, St. John-street, and Warwick-road. All the principal roads in the district will again be tar-sprayed. The question of the provision of an abattoir and a mortuary are before the council. The building by-laws are being revised with a view to allowing the erection of cheaper artisan dwellings. An improved system of alarm in case of fire is urgently required, and this will shortly receive attention. A scheme is at present in hand for the provision of allotments.

**Kettering** (Mr. THOS. READER SMITH, ASSOC.M.INST.C.E., engineer and surveyor to the urban district council).—The urban council have several things in prospect for the coming year, including a small corn exchange to be built in their cattle market, but fronting the main road, so as to be available for public

purposes as well as for use in connection with the market. The estimate for this is about £1,000. The question of public baths is also to the front, and the proposal is to buy an existing open-air bath belonging to a private company. The bath, which is 240 ft. long, would be divided into two, one end left as an open-air bath, the other covered for a tepid swimming bath, and the usual slipper baths and other conveniences added. The total estimate for this work is about £5,000. Another need felt in the town is for underground sanitary conveniences, and the council are giving their attention to this, and propose to provide one or two in central positions. In the public recreation grounds there are at present no games provided, and it is now arranged in one of them to lay out a public bowling green and two tennis courts. In the near future it will also be necessary to duplicate the present destructor plant, and probably at the same time a public disinfecting station will be provided on the same site, which is very conveniently situated in the centre of the town.

**Kettering** (Mr. W. Hadley Darby, M.I.Mun.E., surveyor to the rural district council).—Beyond the ordinary work of maintenance of roads and bridges (which comprise 110 miles), the following improvements will probably be carried out during the year. The widening of the road between Loddington and Orton, at an estimated cost of £70; new tar footpaths in Burton Latimer and Harrington, estimated cost £100; and smaller works of road improvements. Application has been made to the Road Board for a grant towards the cost of widening and improving Waterfall Bridge, Rushton, and raising approaches thereto, work which is estimated to cost £625. A grant is also sought for the reconstruction of a section of the Station-road, Burton Latimer, at a cost of £500. No work of tar-painting is proposed to be done in the district.

**Kidderminster** (Mr. A. James, borough surveyor).—The extension of the borough boundary will be the chief work upon which the surveyor's department will be engaged, and if successful in the application, new sewage pumping plant, rising main and settling tanks for sewage disposal works will be considered, also the laying of outfall sewers from the added areas, and the making and sewering of streets.

**King's Lynn** (Mr. Alfred J. Smith, borough surveyor and water engineer).—It is expected that a considerable amount of work will be executed during the year 1912, more especially perhaps in respect of road improvement. A contract is about to be entered into for the paving of Norfolk-street and Lattegate-street (4,200 yds.) with wood blocks. This work will be commenced almost immediately. Channels will be paved with granite setts. The bridge over the river at Eau Gate is to be widened and improved, the work being executed in reinforced concrete. A new road will be made from the north end of the bridge running across land belonging to the corporation. This will have the effect of taking the heavy traffic from the sharp bend at the south corner of the present bridge, through the centre of town, at present the business thoroughfare. The road also helps into the market some excellent property, the boundary on the one side by the Great Eastern Railway Dock Branch, and on the other by the new road in question. It is also proposed to erect public swimming baths and a boiler house.

**Kingston-upon-Thames** (Mr. R. Hampton Clews, borough surveyor).—During the present year the following works will probably be carried out:—The construction of a footway having granite kerb with Granolithic top to be completed by this council. The additional improvements consisting of New underground conveniences at New Malden, widening of Anglesea-road, alterations to the carriage of portion of a new footway, and the construction of a new footway in Anglesea-road, the cost of which will be contributed to by the Surrey County Council. A new footway in private ground will be laid down under the Private Street Works Act, 1892, on the eastern side of Beaufort-road. Extension of the main sewer in Eastern-road, from the point where it now terminates to the Fairlands Estate, and the construction of a new sewer in Fairlands-road to facilitate loading of materials for delivery to the various depots. (10) New Sandpits at the recreation ground. (11) Additions to the sewer at the Burying-ground. (12) Several important street widenings are under consideration.

**Knaresbrough** (Mr. Robt. E. Wilson, M.I.Mun.E., surveyor to the urban district council).—Nothing of a very special character is contemplated during the year beyond road repairs with granite and tar-macadam, and tar-spraying the main thoroughfares. The council have recently purchased frontage in Stockwell-road to widen the thoroughfare to 40 ft. Plans are being prepared of various districts throughout the town to be scheduled under the Housing and Town Planning Act, 1909.

**Knaresbrough** (Messrs. W. Lupton and J. H. Halstead, M.I.Mun.E., surveyors to the rural district council).—The chief works to be carried out during the coming year are the required inspections under the new Town Planning Acts. Several districts already have received minute inspections, and reports presented to the Health Committee. New drainage works are suggested at Burton Leonard, Hampsthwaite, and Felliscliffe; also a water supply to the latter place. Several private street works will be commenced in six of the districts. On account of the great success of the work done by the tar-spraying machine, the committee have instructed the surveyor to treat a further considerable length of main and district roads during the early spring. Several lengths of tar-grouted macadam will be laid, several road widenings carried out, and about 3 miles of new footpaths completed, in addition to the ordinary repairs, and coating of the 118 miles of main and district roads under this council's supervision.

**Leatherhead** (Mr. Sidney R. Drake, surveyor to the urban district council).—In all probability a further length of tarmac will be laid this coming year at a cost of £300 to £400. The council has agreed to purchase a piece of land for £500 at the Swan corner for the purpose of rounding off a very dangerous corner, and this work may be carried out during the year, at an estimated cost of £140. The council intend to further extend the practice of surface-tarring to all the roads in the district, owing to the saving in the cost of maintenance.

**Leek** (Mr. W. E. Beacham, surveyor and water engineer to the urban district council). Population, 17,000; rateable value £57,000; area 1,460 acres. During the past year the principal works carried out have been the extensions to the electricity undertaking of the council, and the expenditure of £5,000 in the laying down of a 200-horse power Diesel oil engine, together with the necessary foundations, water tank in concrete and expanded metal, and cooling towers, and, still further, extensions are foreshadowed in the very near future, in order to deal with the demand. The alterations to the Sun Lion Inn and adjoining premises, in order to effect the widening of Brook-street, have been carried out and one of the many objectionable street corners considerably improved. During the present year the question of improved bathing and swimming facilities is to be considered, and plans are in course of preparation for considerable extensions to the existing public baths in Derby-street, and a complete new baths on land already possessed by the town in Ballstaye-street. Extensions are being considered at the council's gasworks, and plans are in the surveyor's hands for new general offices and additions to cool store &c. Other works of street improvement are under consideration, and the Road Board are being approached with regard to the improvement of the Ashbourne road. Considerable development of land is contemplated in order to deal with the demand for small houses and the erection of a cement school at the east end of the town will no doubt greatly accelerate building operations. Several new streets are about to be laid out. Generally the year promises to be a most active one.

**Leigh-on-Sea** (Mr. John W. Liverseed, A.M.Inst.C.E., engineer and surveyor to the urban district council). The work projected during the coming year comprises private street works at a cost of £10,000 and the Broadway improvement scheme for the widening of the main thoroughfare, so as to provide a 50 ft. road. In respect of this work a Provisional

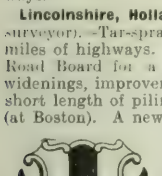
Order has been granted. New public offices and fire station will be completed, the cost being approximately £6,000. The gasworks extensions will include the provision of liquor tank, purifier shed and new purifiers, and manager's offices and stores, at an estimated cost of £1,400. Instructions have been received to prepare plans for the extension of the sewerage system, so as to include a large estate already laid out, and in connection with which building operations are being pushed forward. Matters under consideration by the council include the new infectious diseases hospital, the question of electric lighting for the district, extension of sea bathing facilities (with accommodation for both sexes), and the provision of a bathing pool, groynes, the erection of public conveniences, and further work in connection with pleasure grounds.

**Leicester** (Mr. E. GEORGE MAWBEY, M.INST.C.E., borough engineer and surveyor).—The following are among the works contemplated in this town during the coming year: A public hall, capable of accommodating over 3,000 persons, estimated to cost £17,000; a storm-water sewage disposal scheme, and augmentation of the sewage pumping plant; a further section of the tributary sewerage scheme, to cost £7,000; and probable tramway extensions.

**Leith** (Mr. J. R. FINDLAY, burgh surveyor). The coming year is likely to be quiet so far as concerns municipal work in this burgh, the only work at present contemplated being the laying of about 400 yds. of a new 24-in. pipe sewer, the improvement or rebuilding of upper drawbridge at the Water of Leith, and various small road widenings.

**Lichfield** (Mr. W. B. CHANCELLOR, city engineer and surveyor).—The following are the projected works in Lichfield: Sewerage extensions; erection of refuse destructor and tar-macadam installation; street improvements; the tar-spraying of some miles of highways.

**Lincolnshire, Holland** (Mr. HENRY MOODY, county surveyor).—Tar-spraying is being carried out on 10½ miles of highways. Application is being made to the Road Board for a grant towards the cost of road widenings, improvement of dangerous corners, &c. A short length of piling to the river bank is to be done (at Boston). A new steam roller to be purchased.



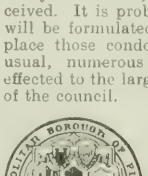

**Lincoln** (Mr. R. A. MACBRAIR, M.INST.C.E., city engineer and surveyor).—It is probable that the long-contemplated step of providing a refuse destructor will be taken. At the sewage farm either more revolving sprinklers or settling tanks will be constructed. A scheme will probably be prepared under the Town Planning Act, and the latest edition of the building by-laws adopted. The tar-macadamisation of roads will be continued.

**Liversedge** (Mr. A. ROTHERA, M.INST.M. AND C.E., engineer and surveyor to the urban district council).—During the coming year some important work is proposed by the council. The chief item will be the extension to the lower sewage works, where it is intended to acquire about 18 acres of land adjacent to the existing works, and construct additions to existing tanks and four new tanks, bringing the total tank capacity to 935,394 gallons, against a dry-weather flow of 1,132,385 gallons. The filtrate will be afterwards dealt with in existing contact beds, and on eight proposed rectangular percolating filters varying in size from 360 ft. by 30 ft. to 225 ft. by 30 ft., the distribution being done by travelling distributors fed from a brick channel supported on arches and piers. The total capacity of contact beds and filters will be 17,755 cub. yds. The filtrate will afterwards be dealt with on land and in humus tanks before passing to the river Spen. The estimate for this work is £17,150. Other work proposed will be the remodelling of the existing destructor, at an estimated cost of £2,290, the widening of Bradford-road between Leeds-road and Littletown, the making up of various private streets, as well as the laying out of the Heald's Hall estate, which has been presented to the districts of Heckmondwike and Liversedge for a public park and museum, and will be worked by a joint committee of the two councils. A large amount of tar-painting of main roads will be done, as well as the reconstruction of some of the main roads, with either Tarmac or by the tar-grouting system. Surface-water drainage along various roads will also be carried out during the coming year.

**Llandaff and Dinas Powis** (Mr. JAMES HOLDEN, ASSOC.M.INST.C.E., engineer and surveyor to the rural district council).—The undermentioned works will be completed or taken in hand during the year 1912: Llanedarne sewerage scheme (estimate £2,000); Llanishen, extension of sewers (estimate £1,000); Pentyrch, Creigiau, sewerage scheme to be prepared; Pentyrch, water supply scheme in course of preparation; Pentyrch, new reservoir in hand (contract £2,220), public road widening (estimated £2,000), and private street works in hand (estimated £8,552). In addition to these the council have recently obtained powers under the 1892 Act to carry out further private improvements in ninety streets and lanes.

**Llandudno** (Mr. E. P. STEPHENSON, ASSOC.M.INST.C.E., engineer to the urban district council; Mr. W. T. Ward, deputy engineer-in-charge).—The new surface-water main drain and sea outfall, commenced in November, 1911, will be completed (loan sanctioned £7,604). By these works the two old 21-in. outfalls will be dispensed with and the new outfall taken further seaward. The trunk main sewer extension works will be commenced early in 1912 (loan sanctioned £7,030). These works will give improved drainage facilities to the east portion of the district. Both the above works will be constructed with concrete egg-shaped tubes, and cast-iron pipes to sea outfall and under the London and North-Western railway. The new cemetery chapel will be completed early in 1912. The council will consider a scheme for the promenade on the west shore, including shelters, enlargement of model yacht lake, &c.; also schemes for the widening of Colwyn-road, one of the chief roads to the town, four private streets improvements, boat jetty for the Craig-y-don district, and extensions and addition to the gasworks plant. It is hoped that during 1912 the proposed through-road scheme from Llandudno to Colwyn Bay will have the Road Board sanction.

**Llansilin** (Mr. E. VAUGHAN-EDMUNDS, M.I.MUN.E., surveyor to the rural district council).—A scheme of sewerage and disposal for the village of Llanrhaiadr, prepared by the surveyor, and estimated to cost £2,000, is under consideration. The council's application for a grant by the Road Board towards the improvement of Sycharth-road, estimated at £3,500, has been received. It is probable that during the year a scheme will be formulated for the erection of cottages, to replace those condemned under the Housing Act. As usual, numerous improvements are likely to be effected to the large mileage of roads under the control of the council.




**London, Finsbury** (Mr. P. G. KILLICK, borough surveyor).—During the year the widening of Rosoman-street will be completed, as well as a further section of Whitecross-street. A fair amount of repaving works (principally wood) will be necessary, and the average amount will probably be spent on the reconstruction of sewers. During the last few years practically the whole of the "dead ends" of sewers have been connected up with other sewers. This, in addition to materially improving the ventilation of the sewers, has very considerably reduced the cost of flushing. The whole of the work has been done without a loan.

**London, Hackney** (Mr. NORMAN SCORGIE, M.INST.C.E., borough engineer and surveyor).—The only work really decided upon for execution during the present year is the repaving in hard wood of the carriageway on the eastern side of Southgate-road in connection with the electrification of the tramways now being undertaken by the county council's contractors, Messrs. Mowlem & Co., and the construction of an underground convenience for both sexes in Kingsland-road, near Middleton-road. Schemes projected comprise: (1) Open-air swimming bath on land belonging to the council, near Millfields-road. (2) A convenience for both sexes in the vicinity of Victoria Park, Hackney Wick. (3) Some more permanent form of paving for the sections of Wick-road traversed by motor omnibuses. (4) The probability is that during the ensuing summer further lengths of macadam roads

may be treated with bituminous grouting, and others tar-sprayed. The borough electrical engineer has an extensive proposal for increasing the capacity of the power station, and strengthening the network of cables throughout the borough. This matter is now before the Electricity Committee, who intend to take the opinion of an outside engineer before submitting any report to the council.

**London, Holborn** (Mr. E. F. Spurrell, borough surveyor).—Although at the time of writing this council had not decided the character of the work to be carried out next year within the borough of Holborn, the programme is sure to include the repaving of certain of the roads and footpaths in the borough, and the reconstruction of some of the local sewers.

**London, Paddington** (Mr. E. B. B. Newton, M.Inst.C.E., F.S.I. borough surveyor).—Until the annual estimates are considered and the votes passed in March by the council, it is impossible to indicate the works which will be put in hand during the coming year, but it may be anticipated that there will be a considerable amount of wood and other paving works, and probably an extension of the use of some bituminous material in connection with some broken stone roads. Probably arrangements for the reconstruction of a footbridge over the canal will be put in hand. Doubtless steps will be taken towards the commencement of new baths and wash-houses, and extensive alterations at the existing baths. The erection of a disinfecting station will be under consideration.

**London, Woolwich** (Mr. J. Rush Dixon, M.Inst.C.E., borough engineer and surveyor).—In addition to the usual work of maintaining the large mileage of roads and sewers, further new sewer and surface-water drainage works will probably be undertaken to prevent flooding in the lower parts of the borough. Extensive road widening and paving works in connection with the reconstruction of the London County Council tramways between Greenwich and Woolwich will be proceeded with, if the scheme is approved by Parliament in the next Session, and the last length of horse tramway here will disappear. The footway tunnel under the river Thames, joining North and South Woolwich, is nearing completion, and is expected to be opened for use early next spring. Lifts at each end to accommodate forty passengers are now to be provided in place of the stairs previously arranged for. A shelter and sanitary convenience for both sexes is to be built at the tramway terminus, Abbey Wood, and an underground convenience for women is to be provided in Beresford-square. Extensive road resurfacing and tar-spraying will most likely again be put in hand, and in addition to various private street works there will be the usual further development of the many building estates in this extensive borough.

**Ludlow** (Mr. J. A. Spreckley, Assoc.M.Inst.C.E., borough and water engineer). The laying out of the new cemetery will be the principal work in the coming year. 7½ acres of land have been provisionally purchased, and plans have been prepared for laying out the site with mortuary chapel, lodge, &c., at a total cost of £4,500. The question of providing a suitable strong-room and reference library for the borough records is under consideration, and seems likely to fructify, as the records are unique of their kind, and would be of interest to tourists visiting the ancient castle, as well as to students of history. The recent improvements to the water supply are now practically complete.

**Luton** (Mr. J. W. Tomlinson, Assoc.M.Inst.C.E., borough engineer and surveyor).—The initial steps in a scheme for the extension of the borough boundaries have been taken, and it is probable that the matter will proceed towards realisation during the coming year. A town planning scheme dealing with an area of 1,856 acres is to be proceeded with at once. The new sewage disposal scheme will be completed shortly, and a scheme for a complete system of storm-water drainage for the borough has been prepared and will be proceeded with, either in its entirety or partially, at an early date. It has been decided to commence the erection of new public baths for the town in September next. Some portion of the new infectious diseases hospital will probably be erected during the year. A school for 320 children will be commenced, and a new cookery centre will also be built.

**Lytham** (Mr. Arthur J. Price, engineer and surveyor to the urban district council).—The coming year promises to be a busy one with regard to new street works, some fifteen streets being scheduled for making, and the Local Government Board have just been asked to sanction a loan of £2,650 for the construction of the first six. Several new sewers are to be laid at each end of the district, and it is hoped that the new outfall sewer and storage culvert will be carried out during the present year. A bowling green is now being laid out at the east end of the district, and a footbridge over the Liggard Brook is to be constructed near the green. Tar-painting and tar-macadamising will be further extended, and several important road improvements, which include the widening of Preston-road from 35 ft. to 60 ft., and the widening of two bridges, are now under consideration.

**Maesteg, Glamorgan** (Mr. Samuel J. Harpur, engineer and surveyor to the urban district council).—The chief works contemplated for carrying out this year are: Sewage disposal works (£19,500); street widenings and works (£6,000); river retaining wall (£2,000); extensions to town hall buildings (£3,000); and new public offices (£4,500); together with the tar-spraying of about 2 miles of main and other roads, and the laying down of a considerable length of asphalte footways. All the schemes have been designed, and will be carried out, by the surveyor and his staff.

**Maidenhead** (Mr. Percy Johns, Assoc.M.Inst.C.E., borough surveyor). The advent of the new year finds the council taking into serious consideration schemes for the enlargement or complete rebuilding of the municipal buildings, the much-needed surface-water drainage of High-street, together with the kerbing, channelling and repaving of the same thoroughfare. The prosperous condition of the electric light undertaking demands a substantial addition to the central station, which will shortly be taken in hand. At the sewage works the committee are contemplating the provision of new filters for the sludge-water effluent, and new offices for the superintendent. The council have also applied for sanction to a loan for entirely reconstructing the whole of the lower portion of the Great Bath Road—which passes through the borough from east to west—in tar-macadam, and effecting other improvements to the same highway. Works of tar painting and spraying are to be considerably extended this year, and the authority are about to purchase their own machine for this purpose. Outside the actual jurisdiction of the council, of course, but of prime importance to the town, is the rebuilding of the famous Boulter's Lock by the Thames Conservancy. The lock itself is being considerably enlarged, a new boat slide, with mechanical conveyor, which should prove of inestimable service during the press of traffic on Sunday, is being constructed between the river and the old mill stream, new conveniences are to be built, and generally much of interest done to improve this important point in the river.

**Mansfield** (Mr. Thos. P. Collinge. Assoc.M.Inst.C.E., borough engineer and surveyor). The year 1912, the twenty-first since the incorporation as a borough, promises to be an exceptionally busy one. The new sewage disposal works, costing about £30,000, are practically completed, and will be formally opened in March. Plans are being prepared for sewering and sewage disposal works at Rainworth on account of the great development in this district in consequence of the new colliery at Rufford. The construction of the new railway through Mansfield from Clipstone to Kirkby has been commenced, and good progress will be made during the year. A Provisional Order is being promoted this

session for acquiring properties and land in various parts of the borough for ten street improvements. Application has been made to the Local Government Board for a loan of £5,500 for sewering Big Barn-lane and Southwell-road district, and it is hoped this work will be commenced at an early date. Several streets are being reformed under the Private Street Works Act, and the county main roads are being resurfaced with tar-macadam. Great attention is being given to the Housing and Town Planning Act, 1909, and schemes are being prepared for certain areas. Alterations to the administrative block and two fever pavilions are to be erected at the Forest Infectious Diseases Hospital. New slipper baths are proposed to be erected at Pleasley Hill, and further extensions and alterations to the cattle market carried out. New council schools are to be erected at Mansfield, Pleasley Hill, and Rainworth. The population of the borough at the last Census was 36,897, and during the past year 566 new houses have been erected and certified for occupation.

**Maidstone** (Mr. T. F. BUNTING, borough surveyor).—During the ensuing year there is in contemplation the erection of a secondary fee-paying school in the borough, and a considerable addition to one of the largest elementary schools. Various extensions of the public sewers will be undertaken, and the making up of new streets under the Private Street Works Act. Beyond this the municipal work of the year will probably comprise nothing out of the ordinary.

**Margam** (Mr. JOHN COX, surveyor and waterworks engineer to the urban district council).—The projected works include the erection of gasworks, for which Parliamentary sanction was obtained in 1910; extensions and improvements of lighting systems of the district; the construction of new trunk road, Afon Valley, Port Talbot; new trunk road, Duffryn Valley, Port Talbot; provision of public cemetery, chapels, &c. (area 10 acres, estimated cost £7,000); provision of additional storage reservoir and extensions of water supplies; erection of stables, stores, caretaker's premises, fire brigade station, mortuary, &c.; new main sewer, Groeswen; new water mains, Groeswen; provision of two public urinals; progress of new main sea outfall sewer, jointly with the Glyncorrwg Urban District Council; erection of twenty-six workmen's dwellings on the site of the old market, Taibach; and the provision of public abattoir. This district is probably one of the most progressive in South Wales, and the population during the last twenty years has trebled. From all appearances there is no fall in development, and the erection of a large and important industrial town is assured.

**Market Harborough** (Mr. HERBERT G. COALES, A.M.INST.C.E., F.R.SAN.I., engineer and surveyor to the urban district council).—A 15-in. intercepting sewer through the market, connecting Northampton-road with Kettering-road, will be put in, together with a 21-in. storm overflow at St. Mary's Bridge. The Little Bowden Recreation Ground will be provided with a laid-out enclosure and bandstand. No important new work is contemplated, the town being already well served with its public undertakings. It is intended to continue the tar grouting or painting of the principal roads. A scheme for widening of the narrow part of the St. Mary's-road is in progress. Renovations and small additions to the council chamber and offices are in hand. The council have reduced their district rate from 1s. 9d. to 1s. 8d. a half-year.

**Matlock** (Mr. JOSEPH TURNER, M.R.SAN.I., engineer and surveyor to the urban district council).—A loan of £45,500 has been sanctioned by the Local Government Board for the carrying out of a main sewerage scheme, comprising four districts. Further additions, including the erection of shelters, laying out of walks, bowling green, and tennis courts are to be proceeded with at the Hall Leys Pleasure Grounds. Other improvements are under the consideration of the council.

**Merthyr Tydfil** (Mr. T. F. HARVEY, M.INST.C.E., borough engineer and surveyor).—During this year the corporation, in connection with their water undertaking, propose to commence the construction of an additional large impounding reservoir at Pontsticill, and several miles of aqueduct and other works, for which Parliamentary powers were obtained last year. The estimated cost of the scheme is £399,972, and the capacity of the intended reservoir about 3,300,000,000 gallons, with a top water level of 1,082 ordnance datum, and an earthen dam 100 ft. high. A new 30-in. main sewer 4½ miles in length, and a 24-in. relief sewer about 1 mile in length, will be constructed, together with several smaller sewer extensions. A new septic tank is in course of construction, and various works are projected on the farm lands of the Merthyr and Aberdare Joint Committee. A ferro-concrete roadway bridge over the river Taff, at Aberfan, having a span of 76 ft., and a width of 32 ft., is now being constructed, and the corporation anticipate the widening of one or two other of their road bridges. A large number of private street works will be carried out, and it is proposed to lay out recreation grounds at Treharris and Dowlais, and to extend the corporation's cemetery at Aberfan. In connection with the Housing of the Working Classes Act, some forty-eight houses at Pentrebach (estimated cost £200 each), and some thirty-eight houses at Thomastown (about £180 each), will be erected. The corporation have already built some 294 working-class dwellings, and contemplate the erection of many more cottages. Five new school buildings are in course of erection, and the corporation project the building of three additional schools this year. Extensive extensions are being carried out at the corporation hospital. In addition to these special works many estates are being developed, necessitating a large amount of work in the supervision of building and street works.

**Middlesbrough** (Mr. S. E. BURGESS, M.INST.C.E., F.R.SAN.I., borough engineer and surveyor).—The whole of the works in connection with the transporter bridge over the river Tees are now completed, and the structure was publicly opened by H.R.H. Prince Arthur of Connaught, K.G., in the middle of October, 1911. The total cost is about £86,000. During the year much engineering and other public sanitary work is under contemplation. An extensive main drainage and sewerage scheme is under preparation, and will come up for consideration within the next few months; the total cost is estimated at about £40,000. The corporation have also under consideration the extension of the borough boundaries, to include a considerable district both south and south-east of the existing borough, especially having regard to the continuity of interest of the outside with the central portion of the borough. This will entail considerable work both engineering and sanitary by the borough engineer's department. The details of a comprehensive town planning scheme are also under preparation, and a report on the matter is being considered by the Joint Committees of the corporation dealing with town planning. The scheme embodies the laying out on a well-matured plan of the remaining unbuilt-up portion of the borough, including some acreage beyond. A total area of 1,000 acres is under review. An important feature in the scheme is the improvement of radial main artery roads, and the construction of boulevards or ring roads to form outer, intermediate and inner circles; also the abolition of back streets. The installation of water-closets in lieu of privies has been extensively carried out during the past year, and during the present twelve months will be continued, so that in a few years' time it is hoped that the water-carriage system will be practically the system in the borough. A scheme for refuse disposal by means of destructor works is also under consideration by the Sanitary Committee, the total cost being estimated at about £17,000. Alternative sites are proposed, and this matter will be gone into during the year. Road improvements and street paving to the extent of about £12,000 will also be put in hand. Internal alterations of the municipal buildings, in order to adapt them for use by the various departments by reason of the removal of the free library and newsroom to the new Carnegie library, which will be opened during the year—will also be put in hand. The basement portion of this work has already been commenced. At the Cleveland Asylum a water-tower, 100 ft. in height, with tank of a capacity of 150,000 gallons, is also to be erected, at a cost of about £3,000. The erection of additional cottages for attendants at the asylum will also be proceeded with, as well as other constructional work for the treatment of phthisis cases.

**Middleton** (Mr. W. Welburn, borough surveyor).—At Middleton the following works will be carried out: New street works, £900; road widenings, £263; school extension, £1,000; extension of sewage works. Plans are in hand for laying out 7 acres in connection with the town planning scheme.

**Milnrow** (Mr. Robert R. Jones, M.Inst.M. and Co.E., engineer and surveyor to the urban district council).—During the latter part of last year various plans, estimates, &c., were prepared in the surveyor's department for schemes which are likely to be carried out or commenced this year. The Rochdale and Shaw main road is to be reconstructed and improved throughout its entire length. Property is to be acquired in Bridge-street and Rochdale-road for street improvement purposes. A strip of land has been given to the council for the improvement of Harbour-lane. A length of sewer in Station-road and Equitable-street is to be laid. A large cart shed, with storage accommodation, and also a public convenience, are to be built on land adjoining the council offices. A long length of retaining wall is to be erected at Two Bridges, New Hey. A new council school is to be built by the county council at Moorhouse. A number of streets are to be made up by the council under the Private Street Works Act. During the early part of the year the construction of the Milnrow district tramways will be completed, and a through service from New Hey to Rochdale will then be provided. The Oldham Corporation will complete the work in this district of constructing the 12-in. water main from Butterworth Hall Colliery to Piethorne Reservoir, and the necessary pumping station and concrete reservoir at Butterworth Hall.

**Morecambe** (Mr. J. W. Hipwood, Assoc.M.Inst.C.E., borough surveyor and water engineer).—The following works will be completed: The reconstruction and doubling of the corporation tramway track on the promenade, scraping and cleaning of all the old water mains in the town, and the making up of several back streets. The works immediately projected or under consideration are: The widening of Poulton Bridge and approaches (this being the main entrance to the town), estimated to cost £5,000; the construction of new sea-wall, ornamental gardens, &c., on the foreshore at Bare, estimated to cost £4,500; also the construction of additional groynes and slipways. Further tar-macadam works will be executed, and probably the whole of the streets in the borough will be tar-painted. Experimental lengths of Rocmac will be laid. The new art and technical schools will be completed, at a total cost of £12,000. Several additional private streets will probably be made up.

**Morpeth** (Mr. J. Davison, borough surveyor).—During the past year the improvements carried out by the council consist mainly of the making up of private streets and the completion of a scheme involving the demolition of a number of obstructive buildings. In connection with the water supply of the town an application is being made to the Local Government Board for sanction to a loan for the erection of an engine-house and purchase of an engine, and the laying of a branch water main in Dark-lane. A new pump has been fixed at the well and borehole at Tranwell reservoirs, and the further sinking of the well will be proceeded with during the early part of the year. There are also a number of private streets to be dealt with. The making of a new street from Bridge-street to Well Way is under consideration.

**Mossley** (Mr. R. H. Buckley, borough engineer and surveyor).—It is hoped during the year to construct a new fire station and form a permanent fire brigade. A new school is at present under construction, and the erection of a further school is now being considered. Borrowing powers for extensive alterations at the gasworks are being sought.

**Neath** (Mr. D. M. Jenkins, Assoc.M.Inst.C.E., borough and water engineer).—The works for next year include the completion of a recreation ground, roads and sewers for additional workmen's dwellings, and a reinforced concrete bridge across the canal, 50 ft. span. The projected works comprise service reservoir and mains in connection with the Ystradfellte waterworks for auxiliary supply to the borough; extension of Llantwit sewage works—septic tanks and filters; a number of private street works; street widenings; extensions of electrical distributing mains, &c. Application is to be made to the Local Government Board as early as practicable for sanction to a loan for the erection of about 100 workmen's dwellings—to designs similar to those of the sixty-one houses which have been already built by the corporation, and which have proved a success. A new steam disinfector is to be installed forthwith. The use of "Rocmac" for roads will be continued, the treatment with this material having so far proved very satisfactory. The question of purchasing tar-spraying machines will again be considered at an early date. Up to the present the borough engineer has advised the corporation to enter into annual contracts for the carrying out of the work of tar-spraying, and to defer the purchase of machines. The consideration of the general outline of a town planning scheme under the Housing and Town Planning Act, 1909, is proceeding. Already much useful work has been done in the borough under the powers of the housing part of the Act.

**Newburn** (Mr. Thomas Gregory, engineer and surveyor to the urban district council).—The principal matters which will engage attention during the year included the completion of private street works at Sugley, Lemington and Walbottle, at a cost of £4,000; the formation of a new path from Lemington to North Walbottle, at a cost of £900; the construction of a new sewer from Newburn to North Walbottle, at a cost of £2,200. Contracts for these three works have been let. The contemplated works also include the widening and lifting of road at Slatyford, and the widening of about 3 miles of road in conjunction with the Newcastle Corporation, in connection with tramways extensions, at an estimated cost of about £12,000. Consideration is being given to a housing scheme, at an estimated cost of £12,000.

**Newport Pagnell** (Mr. C. A. Branford, surveyor and sanitary inspector to the urban district council).—The council have not decided definitely if they intend carrying out any special works during the coming year.

**Newry** (Mr. C. Blaney, borough surveyor and water engineer).—In addition to the erection of eighty dwellings for the working classes, which are at present in the course of erection, the works proposed to be undertaken during the present year embrace an extension to the town hall at an approximate cost of £1,500; and the construction of filter-beds and improvement in the water supply, at a cost of between £6,000 and £7,000. It is proposed to purchase a new plant for the manufacture of tar-macadam, while the construction of an above-ground convenience may also be undertaken. The street works include the construction of a new street 40 ft. wide, and 85 yds. long, the widening and other street works in connection with the housing scheme, the laying of a considerable area in tar-macadam, and the surface tarring of a long length of macadamised streets. A new steam fire engine of 300 gallons capacity has been delivered by Messrs. Merryweather & Sons, Greenwich-road, London; the proper equipment of the fire brigade will also engage the attention of the council.

**Newton-in-Makerfield** (Mr. Arthur Bowes, Assoc.M.Inst.C.E., surveyor to the urban district council).—An isolation hospital for twenty beds is now in progress. The surveyor is preparing plans for sewage treatment at four separate outfalls. A town planning scheme is under consideration. The usual making up of private streets will be continued during the year. The council have decided to apply for an electric lighting order.

**Norfolk** (Mr. T. H. B. Heslop, M.Inst.C.E., county surveyor).—The following is a list of the works projected in the county surveyor's department: Surface treatment for prevention of dust on about 100 miles of roads, principally through small towns and villages, a large amount of which carry motor traffic; widening similar class of roads, and improving corners; reconstruction of lengths of similar roads; new bridge over the river Ouse, between King's Lynn and Downham Market; new bridge at Beetley; cottages in various villages for county police; residences for police superintendent and police sergeants; and new stores, recreation hall, &c., at county asylum.

**Northampton** (MR. ALFRED FIDLER, M.INST.C.E., borough engineer and surveyor).—It is expected that considerable progress will be made with the Bridge-street improvement, which consists of street widenings to 50 ft., and the widening of South Bridge, a three-arch structure spanning the river Nene. The estimated cost of this is £70,000. Other works to be undertaken are the construction of the Far Cotton tramways, a distance of 1¼ miles, a single line with passing places; extensions to the refuse destructor depot; the laying out of Far Cotton recreation ground; the acquisition of a recreation ground for the Kingsthorpe district; schemes for the erection of artisans' dwellings, swimming baths and district baths; and the erection of a secondary school for girls by the Education Committee. Various works in connection with the public parks are also to be carried out during the coming season.

**Norwich** (MR. ARTHUR E. COLLINS, M.INST.C.E., city engineer).—It is expected that the substitution to a comprehensive programme of impermeable carriageway surfaces for flint, shingle, or ordinary water-bound macadam in urban streets where the traffic or sanitary conditions render it desirable will be proceeded with during the year. Generally, it is probable these new surfaces will consist of bitumen-macadam. To assist in meeting the demands of a large body of unemployed labour, arrangements are in hand for constructing a new road, in place of an existing highway which will be closed, on the north side of the cavalry barracks. Distress labour will also be employed at the Corporation Whitlingham Farm in raising gravel, road making, &c. The corporation will proceed with the conversion of the public lighting of the streets from incandescent gas, supplied by the British Gas Light Company, to electricity from the corporation's electricity undertaking. Electric lighting has already been installed as regards about one-third of the area of the city, and the conversion of the lighting of another one-third section will be completed during the next twelve months. The Travis tanks at the sewage farm continue to give highly satisfactory working results. The difficulty at first experienced in dealing with the sludge on account of its mucilaginous character and slow separation of water has been to a great extent conquered, but the corporation, thinking that even better results can be got, are about to adopt a system of treating the sludge so as to extract the fat and reduce the remainder to a dry powder of considerable manurial value. A responsible firm in London is entering into a contract to carry out this process at their own risk. Arrangements are in progress for transferring the work of the wholesale fishmarket, now held adjoining the Guildhall, to a site purchased for the purpose in Mountergate-street. The Local Government Board have granted a loan for this scheme, the carrying out of which will enable a street widening to be effected. A new gallery is being added to the Norwich Castle Museum, at a cost, without furnishing, of £1,500. The roof of this extension will be constructed in reinforced concrete. Restoration works will be recommenced to St. Andrew's Hall and the adjoining Blackfriars' Monastery. Further of the ancient churchyards of the city will be laid out as gardens. The continuous prosecution of this work has added greatly to the amenities of the city, as has the provision of parks, swimming baths, cricket, football, lawn tennis, bowling and other games grounds, and the new gymnasium. As far as practicable the use of these places and appliances is free; even at the gymnasium the services of skilled instructors of both sexes are free to learners.

**Notts** (MR. PURNELL HOOLEY, M.INST.C.E., county surveyor). The usual expenditure in road maintenance will undoubtedly be exceeded during the year by the hauling of materials for increased housing accommodation in consequence of the great developments of the coalfields of the county. It is estimated in all about 15,000 tons of Tarmac will be used on the main roads. Several new schools are to be erected, and the asylum built about ten years ago is to be increased to its full extent of 650 beds. The work commenced on the Fosseway will be continued out of grants made by the Road Board, and a further grant has been promised from that board towards the reconstruction of main or trunk roads and improvements to certain dangerous corners.

**Nottingham** (MR. ARTHUR BROWN, M.INST.C.E., city engineer). — The principal works to be undertaken during the year 1912 are the lowering of Carlton Hill to improve the gradient of Carlton-road, which will cost about £5,000; an improved road to Dunkirk, which will entail new bridges over the canal and the river Leen; the straightening and widening of existing roads, and new approaches to the bridges referred to, at a cost of about £17,000; a new main sewer for the Sherwood and Haydn road districts, which will involve the construction of 2,450 lin. yds. of sewer, varying in size from 4 ft. 6 in. diameter to 3 ft. 6 in. diameter; about 800 yds. of the 4 ft. 6 in. diameter sewer will be constructed in tunnel. Besides the large sewers mentioned there will be about 3,000 lin. yds. of sewers, varying in size from 12 in. diameter to 3 ft. 6 in. by 2 ft. 4 in. The cost will be about £21,000. Tramway reconstruction will be undertaken on a rather extensive scale. Most of the track has been in service for eleven years, and practically no relaying of any extent has been carried out at present. The time has now arrived when considerable lengths of various routes will have to be relaid, and the expenditure on this head will be rather heavy during the coming year. Surveys are being made for a report to the city council on one of Nottingham's worst slum areas, which comprises a district of from 5 to 6 acres, and contains about 500 back-to-back houses.

**Nuneaton** (MR. F. C. COOK, ASSOC.M.INST.C.E., borough surveyor and water engineer).—Further progress will be made with the new waterworks pumping station at Griff, the well in connection with which has now been taken down a depth of 270 ft. At the sewage disposal works the conversion of the secondary contact beds into percolating filters will be completed. A new pumping plant will be installed at the sewage pumping station, capable of raising 100,000 gallons per hour. A tender has also been accepted for the construction of a duplicate refuse destructor and for the installation of two new boilers. A new cemetery at Stockingford will be laid out, and additions are contemplated at the isolation hospital. It is not known whether a tramway scheme will be undertaken, but the matter is under consideration by the corporation.

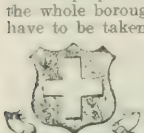
**Oakham** (MR. ARTHUR L. PARKER, surveyor to the urban district council).—In addition to the ordinary routine work, the council are considering the question of erecting new stables on their land in Cold Overton-road, and constructing an additional filter-bed at the sewage farm.

**Okehampton** (MR. FRANCIS J. WORDEN, borough surveyor).—The principal works to be carried out this year are street improvement schemes, new footpaths, of an estimated cost of £800, proposed development of a corner site at the junction of Station-road and George-street for the erection of municipal buildings and town hall, and a separate scheme is being considered for the erection (on a portion of the same site) of new police station and public lavatories, at an estimated cost of £3,000. If terms are made with the owners of land, the latter will be put in hand very shortly. The council have still under consideration a scheme for the housing of the working classes, which will probably be got on with if private builders do not undertake similar work. Works not coming directly under the borough surveyor's supervision are a new drill hall, extensive works at the Royal Artillery Camp, and restoration of parts of the old castle ruins.

**Ormesby** (MR. CHAS. HEARDER, M.I.MUN.E., engineer and surveyor to the urban district council).—The council have approved of a scheme for the improvement of one of their main streets with Limmer rock asphalte, concrete flags, &c., and are to apply to the Local Government Board for sanction to borrow £3,500 to do this work. Part I. of the Housing, Town Planning, &c., Act, 1909, is being strictly carried out, and the council are considering the preparation of a scheme for town planning for part of their district. The main sewerage scheme for the North Ormesby district has now been completed. The main drainage for the village of Ormesby is under consideration on account

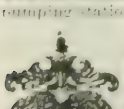
of building operations having commenced. About £5,000 worth of private street improvement works are under consideration. The council have tar-sprayed ¼ mile of main road, and also laid 2,000 super. yds. of tar-macadam on the same road as test lengths.

**Ossett** (Mr. H. Holmes, M.Inst.C.E., borough surveyor and water engineer).—The present year promises to be a very busy one for the borough surveyor's department. The Flushdyke Council school, estimated to cost £3,650; the Gawthorpe water pumping scheme, estimated to cost £1,000; Dale-street improvement, £300; and Southdale-road private street works, estimated to cost £800, are nearing completion. The council have instructed the surveyor to prepare a scheme for dealing with the sewage at the Spa sewage works, which will include storm tanks, settling tanks and percolating filters. The following works are to be taken in hand during the year: Gawthorpe sewerage and surface-water scheme, to cost £1,659; underground conveniences in the Market-place, to cost £450; engine-house, engine and pump and distributing sludge mains, to cost £1,820; reconstruction of 3-ft. by 2-ft. main outfall sewer, to cost £1,533; stores and workshop at corporation depot, £215; boundary walls to form approach to Healey Bridge; South-parade improvement; making up of the destructor road, £716. The council have instructed the surveyor to report on sixty private streets in the borough which require attention. They have also instructed him to prepare a surface-water drainage scheme for the whole borough. The revision of the by-laws will have to be taken in hand.



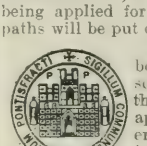
**Oswestry** (Mr. G. William Lacey, borough surveyor and water engineer).—The chief works projected by the town council are the erection of ten almshouses, at a cost of £1,400. A living-room, bedroom, scullery and water-closet, all on the ground floor, are provided in each house; the ground will be laid out with a large lawn and borders, with tar-paved roadway all around, and very desirable little residences will be provided at a comparatively moderate expenditure. The erection of a bandstand in Cae Glas Park will also be proceeded with in the spring. A secondary school for girls is now nearing completion, and a similar school for boys will be erected during the year, making Oswestry, with its ancient grammar school, a first-class educational centre.

**Oundle, Northants** (Mr. G. Belson Chilvers, A.M.I.Mun.E., A.R.San.I., engineer and surveyor to the urban district council).—The widening of the North Bridge by the county council will be commenced early in the year at a cost of about £7,000. About 20,000 sq. yds. of tar-painting will be carried out. A further length of about 1,000 yds. of the main road will be treated with Tarvia binding (instead of being water-bound), the length treated by this method being satisfactory so far. There is also a possibility of all repairs to district roads being bound with tar in the future, the cost being very little above water-binding. Negotiations have been completed with the rural district council for the enlargement of their isolation hospital, at a cost of about £1,000, the cost being borne by the urban district council; when completed the building will be under the joint control of the two councils. The education authority have, after a public inquiry and opposition, obtained sanction to erect a new elementary school for the accommodation of about 300 scholars, and the work will probably be commenced during the year. Other works include the installation of an electrical water-level indicator by arrangement with the General Post Office from the reservoir to the pumping station, a distance of 1 mile.



**Padiham** (Mr. J. Gregson, Assoc.M.Inst.C.E., F.R.S.I., engineer and surveyor and water engineer to the urban district council). The council are looking forward to a busy year. Application has been made for consent to borrow £6,086 for street improvements, £500 for water mains, £250 for the extension of the main sewer, £2,000 for two footbridges spanning the river Calder, and £700 for the widening of a bridge from 30 ft. to 42 ft. Land is to be laid out for a bowling green, and the recreation ground to be enlarged. Competitive plans are being obtained for the laying out of land for a town hall, public offices, markets, baths, fire station, ambulance station, shop property and street widening. There will also be some £2,500 spent in street improvements, for which sanction has been given.

**Peterborough** (Mr. J. W. Walshaw, city surveyor).—The council do not contemplate carrying out much more than ordinary work during the present year. A new system of surface-water drainage will be commenced, and one section of the work, costing about £500, will be carried out each year. A street improvement at Crawthorne-road will be partly carried out. The improvement comprises the removal of five old cottages and widening the existing road, which is now about 25 ft. wide at its widest part, to a width of 50 ft. The cost of the work, for which a loan has been obtained, will be £1,800. Efforts are being made to secure the construction of a bridge over the Great Eastern Railway level crossing. A conference with respect to the matter will shortly take place between this corporation and the adjoining local authorities. A site for a new cemetery of about 25 acres is being sought for. Application for a loan of £1,500 for the purchase of a recreation ground, 5 acres in extent, in the western portion of the town, is being applied for. New concrete and asphalte footpaths will be put down at a cost of about £800.



**Pontefract** (Mr. John E. Pickard, borough engineer and surveyor).—A scheme has now been approved by the council, and a loan of £21,000 applied for, with a view to the erection of 100 working-class dwellings, to relieve the present overcrowding, which has assumed serious proportions. The rents will range from 4s. 6d. to 6s. per week. Competitive drawings have been accepted for new public baths (to cost £4,500), and plans prepared for a public mortuary and new and commodious stables for the highways and sanitary departments, all to be erected on the corporation's Headlands estate. Extensions are to be made at the sewage outfall works by the erection of percolating filters. The waste of water in the borough is being thoroughly investigated, and a complete system of waste-detecting meters installed. The widening of the remaining half of Gillygate, an important thoroughfare, is to be proceeded with, while the paving of narrow streets over which heavy traffic passes with Norwegian granite setts is still be carried out.

**Poole** (Mr. Samuel J. Newman, F.R.I.B.A., borough surveyor).—A considerable amount of work is in contemplation for execution during the coming year. Plans have been prepared for sewering the Hamworthy portion of the borough, including the provision of another ejector station and a syphon across the harbour. Various extensions and improvements of surface-water drainage are to be carried out, including new main drains along the Bournemouth-road, and also a system to more adequately deal with the drainage of the Central Parkstone area. A number of private streets are also scheduled to be made up, sewered, &c. Street widenings and improvements are to be carried out in the Parkstone-road, Sandbanks-road, and South-road. The wood-block paving of 2 miles of main road up to the confines of Bournemouth has just been completed, and plans are being prepared also for wood paving the High-street. It is also proposed to obviate some of the difficulty caused by the local railway crossing in the High-street by forming a subway for pedestrians and cyclists. In the older portion of the borough further improvements are to be made to the roads and footways. Last year over 6 miles of highways were tarred by hand, and it is proposed to largely increase this work in the coming season, and use suitable machines for the purpose in lieu of hand labour. A housing scheme is in progress for dealing with areas requiring improvement. Plans for eight blocks of sanitary conveniences in various parts of the borough are awaiting the Local Government Board's approval. The various conveniences in the park are to be remodelled, and retaining walls of the lake rebuilt and new entrance gates erected. Two new pavilions are to be erected at the isolation hospital, Ringwood-road, and a steam disinfecting apparatus provided, with other additions. A new elementary school for 500 children has just been erected, and is to be opened this month. Plans have also been approved for a new infant school for 250 to be erected this year, also for considerable extensions at two other schools. The population of the

borough increased by 41 per cent in the last decade, and it will probably continue to grow at a greater rate, as there are extensive and attractive areas in the Canford Cliffs, Parkstone-on-Sea, and Branksome Park districts, where large stretches of golden gorse, heather, and fir woods still occupy the ground; while the golf links of the charming Lilliput Valley are an additional attraction. The present rateable value of the borough is £187,460, and the population at the last census was 38,886.

**Portslade-by-Sea** (Mr. A. TAYLOR ALLEN, surveyor to the urban district council).—Many and varied are the improvements contemplated during the year. They including making up several streets under the Private Street Works Act, new outfall and extension of existing surface-water sewer, erection of new public offices in St. Andrews-road, and the enlargement of the recreation ground (the Local Government Board having already approved of the plans prepared by the surveyor for laying out the ground), and provision of gymnastic apparatus. Negotiations are proceeding for the extension of the principal thoroughfare to connect the northern portion of the district, and in order that through traffic between Brighton and Portsmouth may proceed direct without having to pass over the level crossing at Portslade Station. The work of converting the street lamps into the "inverted" system will be completed during the year. The council has been one of the few fortunate enough to obtain a grant from the Road Board for a road widening scheme in accordance with plans and sections prepared by the surveyor. A total of 200 trees have been planted in the residential streets, and these are to be followed by a further batch in the ensuing year.

**Portsmouth** (Mr. ARTHUR W. WARD, borough engineer).—During the past year many works have been carried out, and still more projected for the future. Wind screens have been erected around the head of the corporation's beautiful promenade pier on the South Paarde, and free bathing shelters have been provided on the beach. An extensive and much-needed lavatory for both sexes is nearing completion at the northern extremity of the town, in which Portsmouth wil make its first experiment with urinettes—the "Navicula" being the pattern selected. In connection with the latest treatment of tuberculosis a tuberculin dispensary has been erected in the centre of the town, having a large consulting-room, a spacious waiting-room, a couple of dressing-rooms, well-fitted laboratory, and the usual offices. Being one of the first buildings of this kind erected, it has created a good deal of interest, and has been visited by a large number of deputations. The year has also seen the provision of two refuse destructors, one at Eastney, the other at Baffins. A circular, concrete-lined, open-air salt water swimming pond has been constructed, mostly by "unemployed" labour. The pond slopes from the circumference, where there is about 18 in. of water, to a central deep water part some 100 ft. in diameter. The total diameter of the pond is 300 ft., so that there is a water area of over 1¼ acres. Bathing-boxes and a spring board are in hand, and will be ready well before the bathing season returns. A much-needed public football field has been provided at Baffins, in the eastern portion of the town. For the storage of diseased meat and fish waiting to be condemned by a magistrate, a well-fitted meat house has been erected. A tender of £545 has just been accepted for the erection of a house for the engineer-in-charge at the main sewage-lifting station. Two of the outfalls have works of repair being carried out; several experimental pieces of special carriageway have been laid down, and observations taken; and, as is to be expected with a town of 231,165 inhabitants, scores of small jobs have had to be carried out. The coming year is expected to be a very full one. The immediate preparation of a town planning scheme for all undeveloped building land within the borough, and the contingent possibility of getting a new road out of this island-borough, will be no small work. At the last council meeting a £20,000 storm-water scheme was adopted for a large new district at the south-western part of the town, and will be pressed on with very shortly. The corporation are very much alive to the necessity of public open spaces in the town, although no part of it is more than 2 miles from the sea, and to this end they have purchased, and will come into possession early in February of Milton Park, and also a large tract of land at Eastney, which will be ultimately a capital recreation ground. It will be difficult to find a town better provided than Portsmouth will now be with open spaces. The provision of a salt-water supply for street-watering purposes in the north of the town is under serious consideration, the idea being to pump sea water from the recently-completed swimming bath to a tank at such a level as will give head enough to force the water over a considerable system of iron pipes to the various hydrants. There are many other things on the horizon that bid fair to make the borough engineer of Portsmouth a busy man in 1912.

**Prescot** (Mr. RICHARD NORRIS, A.R.SAN.I., surveyor to the urban district council).—A public convenience is to be erected in Grosvenor-road, to cost £150. The hotel at the corner of West-street is to be demolished, and the whole of the site added to the roadway, which is very narrow at present. The roadway will be made up with tar-macadam, and the total cost of this improvement to the council will be about £1,000. Stables are to be erected, carts, dust wagons, &c., purchased, as the council intend to have their own horses after March 31st next. A tar-spraying machine is to be purchased, and most of the roads in the district will be tar-sprayed before and during the summer months. It is intended to pave a number of back passages during the year. The council have applied for compulsory powers to purchase a field for the purpose of refuse disposal.

**Prestatyn** (Mr. FRED. WILKINSON, M.INST.M. AND CO.E. (engineer, surveyor and gas manager to the urban district council).— During the past year the recently-acquired gas undertaking has been put on a satisfactory working basis, some 2 miles of 6-in., 4-in. and 3-in. mains have been laid, at a cost of some £400, together with a number of small extensions for new street developments; the alterations at the works involving new exhauster and engine, buildings, photometer-room, additional bench of retorts and chimney stack, together with two 12-ft. purifier boxes, the total contract for which amounted to £1,294, most of which was carried out by Messrs. R. Dempster & Son, Limited, Elland, has been completed. The council have also let to the same firm a contract for a telescoping holder of 36,000 cub. ft. capacity, for £425, which will be completed in the course of a month or so. Plans have just been prepared for submission to the Local Government Board for the laying out of pleasure grounds, the construction of sanitary conveniences, &c., the estimated cost of which is about £1,000. It is intended to improve Station-road by the laying of concrete flags; negotiations are still in progress for the widening of Bastion-road from 30 ft. to 45 ft. A much larger amount of tar-spraying will be done, owing to the council acquiring their own plant. Building operations have not been quite so brisk during the year. Some forty plans of houses and streets were approved during that period, most of which have been carried out. Lord Aberconway, who, together with trustees, are the owners of a very large proportion of the council's area, are entering on a bold and comprehensive scheme for the development of the estate, and are offering premiums amounting to £100 for its planning. Sir J. Tudor Walters is their professional adviser, and Mr. H. V. Lanchester, F.R.I.B.A., the assessor in the competition. The development will necessitate almost the entire reconstruction of the sewerage of the town and the outfall works. The matter has been under the consideration of the council, and probably before the year is out something tangible will be done in this direction. A number of small water main extensions have been carried out, and the whole of the public standposts in the parishes of Dyserth and Meliden, which are in the council's area of supply, have been abolished, and the premises supplied direct from the mains. The surveyor's department has consequently been kept fully occupied.

**Prestwich** (Mr. SYDNEY H. MORGAN, ASSOC.M.INST.C.E., engineer and surveyor to the urban district council).—During the year it is the intention of the council to commence the work of reconstructing the macadam portions of Bury Old-road, and general widening. The new work will consist of granite setts, laid on a foundation of 6 in. of Portland cement concrete, and, together with the widenings, the work is estimated to cost £17,047. About £2,800 will be spent upon the improvement of secondary roads. Sanction to borrow £1,800 of this amount has been obtained from the Local Government Board. The Earl-street continuation, a much-needed improvement, which consists of cutting a way for the convenience of traffic between Earl-street and Whittaker-lane, will be carried out early in the year.

In addition to the above, about £3,000 will be spent on the maintenance and improvement of the main and district roads. A number of private street works are at present in the contractors' hands, and several additional streets will be made up under the Private Street Works Act, 1892, during the year, at an estimated cost of £7,050. Some very effective streets, planted with trees and provided with turf margins, have been laid out. The Town Planning Committee is making steady progress with a town planning scheme. Map No. 1 has been prepared, and the notices required under the regulations will be served on the owners and occupiers in the prescribed area early in the year. It is probable that considerable extensions to the stables and the store sheds at the town's yard will shortly be carried out. Thirty garden and poultry allotments have been laid out during the year, and a sub-committee has been appointed to consider the advisability of providing further allotments on the Croft off Gardner-road. The extensions at the sewage disposal works have been completed during the year. The total expenditure has been £9,700. About 1½ miles of sewers have been laid. Considerable improvement has been made in the public lighting of the district. By a reorganisation of the work provision has been made for lamps to remain lighted all night. Further improvements are expected during the year. The district still continues to grow rapidly. Two hundred and fifty-four houses have been certified for habitation during the past twelve months.

**Preston** (Mr. THOMAS COOKSON, ASSOC.M.INST.C.E., M.R.SAN.INST., borough engineer and surveyor). The following works are in contemplation for the ensuing year: New baths (£16,000), laying out of new park (£8,000), Deepdale Mill-street Bridge (£3,000), new market offices (£2,000), repairing of river wall, Miller Park (£1,000), and various street improvements.

**Ramsbottom** (Mr. THOS. H. BELL, surveyor to the urban district council).—The council are making application to Parliament next Session for powers to construct and equip a railless traction scheme. The routes at present contemplated cover a distance of about 3½ miles. Route No. 1, commencing at Holcombe Brook Railway Station, and passing along Bolton-road West, Bolton-street, Bolton-road North, and Market-street, Edenfield, terminating at the finger-post in that street. Route No. 2 will commence at Market-place by a junction with route No. 1, and pass along Bridge-street, with a termination at the Ramsbottom Railway Station. The powers for extensions along other routes, with the sanction of the Board of Trade, are also applied for under special clauses in the Bill. Tenders have been invited for the carrying out of the various works in connection with the provision of a refuse destructor and steam disinfector installation. The acceptance of a tender will be subject to the sanction of the Local Government Board in respect to proposals to take up a loan to cover the cost of the proposed works. The purchase of the site has already been agreed to by the Local Government Board. Important road works and sanitary improvements are to be carried out during the year. Chief among these may be mentioned the improvement of Callender-street, involving an estimated expenditure of £850, and the resewering and making up of Back Callender-street, including the erection of a retaining wall, at a total cost of £500 or thereabouts. The co-operation of the county council is to be asked for in carrying out the widening of a portion of the main road in Bolton-street, a scheme involving upwards of £1,000, and also to the setting back of existing garden walls in Stubbins-lane, so that an increased width of main road may be obtained at that point. Plans have been prepared, together with detailed estimates, and have been lodged with the Local Government Board, accompanied with a request for an inquiry in respect to a scheme to provide public offices. The proposal is to acquire the premises which are at present rented as offices, and also to buy certain adjoining buildings, and to adapt the whole block of buildings for municipal purposes. The amount of the loan to be asked for is £2,150. There are indications of a slight stimulus in the trade industries of the town, which will probably result in the erection of more dwelling-houses, for there are very few untenanted houses in the council's area. Work of an extensive character will be carried out at the sewage works, in order to lift the sewage from Lower Summerseat and Brooksbottoms, so that it may be treated before being passed into the river Irwell.

**Rawtenstall** (Mr. JAMES JOHNSON, borough engineer and surveyor).—During the coming year the following works are contemplated: (1) Improvements in Dean-lane, including the construction of retaining walls, paving, and the reconstruction of two bridges. (2) Widening of Haslingden New-road, near Whitaker Park, and the erection of new walls, railings and gates to Whitaker Park. (3) Several small, but important, main-road widenings. (4) The paving, flagging, sewering, &c., of thirty to forty private streets. (5) Extension of Central Market. (6) Extension of electricity works. (7) Sewering of Townsendfold district, &c. (8) Erection of public baths and the construction of public bowling green will probably be proceeded with if it is found when the estimates are prepared in March next that there is a prospect of same being obtained without increasing the present rates.

**Redcar** (Mr. J. HOWCROFT, engineer and surveyor to the urban district council).—The works to be carried out include the provision of covered seats on the promenade, the making of macadamised streets, paving of back streets, and the extension of water-works.

**Redditch** (Mr. A. J. DICKINSON, engineer and surveyor to the urban district council).—The new sewage disposal works were completed on August 31st last. Extensive additions to the producing plant at the electricity works are being made. The widening of Evesham-street will be commenced. Several new private streets will be constructed. New swimming baths may be provided. The main roads, and about 3 miles of district roads, will be tar-sprayed during the year.

**Richmond, Yorkshire** (Mr. H. W. MARSDEN, M.I.MUN.E., borough surveyor).—During the past year several sanitary improvements have been carried out, and a large number of houses redrained and put into a sanitary condition under the Housing and Town Planning Act. A new tar-grouted road has been constructed through the centre of the market, and a large amount of tar-spraying and tar-grouting done in other parts of the district. The market hall is at present being installed with heating apparatus, by means of low-pressure hot water. It is intended during the coming year to do a good deal of tar-grouting, tar-spraying, relaying of footways with artificial stone flags, and street improvements generally.

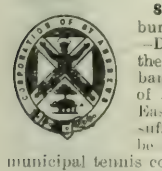
**Rochdale** (Mr. S. SYDNEY PLATT, M.INST.C.E., F.R.S.I., borough surveyor). The works projected outside the routine works for the coming year include the widening of Manchester-road bridge over Rochdale Canal at Castleton, the widening of Milnrow-road at Firgrove, the conversion of macadamised roads to granite-paved ways, and a scheme for town planning a portion of the borough.

**Rugeley** (Mr. W. E. ROGERS, surveyor to the urban district council).—The authorities of this district are thinking of installing an electric lighting scheme for the town, at a probable cost of about £5,000, tar-spraying about 2 miles of main and other roads, laying down certain lengths of tar-macadam roads, and extending concrete-flag paving of certain footpaths. These are the main features of the year's programme.

**Rushden** (Mr. W. B. MADIN, M.R.SAN.I., engineer and surveyor to the urban district council). The coming year promises to be a very busy one for the surveyor's department at Rushden. In addition to the ever-increasing routine work of a growing town, it is expected the contract for the new sewage disposal works will be let, and the work got well in hand. The scheme, which has been prepared by the engineer and surveyor to the council, is one of sedimenta-

tion tank treatment, followed by double filtration through eight circular filter-beds. The cost will be about £12,000. Plans have been prepared and application made to the Road Board through the county council for an important widening in High-street and Newton-road, at a cost of £1,200. Plans have also been prepared for the completion of the Rectory-road improvement, at a cost of £1,250 for works only, in addition to the acquisition of property. This improvement, if carried out, will open out a new thoroughfare from the railway station to the heart of the town. The question of erecting a public mortuary and the provision of a recreation ground are now before the council, and it is probable something will be done in this direction before the end of the year. It is also intended to lay down on the main roads about 800 tons of granite macadam grouted with one of the bituminous compositions. Some 400 tons were so treated last year, and the results have far exceeded our expectations. The Higham Ferrers and Rushden Water Board (Mr. W. B. Madin being the engineer) have signed an agreement with the Wellingborough Rural District Council to supply the villages of Wollaston and Irchester with water in bulk, and these works, it is anticipated, will be carried out by the rural district council during the year. This will necessitate the board laying a considerable length of 6-in. main to connect up with the mains to be laid by the rural district council. A company has been formed under the title of Rushden and District Electric Lighting Company, and they are applying to the Board of Trade for a Provisional Order under the Electric Lighting Acts to supply light and power. This application will not be opposed by the council.

**Saffron Walden** (Mr. ARCHIBALD H. FORBES, M.INST.M. AND CO.E., A.S.I., borough surveyor).—The new system of sewerage and sewage disposal works being practically completed, one of the most important works here will be that of connecting the houses in the town to it. Application is being made to the Local Government Board for permission to borrow £2,500 for this purpose. It is probable that in most cases the drains will have to be entirely relaid. Application is being made also for sanction to borrow £2,005 for the construction on the existing reservoir site of a water tower, which is to contain a 30,000-gallon cast-iron tank, 65 ft. above the ground level. It is probable that five or six roads will be made up and taken over under the Private Street Works Act, 1892.



**St. Andrews** (Mr. WM. WATSON, burgh surveyor and water engineer).—During the year it is expected that the retaining wall at the Bruce Embankment will be extended, at a cost of £5,000. The retaining wall at the East Bents property, which recently suffered considerable damage, is to be repaired. A proposal to lay down municipal tennis courts and a bowling green in close proximity to the three golf courses is under favourable consideration. It has been agreed to lay down an up-to-date meteorological station, embracing sun recorder, rain gauge, and barometric readings. The construction of the new waterworks at Cameron, with a storage capacity of 200,000,000 gallons, is anticipated—to be completed in the autumn. The further extension of surface spraying with tar is to be extended practically to all the main roads in the burgh.

**St. Austell** (Mr. E. D. GROVES, engineer and surveyor to the urban district council). Street improvements and main road widenings will form a large portion of the extra work. There is at present an application before the Local Government Board for a loan for widening portions of two main roads, at an estimated cost of £1,934. On the Bodmin-road it includes a setting back for a depth of 5 ft. the dwarf walls in front of houses and portions of buildings. On East-hill a strip of land has been obtained 475 ft. long by 12 ft. wide to allow for a 5-ft. cement-concrete footpath, and widening the road to an average width of 28 ft. An important widening is also to be carried out on Tregonissey-road, where there now exists a dangerous corner. This will include setting back the present boundary an average depth of 18 ft. for a distance of 400 ft., and widening road and constructing foothpath, at an estimated total cost of £400. An important street improvement scheme is now being prepared for Duke-street. Owing to the demolition of old property, the council are taking the opportunity to lay down a new frontage line on each side, thus converting the present narrow winding street into straight street 30 ft. wide. A new drainage scheme for the western part of the district is being prepared, and this work will be carried out this year, an early start being proposed. Tar-painting of roads will be carried out and portions of the heavy-traffic main roads will be laid with tar-macadam. The public conveniences now in course of erection will be completed shortly.

**St. Helens, Isle of Wight** (Mr. C. PURSEY, surveyor to the urban district council).—During the year it is expected that the Salterns outfall and sewer will be laid. The council are considering the question of providing a storage reservoir to hold 100,000 gallons. A considerable amount of tar-spraying will be carried out, and a quantity of tar-macadam laid.

**St. Neots** (Mr. JOHN EDEY, surveyor to the urban district council).—It is proposed to improve the lighting arrangements by the substitution of inverted in place of existing upright burners for street lighting, where not already completed during past year. Application has been made for assistance from the Road Board for widening and improving the approach to the bridge spanning the river Ouse, and for continuing the laying of tar-macadam and tar-spraying macadamised roads. The stretch of roadway on Market-square, joining up with High-street, will probably be laid with tar-macadam. The surveyor has been asked to prepare an estimate for laying about a mile of 12-in. pipes in the waterlogged ground (north of the town) for a new outfall for sewage.

**Salford** (Mr. J. CORBETT, borough engineer).—During the year, in addition to the general highway, sewerage and private street works, the construction of the flood relief works for the Pendleton district, as also main sewerage works at Irlams o' th' Height, will be well advanced; and an extensive scheme of public conveniences for the borough will be completed. A number of steel bridges over the river Irwell will be repainted, and extensive additions are also contemplated at the sewage works.

**Saltash** (Mr. W. W. HARVEY, borough surveyor).—This authority at present only contemplate, beside the ordinary routine work, a new public convenience at the Ferry Beach, improving Alexandra-square, and some private streets improvements.

**Sandgate** (Mr. CHAS. J. CONQUEST, engineer and surveyor to the urban district council).—It is hoped that the new waterworks scheme (which has been unavoidably delayed) will be carried out during the ensuing year. It comprises new reservoirs, pumping plant and station, rising and delivery mains. The continuation of the laying out of the gardens at the west end of the town is the only other work in contemplation, apart from the general routine.

**Sandown, Isle of Wight** (Mr. LESLIE G. DASHPER, M.I.MUN.E., A.R.SAN.I., surveyor to the urban district council).—A Local Government Board inquiry has recently been held relating to the making of a footpath and subway under the railway (with sewer under) to the cliff at Lake, and, if sanctioned, this work will be carried out during the year. The council have decided to raise the main road at Morton Common for a distance of 380 yds. to remedy the flooding that occurs there in heavy rains—the Road Board contributing half the cost of this work—and have also decided to carry out certain private street works. An experiment in central lighting over the roads where trees are planted will be carried out shortly. The council also have under consideration the provision of a convenience, bandstand and shelter on the Esplanade, and the provision of a recreation ground.

**Scarborough** (Mr. H. W. SMITH, ASSOC.M.INST.C.E., borough engineer and surveyor).—Among the many projected improvements to be carried out in the borough during the coming year, the following are the more important: The land recently purchased from the Crown in the North Bay is being laid out as a public park and pleasure ground, with an ornamental

lake, shelter, boat-houses, &c., and the work will be completed for the coming season. The North Bay Promenade is being extended, and nineteen beach bungalows and forty bathing boxes, with shower baths, conveniences, public shelter and café, are being erected. The 14 acres of undercliff between the Spa and Holbeck Gardens is about to be developed as parks and pleasure grounds, and lavatories, shower baths, shelters, café and paddling pool are to be ready for the coming season. The Floral Hall in the Alexandra Gardens will be enlarged to give additional accommodation for 500 seats. Additional tennis courts are to be added to the grounds of the Yorkshire Lawn Tennis Club on the Weaponness estate. An information bureau, with conveniences for both sexes attached, is to be erected in Harcourt-place. An addition to the municipal schools is projected, and several street improvement works will be undertaken. A town planning scheme is also before the council.

**Selby** (Mr. BRUCE MCG. GRAY, ASSOC.M.INST.C.E., F.R.S.(EDIN.), waterworks engineer and surveyor to the urban district council).—The works to be carried out this year by the Selby Urban District Council include the following: Laying out the land that has just been purchased at a cost of £2,100 as an extension of the park; the erection of eight workmen's dwellings, for which the sanction of the Local Government Board has been obtained, the cost being £1,600, exclusive of land belonging to the council; the construction of a new public convenience in the park for both sexes; and the extension of sewer from outfall at river Ouse to new works between Aire and Calder Canal and North-Eastern Railway. It is also suggested that the council build houses in different parts of the town, as there is great overcrowding at present, and from 300 to 400 new houses are required at once, with the probability that several hundreds more will be required in the near future. The sewer near the Portholme Mills is to be extended as far as the new cottages which the council are building. The villages of Cawood, Thorpe and Gateforth, comprising a population of nearly 2,000, will be using water from the Selby waterworks early this year. There is also a prospect of several other villages using Selby water before the end of the year. Several minor improvements are contemplated. The work of flooring the swimming baths, for use as a concert hall, &c., during the winter months, is now in hand, and will shortly be completed.

**Sheffield** (Mr. C. F. WIKE, M.INST.C.E., city engineer and surveyor).—In addition to the usual routine work of the department, including sewage treatment, laying out of parks and recreation grounds, &c., a portion of the scheme for the disposal of the Sheffield sewage (estimate, £270,000) is in progress, and the expenditure on this work during the year will probably amount to about £25,000. Powers have been obtained for including the adjoining parish of Tinsley (area about 700 acres), within the city, which will entail additional work, and the corporation are also applying for Parliamentary powers for improvements and tramway extensions, including several trackless tram routes. Several important street improvements are to be taken in hand, at a probable cost of, say, £50,000, together with numerous smaller improvements. A new bridge is to be constructed over the river Sheaf, at a cost of about £5,000. This is in connection with the construction of a new street, 70 ft. wide (estimated cost, £110,000), in the centre of the city. A considerable amount of work is in progress in connection with town planning, and this will be proceeded with during the year. The total area of the town planning schemes at present in hand is 1,209 acres, and it is anticipated this will be increased from time to time until the whole of the undeveloped land in the city has been dealt with. Public conveniences are to be erected in various parts of the city, at a cost of over £2,000.

**Sheffield** (Mr. W. J. HADFIELD, surveyor of highways and deputy city engineer).—The principal works likely to be taken in hand during the coming year are as follows:—Highways.—In addition to a sum of £50,000 granted for the ordinary maintenance and upkeep of the public highways of the city, the length of which is over 300 miles, it is proposed to spend £25,000 on paving loan account, mostly in the conversion of old macadamised streets to more modern forms of paving, but partly in the paving of macadam roads, the traffic over which is now too heavy for that class of construction. Private street works will cost at least an additional £30,000. The corporation are proceeding at a very rapid pace with the conversion of old rubble sewers within the city. During the past three years about £100,000 has been spent in that way, and the estimate for the coming year will not be less than £30,000. Tramways renewals and repairs will absorb a further sum of £35,000, in addition to which the construction of some of the new routes now before Parliament may be undertaken. During the next two years about 80,000 sq. yds. of tar-macadam are to be laid on the main roads in place of some of the present dry macadam, which is being rapidly superseded, no less than 15,000 tons of tar-macadam having been laid during the past twelve months. The above items, and others still to be arranged for, will bring up the expenditure of the department to about £250,000 for the year, the average for the last four years having been little short of this figure. The work referred to is all to be carried out under Mr. W. J. Hadfield, the surveyor of highways.

**Sheringham** (Mr. F. HALL SMITH, M.INST.C.E., P.A.S.I., M.R.SAN.I., engineer and surveyor to the urban district council).—The authorities of this town have just received sanction to a loan of £600 for the purchase of Beeston Hills, which comprise about 10 acres of land overlooking the sea, at a height of 250 ft. above ordnance datum, and which will be used as an open space for visitors. Seats will be fixed in different positions, from which a splendid view is obtained of the sea, town and woods inland, and the acquisition of the site is a splendid asset to the town. Application has been made for sanction to a loan for building conveniences at the eastern end of the promenade, and these will be erected in the spring. Two new streets are being made up, and the town continues to grow, a good class of house being erected. A scheme is in hand for another golf course, which will be a good thing for the town. The sewer outfall is to be extended another 100 ft., which will be well below low water of the lowest tides.

**Shoeburyness-on-Sea** (Mr. F. FEATHER, M.R.SAN.I., engineer and surveyor to the urban district council).—The works to be undertaken by the council during the year include the deepening of well and providing new plant at the waterworks, £2,300; purchase of foreshore, construction of new promenade; road widening, £1,700; and private street works, £1,000. The year promises to be a busy one for the laying out of new building estates. The surface-water drains will be extended. The extension of the promenade adjoining Southend-on-Sea will be considered, also the question of construction of a public convenience on the common.

**Skipton** (Mr. ARTHUR E. W. ALDRIDGE, surveyor and waterworks engineer to the urban district council).—During the coming spring a start will be made with the construction of two steel footbridges (90-ft. and 60-ft. span) over the Leeds and Liverpool Canal. Application has been made to the Local Government Board for a loan of £4,250 for the erection of stables and cart sheds, &c., at the depot. The council are engaged in considering a town planning scheme for the undeveloped portion of their area immediately adjoining the town. A new recreation ground (16½ acres) has just been purchased, and steps will shortly be taken to proceed with the laying out of this and the Firth recreation ground, a loan of £1,300 having been obtained. It is probable that during the coming year tar-spraying will be extended on the main road. For several years an area of 50,000 yds. has been done and proved very successful. Minor work such as street making under the 1892 Act will continue as usual.

**Southampton** (Mr. J. A. CROWTHER, ASSOC.M.INST.C.E., borough engineer and surveyor.—The following is a short description of the works which will be proceeded with in this year: Private streets. Plans for twenty private streets are at present being prepared, and this number will no doubt be considerably increased before the present year expires. Schools.—Tenders have been accepted for enlarging one of the council schools, and for a handicraft and cookery centre. Plans for a new school, accommodating 1,200 children, are before the Board of Education, and the corporation are contemplating erecting another school to accommodate a like number, negotiations for a site being in progress. Tram-

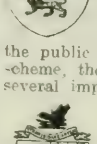
ways.—One of the tramway depots is being extended at a cost of £4,500. Street Improvements.—Important street improvements have been carried out in the past, and a scheme is now being prepared forming a circuit around "The Bargate," which will entail the corporation acquiring some of the most valuable property in High and Above Bar streets. Roads.—The corporation have in hand contracts for coating various carriageways with Trinidad asphalte macadam (Welsh or Guernsey granite), at a cost of £11,000. This class of work will be considerably extended this year, in order to cope with the increasingly heavy traffic. Estimates are being considered for carrying out tar-macadamising work in various streets, at a cost of £30,000. Recreation Ground.—The corporation are considering the question of laying out a recreation ground in the suburbs, with an area of about 11 acres. The land was purchased as a gravel pit some years ago, but is not now used, the gravel not being durable enough for the traffic of the town. Cemetery.—The chapel and lodge at the cemetery were completed last year, and the corporation are now forming paths, &c., with a view to opening the cemetery at an early date for burials. Baths.—The corporation have accepted a tender for extending the slipper baths at the Western Shore Baths, owing to the large increase in the demand for this form of bathing. Refuse Destructor.—Schemes are now before the council for constructing destructors for the outlying districts to do away with the necessity of using tips, &c. Generally.—Last year plans for 500 houses, shops and complete buildings generally (not including small additions), including a new out-patient's department at the South Hants Hospital, and large extensions to the workhouse infirmary, were submitted and approved by the council. Large estates will be laid out for building this year to cope with the large demand there is for houses.

**Sleaford** (Mr. W. B. MARSDEN, surveyor to the rural district council).—The principal works in progress or contemplated during 1912 are a comprehensive scheme of water supply for Scopwick, Kirkby Green, and Blankney. Water supply for Burton Pedwardine, Billinghay and district, water supply extensions of mains (12 miles) to Fen districts, and new sewerage and disposal works for Hickington. The erection of about forty houses under the Town Planning Act, 1909, and various other works are also contemplated.

**Southend-on-Sea** (Mr. ERNEST J. ELFORD, borough engineer and surveyor).—The new main sewerage and sewage disposal works, estimated to cost £160,000, are well in hand, and approximately £90,000 has already been expended. The greater portion of the sewerage work has been completed, while the pump well is nearing completion. The pumping station buildings were to be commenced early in the year, the contracts for machinery having been let. The sedimentation tanks, percolating filters, &c., are in hand, and will probably be completed by the end of the year. A refuse destructor, at an estimated cost of £11,000, will be commenced at an early date. A further extension of the Western Esplanade will be carried out during the present year, the total cost of the completed esplanade being £50,000. Application is being made to the Local Government Board for the construction of a swimming bath in connection with these works, at a total estimated cost of £8,000. The corporation have applied to the Board of Trade for the authorisation of large extensions to the South-end Pier, and the construction of a new promenade pier at Westcliff, the estimated total cost being £49,000. Work has commenced in connection with the improvement of the north station on the pier. Tenders will shortly be asked for the construction of a new landing pier at the eastern end of the Marine-parade, the total value of work being £11,000. The light railways extensions are being rapidly pushed forward. Application has been made to the Local Government Board for the erection of a lodge at Southchurch Park, at an estimated cost of £1,000. Private street works will proceed as usual, and the expenditure for this purpose will probably be about £30,000.

**South Molton** (Mr. H. C. E. RAYNER, borough surveyor and water engineer).—In the course of the present year it is proposed, in connection with the waterworks, to lay down new distributing mains throughout the town, together with new valves and hydrants; also to install two new patent high-pressure filters on the trunk main, and to construct new filter-house for the same. At the same time, in connection with the corporation's gasworks, it has been decided to take up the existing cast-iron mains, and to substitute new steel tubes; also to provide additional retorts. The corporation are also taking steps for the purchase of land and for the erection of new workmen's dwellings. In addition, the usual tar-facing of the streets and roads throughout the town will be carried out.

**South Shields** (Mr. LESLIE ROSEVEARE, ASSOC.M.INST.C.E., borough engineer and surveyor).—The works projected include a considerably increased expenditure on roads, embracing the entire repaving of several streets, the further development of the foreshore by the construction of lodges and lavatories and the erection of shelters, and the proposed construction of a new wharf (210 ft. long) and the erection of transit sheds. Foundations for a 1,500 kilowat motor-turbo generator are in hand for the electricity works. The formation of a new bowling green has been decided upon, and a scheme for the construction of four new tennis courts abutting the sea road is before the council. A new graving dock, to be constructed on the riverside, will necessitate the diversion of one of the main thoroughfares and the remodelling of one of the sewerage districts and a main outfall. An extension of the recently-installed 4,000-candle power lamps for the lighting of the main thoroughfares is proposed, and an addition to one of the schools, at a cost of £8,000, is in course of erection.



**Stafford** (Mr. WM. PLANT, ASSOC.M.INST.C.E., borough engineer and surveyor).—The works projected for 1912 include the completion of the scheme of waterworks extension, the laying out of two building estates owned by the corporation, the opening of a further section of the public pleasure grounds, a markets extension scheme, the erection of a new public library, and several important street improvements.

**Stoke-on-Trent** (Mr. A. BURTON, ASSOC.M.INST.C.E., F.S.I., borough surveyor).—This year again promises to be an exceedingly busy one, owing to the fact that the work of bringing into line the administration of the federated area is still in hand. Several important street improvements and road paving works in wood and granite are to be carried out, and the council intend to make up as many private streets as possible under the Private Street Works Act, 1892. A committee has been appointed to discuss the advisability of preparing a scheme under the Housing and Town Planning Act of 1909, the area comprising 880 acres, and a conference of the owners and the committee is to be held in February. Plans, &c., are being prepared for a large scheme of surface-water drainage in the Burslem district, and several works of sewer construction and reconstruction will be carried out. Surveys have been prepared and improvement lines of various widths laid down for the widening of several of the arterial roads within the county borough, and it is hoped that by the end of the year a comprehensive scheme on the widening of most of the important main roads will be completed. Extensions to Cobridge Park are in hand, and a new park at Fenton and one at Goldenhill are under consideration. Building operations in connection with the Stoke Town Hall extensions are nearing completion, as also is the reconstruction of the Longton Market Hall roof. Extensive works are now in hand in connection with the remodelling of the Longton Town Hall. A new electric power station has recently been commenced at Hanley, and alterations and additions to the power stations at Stoke and Burslem are to be commenced shortly. New underground conveniences at Hanley are in hand. Among other works contemplated are additions at the free library, Hanley; new fire brigade station, Stoke; underground conveniences and mortuary at Stoke; and the reconstruction of the market hall roof at Tunstall.

**Stowmarket** (Mr. G. W. LINGWOOD, M.INST.C.E., A.R.SAN.I., surveyor and sanitary inspector to the urban district council).—The works that will be carried out this year, if the sanction of the Local Government Board can be obtained, are as follows: Reconstruction of sewers in Violet-hill, Tareen-street, Finborough-road; new 9in. sewer in Takers-lane,

12-in. storm-water drain from Fusil-road to river Gipping; total length 2,820 yds. The estimated cost is £2,500. The inquiry has been held. The present scheme has been designed by the surveyor.

**Stretford** (Mr. Ernest Worrall, C.E., F.S.I., surveyor to the urban district council).—A year of important work is before the council of this rapidly developing district. The extension of the town hall and provision of adjacent baths is in hand, and will be completed during the year, likewise an extension of the technical institute in Old Trafford. The development of the Longford Hall estate, an area of 70 acres, recently acquired as an additional park, will be undertaken. A new bridge and approaches 50 ft. wide with a skew span of 37 ft. over the Bridgwater Canal on the Chester main road is expected to be carried out. A further instalment of inspection chambers on the older sewers will be made. A large number of private streets will be completed in rock asphalte, and several road-widening schemes are in hand. A new bowling green and pavilion in Trafford Park will be opened to the public—making thirteen greens in the district. Sundry smaller items of improvement and the usual maintenance and renewals will complete the year's work.

**Sudbury, Suffolk** (Mr. Wm. Ironside Tait, Assoc.M.Inst.C.E., borough and waterworks engineer).—The main roads in the borough are about to be adopted as such by the West Suffolk County Council, and are being brought up to the standard of their requirements. A new isolation hospital will be erected in the early part of the year, the construction being on the "Doecker" principle. The laying out of the added area of the cemetery will be completed during the year. Alterations to the town hall and improvements in the heating arrangements are also proposed. The council have recently obtained sanction to borrow £10,300 for the purpose of paying off a paving loan which has been running almost a century, and on which interest only has been paid, but no repayment of capital.

**Sunbury - on - Thames** (Mr. Harold F. Coales, Assoc.M.Inst.C.E., engineer and surveyor to the urban district council).—The question of the extension of Church Wharf, tenders for which have already been received, will be considered; also the laying out of a further length of river lawn. The council will continue the making up of private streets and lanes under the Private Street Works Act, as in the past year, and will extend the use of tar-macadam on some of the principal highways. Tar-painting will again be carried out on a considerable scale. A surface-water drainage system for part of the council's area will be considered. The remaining portion of the ground recently acquired near the sewage farm will be parcelled out in allotments and small holdings.

**Sunderland** (Mr. J. W. Moncur, M.Inst.C.E., F.I.S.E., borough engineer and surveyor). The corporation have no important schemes under consideration for carrying out during the coming year.

**Surrey** (Mr. Alfred Dryland, M.Inst.C.E., county surveyor). The chief works likely to be commenced in the coming year are the widening of Kingston Bridge, from 25 ft. to 55 ft., and the construction of a ferro-concrete bridge, 40 ft. wide and 70 ft. span, over the Wey at Guildford, to replace an existing double-span narrow brick bridge. Surveys will be made for various schemes of widening and improvement of trunk roads, and possibly also some loop roads, and it is hoped to make further progress with the conversion of the surface of the main important arterial roads from water-bound to tarred water-bound macadam.

**Surbiton** (Mr. Henry T. Mather, engineer and surveyor to the urban district council).—The principal work will be the construction of the council's sewage disposal works, at an estimated cost of about £68,000, including the erection of a house refuse destructor. The council have also applied to the Local Government Board for a loan of £14,770 for the purchase of the land and the laying out of a recreation ground and allotments. The council will apply to the Local Government Board for permission to prepare a town planning scheme for the district, and a considerable amount of work will be involved in the preparation of the scheme. The usual departmental work will be proceeded with, including the construction of conveniences and making up of private streets under the Private Street Works Act, 1892. New sewers will also be laid for surface-water drainage. A scheme will probably be proceeded with for diverting one of the busy thoroughfares, involving the building of two bridges and doing away with two dangerous corners. The Road Board will be asked to contribute to this scheme.

**Sutton Coldfield** (Mr. W. A. H. Clarry, Assoc.M.Inst.C.E., borough engineer and surveyor). The past year having been a very busy one, during which many contracts were commenced and either carried out or are now being completed, it is therefore not contemplated to enter into any new works of an extensive character during the ensuing year. The preparation of a town planning scheme will take up a great deal of the time of the department. It is proposed to apply to the Local Government Board to give permission to prepare a scheme for an area of some 7,000 acres; all the preliminary steps have already been taken, and as soon as the board's decision is received, the detail work will be commenced. A large open swimming pond in the park is under consideration, also the provision of slipper baths in the centre of the town. Other works of drainage, road widening, experimental lengths of construction, with patent binders, and surface spraying will be made, but will not be of an extensive character.

**Sutton-in-Ashfield** (Mr. Walter Burn, Assoc.M.Inst.C.E., engineer and surveyor to the urban district council).—The new gasworks are now nearly completed, and the old retort-house has been pulled down so that the improvement of Outram-street will be carried out this year. The question of new offices or additions to the existing offices will be settled, and the surplus land from the old gasworks will be sold for building land. Application is to be made for a loan for ten streets to be made up under the Private Street Works Act, 1892, and for a 3-ft. diameter concrete-tube outfall sewer, 500 yds. long. Two main road widenings are to be carried out. The Lawn Pleasure ground, of 20 acres, has been purchased, and during the year the council propose to erect a public convenience there, providing accommodation for both sexes. The use of tar-macadam and the work of tar-spraying will be extended.

**Sutton, Surrey** (Mr. Wm. Hedley Grieves, surveyor to the urban district council).—The past year in Sutton has been one of considerable activity. The recent Census shows that the population has increased from 17,223 to 21,275 during the last decade, and from a return made during the year by the accountant to the Beckenham Urban District Council it appears that Sutton was the lowest-rated district among the forty districts surrounding Sutton. The number of new buildings has not been up to the average, but there appears to be signs that there is greater activity in the building trade here. In view of the large and increasing amount of motor traffic to and from London, various forms of road paving have been put down during the past year, including Constable Hart's tar-macadam, Quarrite Reemac, and a length of wood-block paving. Nearly 20 miles of roads were tar-sprayed during the summer months, and it is believed that the amount spent on this treatment was more than saved during the terrific storm on Derby Day, May 31st, when roads that were not tarred were considerably washed away. During the coming year several new schemes will be advanced. The council are applying for a town planning scheme, and extensions to sewerage in the district, as well as the erection of public conveniences, will occupy the attention of the council. There is also a proposal to sink a well at the public baths in order to try and reduce the cost of water supply to the baths. The Road Board made grants to the council last year, and new ones are being considered for the coming year. Undoubtedly before long the question of the provision of a refuse destructor will have to be considered. If rumour is correct a motor-omnibus service will be extended to Sutton direct from London.

**Swansea** (Mr. GEORGE BELL, ASSOC.M.INST.C.E., borough surveyor).—The corporation are promoting in the next Session of Parliament a Bill in which is included the following matters relating to the borough surveyor's department: The purchase of land for, and the carrying out of, the work of street widenings in various parts of the borough (£98,850); extension of tramways in the borough (£15,694). Other projected works are: New buildings for central stores and workshops for all departments of the corporation, estimated to cost £10,000; a new bridge, proposed to be of ferro-concrete, for the Mumbles-road and the railways adjoining, to give better access to the sands and a sea promenade which is in contemplation; a new cemetery for the northern portion of the borough. The widening of Castle-street, the most important street in the centre of the town, to a width of 60 ft., has at last been accomplished. The whole of the adjoining land has been practically let at very satisfactory ground rents, and the erection of the buildings, consisting of sixteen separate premises, is about to be commenced, the cost of which will be approximately £40,000. The report, entitled "Floreat Swansea," submitted to the corporation by the borough surveyor in July last, is bearing fruit in various directions, and in all probability during this year endeavours will be made towards fixing a new civic centre for the borough. The borough surveyor is at present engaged on a large scheme for the development on town planning lines of the greater portion of the works district within the borough, whereby very valuable intercommunication roads would be obtained, and the influx of many more manufacturing concerns is anticipated for occupation of the ideal sites. It is intended during the year to apply for a Provisional Order for considerable extensions of the borough, as the population is rapidly outgrowing the present boundaries. The borough of Swansea has combined with the borough of Merthyr Tydfil in the establishment of a large mental hospital at Cefn Coed, just outside the borough of Swansea. The architect is Mr. Hine, of London, and it is expected that a commencement may be made in the erection of the buildings during this year.

**Swindon** (Mr. H. J. HAMP, ASSOC.M. INST.C.E., borough surveyor).—In addition to the ordinary routine work the following will be carried out during the coming year: Laying out Whitworth-road cemetery, at a cost of £5,000, will be proceeded with early in the new year; extensions at the sewage disposal works, at an estimated cost of £12,000; several small main improvements, at a cost of £1,600, and the making up of a large number of private streets and back roads.

**Taunton** (Mr. DAVID EDWARDS, ASSOC.M.INST.C.E., borough engineer and surveyor). A proposal is under consideration for the connecting of the north and east end of the town by means of a footbridge over the river Tone, with a span of 100 ft. Several works of road improvements and widenings are under consideration. The principal roads in the town are being remade with tarred macadam, and it is expected that upwards of 7 miles of roads will be so treated with tar next season. The extension of the public library will be completed shortly, at a cost of £1,500, and above-ground conveniences are to be erected in the Vivary Park.

**Teignmouth** (Mr. F. W. KNIGHT, surveyor and water engineer to the urban district council). A Local Government Board inquiry was held on the 12th inst. into the application of the urban district council for sanction to a loan of £1,040 for the purchase of a site and erection of buildings thereon for depot purposes, and a further sum of £900 for street improvement works in Paradise-road and Coombe-road, and the widening and improvement of a dangerous corner at the junction of Exeter and Brimley-roads in accordance with the plans prepared by the surveyor. The council have also adopted a scheme prepared by the surveyor for widening and improvement of the Bishopsteignton (main) road and Mill-lane, at an estimated cost of £1,887, and a scheme for improvement to the lighting of the town by gas, at an estimated cost of £560.

**Tenby** (Mr. B. MORLEY, M.R.SAN.I., borough surveyor).—The council, having rejected the schemes submitted for the extension of the western outfall, have now instructed Mr. J. Preece James (Tenby) to prepare a scheme in accordance with the requirements of the Local Government Board. Granite will be used on some of the roads instead of limestone, and the council will probably consider the advisability of erecting shelters and public conveniences in the town. Extensions of sewers are in hand, and the requirements of the Housing and Town Planning Act will be enforced within the borough. An application with regard to the erection of working-class dwellings is now before the Local Government Board, and the council are awaiting the result of the inquiry which was recently held.

**Tenterden** (Mr. W. L. C. TURNER, borough surveyor). —During the coming year plans are to be prepared for new sewers and outfall works, to treat the sewage from a large portion of the borough. The county council are acquiring land for new schools. Tar painting of roads is to be on an extensive scale.

**Thornton** (Mr. HENRY FENTON, surveyor to the urban district council).—During the year it is expected that the making up of several private streets will be completed, at an estimated expenditure of £3,000. Application has been made to the Local Government Board for sanction to borrow for the purpose of laying sewers in Bourne-road and Lawson's-road, and also for several road widenings, &c.

**Tintwistle** (Mr. S. E. KETTLEWELL, surveyor to the rural district council).—During the year the sewerage and sewage disposal works will probably be proceeded with. The Local Government Board held an inquiry last November to consider a scheme prepared by the council's engineers, Messrs. Brady & Partington, Chapel-en-le-Frith, for dealing with the sewage at present being conveyed by the existing old soughs and drains direct into the river Etherow, thus causing pollution. The Mersey and Irwell Joint Board obtained an order against the rural district council to carry out an efficient scheme of sewerage. It is expected the one prepared will receive sanction at an early date, and the construction of the works will then be commenced.

**Todmorden** (Mr. J. A. HEAP, borough surveyor and waterworks engineer).—Paving a portion of Burnley-road with granite setts, coating portions of main roads with tar-macadam, large number of private street improvement works, construction of new sewers, and the completion of the new secondary and Castle Hill council schools.

**Tonbridge** (Mr. W. LAURENCE BRADLEY, engineer and surveyor to the urban district council). The work here during the year will continue to be fairly heavy. The new sewage works will be completed shortly. The alterations and additions to the isolation hospital are just being commenced. Considerable work under the Private Street Works Act is contemplated, also the widening of the Great Bridge over the River Medway.

**Torquay** (Mr. H. A. GARRETT, ASSOC.M.INST.C.E., M.R.SAN.I., borough engineer, surveyor and harbour engineer). The Torquay Town Council, in spite of the large expenditure on works undertaken in 1911 and now in progress (exceeding £30,000 for pavilion and municipal buildings), are continuing their policy of bold enterprise. At the last meeting plans for a system of medical baths, with a large swimming bath, estimated to cost upwards of £15,000, were provisionally approved. A large underground convenience and shelter at Castle-circus, estimated to cost £2,500, is contemplated; the wood paving in Torbay-road is to be extended, at a cost of £3,000; wood paving is also to be laid on Newton-road, at an estimated cost of £1,600; and it is contemplated to extend the wood paving in Fleet-street and on the Strand, at an estimated cost of a further £3,000. A loan of £800 for conveniences at Corbyns Head and in Brunswick Gardens has been applied for. A contract has been entered into for

new elementary schools, at a cost of £6,200, and plans are now being prepared by the county architect for a secondary school, estimated to cost £12,000. A further £1,000 is to be spent on new roads and sewers.

**Tring** (Mr. S. S. GETTINGS, ASSOC.M.INST.C.E., surveyor to the urban district council).—The chief work to be carried out this year will be that of converting all main roads which at present have a flint surface into granite-surfaced roads, the estimated cost being £1,500, towards which the Road Board have made a grant of £342. The question of making up three private streets under the Private Street Works Act will also be considered in the near future, and the work will probably be put in hand during the year, the estimated cost being approximately £3,000.

**Tutbury** (Mr. H. S. TEBBITT, engineer and surveyor to the rural district council).—Owing to bad times in the neighbourhood, expenditure in works of a progressive nature has had to be curtailed. The council are, however, carrying out a scheme of sewerage for the parish of Branstone, and this will keep the engineer's department busy during the coming year.

**Tyldesley, Lancashire** (Mr. R. H. HARTLEY, surveyor and engineer to the urban district council).—It is intended to carry out considerable public works during the ensuing twelve months. An inquiry was held last October into an application for sanction to a loan of 12,000 for extensions to the existing sewage works. The work will no doubt be commenced during the early spring. Plans are also about to be deposited with the Local Government Board for the construction of a main outfall sewer, &c., estimated to cost £12,000. Private street works, above-ground conveniences, and alterations to public baths are among other work that will be carried out.

**Ulverston** (Mr. W. F. Y. MOLINEUX, engineer and surveyor of the rural district council).—In addition to the ordinary maintenance of 520 miles of roads, several road improvements have been carried out, and new culverts con-struc'ed. In the public health department, nine new streets have been made up and taken over under the Private Street Works Act. About 8 miles of water mains have been laid and the houses connected thereto. Small extensions of sewerage have been carried out. Timber traffic has been heavy, but arrangements have been made with the contractor and others to pay a share of the extra cost.

**Ventnor, Isle of Wight** (Mr. H. HUGHES OAKES, M.B.S.A.I., surveyor to the urban district council).—It is hoped that the new high-level landing stage to the Royal Victoria Pier, which is now in course of construction from the designs and under the superintendence of the town surveyor, will be completed early in the new year. The work has been very much delayed during the past few months owing to the state of the weather and other causes, but the contractors, Messrs. T. B. Cooper & Co., of Bristol, have expressed their intention of using every possible opportunity of getting the work completed by the specified time. During the heavy storm which took place on Sunday, December 10th, a large number of the 18-in. by 18-in. greenheart piles, which are 50 ft. long, were washed away, together with other timber from the pier, breaking two of the iron columns and between forty and fifty tie rods, besides doing a great deal of other damage—in fact, at one time it was feared that part of the pier would collapse. Every precaution, however, was taken by the contractors, and the damaged work is now being reinstated. It was satisfactory to notice that none of the new work was hurt in the slightest degree. Further laying out of the eastern and, possibly, the western cliffs will be proceeded with. The improvements to the eastern cliffs already made have given the greatest satisfaction in the town, as what was for so many years barren and waste land has been turned into one of the beauty spots of Ventnor. The cliffs are now largely patronised both during the summer and winter months by a large number of visitors. A scheme is before the council for the extension of the Eastern Esplanade. The town surveyor has prepared plans of a sea-wall over 500 ft. long and 17 ft. high, and it is confidently hoped that this scheme will be carried out during the present year. The surveyor has advised the council that if this work is not done a considerable amount of temporary work will have to be executed for the protection of the cliffs, the encroachment of the sea having during the past winter caused considerable subsidence at this particular spot. It was expected that the land recently purchased by the council for an extension of the cemetery would have been laid out during the past year, but this work has been delayed from time to time, and the council are now taking up a loan so that it may be proceeded with forthwith. One or two small street improvements are under consideration, and it is more than likely that these will shortly be accomplished facts. Among other matters which are "in the air" may be mentioned the construction of further groynes, underground conveniences, provision of shelters on the cliffs, &c. Various schemes have been before the council for the construction of a lift, but nothing has yet been definitely decided in the direction.

**Wakefield** (Mr. J. P. WAKEFORD, ASSOC.M.INST.C.E., city engineer).—The extensions to the sewage disposal works at Calder Vale, estimated to cost £33,500, and sanctioned by the Local Government Board in 1910, are now well advanced, and it is anticipated that the new filters (3 acres in extent) will be brought into use towards the end of the year. These filters will furnish an illustration of what may be accomplished in distribution without sprinklers, the intention being to discharge the tank effluent on to the surface of the filters in intermittent flushes by means of syphons, the upper portion of the filtering media being of fine grade and of the particular size required for the liquid to be dealt with. A scheme for the drainage of Newmillerdam, an area incorporated with the city in 1909, is under consideration, together with the coupling up of the Agbrigg sewage works to the main outfall at Calder Vale. During the year several sewers will be reconstructed, together with storm-water sewers in low-lying parts of the city. Application is to be made to the Local Government Board at once for sanction to borrow £6,000 for the widening of Warrengate, a thoroughfare connecting Kirkgate with the Springs. This is a much-needed improvement, which, when completed, will relieve the traffic in one of the main arteries in the city. Private street works, to the value of £6,500, have been carried out during the past year, and plans and specifications for other street works are at present in course of preparation, the cost of which will approximate £2,000. Several miles of main and other roads within the city were tar-sprayed last summer, the work being carried out by the council's own workmen. The treatment has been highly satisfactory, and provision will therefore be made in the annual estimates for its continuance. Negotiations are at present in progress for the acquisition of Sandal Castle ruins and site, covering an area of 8 acres, to serve as an open space for the use of the citizens. Alterations and extensions are in contemplation at the isolation hospital, and preliminary plans and estimates are in course of preparation. A special committee has been appointed under the Town Planning Act, and plans are being prepared with a view to making application to the Local Government Board for permission to prepare a scheme. Altogether a very busy year is anticipated in the city surveyor's department.

**Walsall** (Mr. JOHN TAYLOR, borough engineer).—The following works are in hand, or are to be carried out during the present year: (1) Main sewage disposal works, in course of construction by the corporation—the first part practically completed and will be working shortly—estimated cost £50,000; (2) underground convenience at "The Bridge," which will be finished in January (£1,500); new tramway offices and waiting-rooms to be constructed in the centre of the town (£1,100); and additional accommodation for 110 children provided to one of the council schools. Granite-sett paving, 5,500 super. yds., is to be laid in two of the principal streets of the borough. All the main streets, about 10 miles, are to be coated with tar, and it is proposed to reconstruct two of the principal roads with tar-macadam, for which purpose a tarring plant has been put down. Two large storm-relief sewers are proposed to be constructed shortly, at an estimated cost of £1,800, and considerable extensions are to be carried out to the Bloxwich sewerage system at a cost of £2,700.

**Ware** (Mr. H. FOX HILL, engineer and surveyor to the urban district council).—No special work is at present contemplated. The question of providing additional

water storage will probably be discussed. The Road Board has made a grant towards improving the surface of certain sections of the main roads in High-street and Watton-road. A trial length of Roemac has been laid in the High-street, and is answering satisfactorily so far. There will be the usual road repairs carried out in the spring, also paving of footways. Beyond this there is nothing contemplated except the usual work.

**Wednesbury** (Mr. E. MARTIN SCOTT, borough engineer and surveyor). The work projected include: About 5,000 yds. of flag paving to footways; widening of the Shambles out of the Market-place; extensive improvements in Walsall-street, consisting of the razing of old cottages, garden wall, &c., widening carriageway and footway; improvements at the junction of Holyhead-road and Camphill-lane, inclosing land with dwarf wall and ornamental-iron palisades, and planting area with shrubs. Sanitary provision in town hall basement, and schemes embracing the enlargement of public offices, town hall and public baths.

**Wellingborough** (Mr. E. YOUNG HARRISON, ASSOC.M.INST.C.E., A.M. I.MECH.E., surveyor and water engineer to the urban district council). —The council have in hand the widening of London-road, at an estimated cost of £350. The improvement of Cannon-street, Cambridge-street and Victoria-road, at their intersection with one another, is another work, the scheme including a new road 42 ft. wide, and the provision of a new convenience, and the total estimated cost being over £6,000. During the past year new surface-water sewers have been laid by direct labour in Victoria-road, Brook-street West, Hatton-avenue, Hatton-street and North-street, and foul-water sewers in Hill-street, Oxford-street and Dale-street. A report is being prepared for a scheme to eliminate the storm water from the sewers in a central portion of the town, having an area of 607 acres. A report, with alternative plans, is being made for new cart sheds and stables at Cannon-street yard depot. In April last the council took upon themselves the work of dust collection, being previously done by contract. The result is satisfactory in every way. Much good work has been done in the improvement of workmen's dwellings under the powers given by the Town Planning Act. New avenues of trees are being planted in the streets, and additional attractions will be provided in the public recreation grounds. A new elementary school is in course of construction. The new girls' secondary school has just been opened, and over £7,000 is being spent in additions to the grammar school for boys.

**Welshpool** (Mr. W. WYNNE, borough surveyor). The works contemplated by the council during the year 1912-13 comprise the clearing out of two storage reservoirs, the capacity of each of which is 3,500,000 gallons, and the construction of a 7-in. by-pass for supplementing the supply from higher levels during operations, with the object of constructing further inlet-beds (two in numbers) at a higher altitude; reconstruction of parts of the town main sewers; construction of six manholes (depth 10 ft.); and diversion of storm water from main sewers into the river Severn.

**West Bromwich** (Mr. ALBERT D. GREATOREX, M.INST.C.E., borough engineer and surveyor).—A fairly busy year is anticipated. Plans are being prepared for the widening of about 1 mile of Newton-road, and also the widening of a main road bridge over the river Tame. Considerable purchases of property in connection with Mayers Green improvement have recently been made, and the council have under consideration the promotion of a Bill in Parliament to carry out the above and other street improvements. Plans for a new fire station are under consideration. Plans are being prepared for considerable alterations and extensions to the sewage outfall works. The preparation of a town planning scheme for a portion of the borough is under consideration. Considerable progress has been made in mapping the roads contiguous to the River Tame and other streams, and the work will be continued during the coming year.

**West Suffolk** (Mr. W. LIONEL JENKINS, ASSOC.M.INST.C.E., P.A.S.I., county surveyor).—The county council have provisionally decided to take over [illegible] roads, 37½ miles of urban roads and 193 miles of rural roads, making together with the 17 miles of existing main roads a total of 247½ miles of county roads. The necessary surface improvements are now being carried out, under the supervision of the county surveyor, and a scheme for main road management is being prepared. Extensive repairs to bridges are anticipated, and Ballingdon Bridge, Sudbury, is to be reconstructed as a reinforced concrete structure.

**Whiston** (Mr. R. J. KNAPMAN, surveyor of highways and buildings to the rural district council).—The principal works contemplated during 1912 are the widening and paving of a portion of St. Helens-road and Hoult-road adjoining, at an estimated cost (including land) of nearly £3,000, towards which the county council are contributing about one-half. A Local Government Board inquiry has been held, and sanction given for a loan for this work, which will therefore be commenced forthwith. The surveyor has been given instructions to prepare plans, &c., for a new road, and for making up a number of private streets under the provisions of the Private Street Works Act, 1892, which are estimated to cost about £4,800. The council will also probably lay down further experimental lengths of macadam road grouted with bitumen, &c. This council do not advocate tar-spraying or other surface palliative treatment for dust laying, but favour an improved method of construction with the same end in view—*viz.*, a road that will withstand the motor-wagon and other heavy traffic which has to be contended with, and at the same time to minimise the dust nuisance. There are several minor road improvements, widening and rounding off dangerous corners, &c., also contemplated by the council. A tender has recently been accepted for a sewage scheme (which was prepared by Mr. J. T. Wood, engineer, of Liverpool), at a cost of nearly £2,000 for the Cloak Face area of Bold township. The council have under consideration a scheme for the disposal of house refuse by direct labour for three townships, with a population of just over 9,000, including the erection of a destructor, &c.

**Whitley and Monkseaton** (Mr. A. J. ROUSELL, ASSOC.M.INST.C.E., engineer and surveyor to the urban district council). The coming year promises to be a busy one for the surveyor's department of the above authority. The works now in course of construction include: Cast-iron outfall sewer at the north end of the town; laying out and draining of the new cemetery at Hartley; retaining wall at the foot of the sea banks, and sloping and turfing of the same, south of Brook-street; and various new streets. In addition the following works will be carried out during the year: Enlargement and extension of main sewers at Monkseaton (£4,250); purchase of land at Hill Heads and enclosing same for council's yard (£6,000); construction of sewers and laying out of estate of 750 houses at Monkseaton; and preparation of town planning scheme for the district. The council will also have under consideration the construction of workmen's dwellings, new refuse destructor, enlargement of slaughter-houses, improvements to the links, as well as the usual work of making up and taking over private streets, public improvements, &c. The district is growing very rapidly, all records as to buildings erected, &c., having been broken in the past year.

**Widnes** (Mr. JOHN S. SINCLAIR, ASSOC.M.INST.C.E., borough surveyor). —Among the works that are contemplated this year are the following: A part of the main road from the railway station to Peel House-lane, 1¼ miles in length, will be paved, the existing macadam surface taken up, and the roadway paved with 4-in. cube granite setts, laid on concrete foundation, at an estimated cost of £11,000. The electric cables for power and lighting are being laid in the streets for a length of 2½ miles for the Mersey Power Company, Limited, by the corporation workmen, and it is expected that the current will be available next month. A road widening and levelling scheme at Appleton is proposed, plans have been prepared, and the estimated cost is £4,000. Private improvement works in various roads and paving will be proceeded with as [illegible] 1912. The laying of Bower Brook 9-ft. by 4-ft. 9-in. brick culvert is nearly completed. The amended cost is £6,100. Application is being made to the Local Government Board for [illegible]

sum of £3,000 for the conversion of privies into water-closets.

**Wilts** (Mr. J. George Powell, county surveyor).—The works to be carried out during the next twelve months include: (1) The repair and upkeep of 761 miles of main road: (*a*) 69 miles; (*b*) direct control, 316 miles; and (*c*) contract, 375 miles. (2) The ordinary repair (including strengthening of some) of 334 bridges. (2) The renovation and repair of a certain number of 128 police stations and cottages. (4) The renovation and repairs of forty-two council schools, together with inspections of work at 299 non-provided schools. (5) Usual annual repairs at county asylum, assize courts, county offices, and weights and measures office. Extra and additional: Strengthening and otherwise improving several lengths of main road, at an estimated cost exceeding £10,000; possibly the erection of five county bridges; the erection of two county police stations and one court-room; extensive alterations at central police station, Devizes; the erection of at least three council schools, and extensive alterations to several other schools; county asylum, new officers' mess-room (in progress); county offices, extensive additions (under consideration).

**Wimbledon** (Mr. C. H. Cooper, M.Inst.C.E., borough engineer and surveyor).—At the present time the works in hand include the following: (1) Outfall for storm-water sewage along Tennyson-road, and then running parallel with the Wandle, so as to discharge below the tail race of Chuter's Skin Works, a total length of nearly 3,000 ft., and estimated to cost £2,300; (2) construction of two percolating filters; (3) increasing capacity of ejector station, Durnsford-road, with 3-in. air main from such station to the pumping station, Durnsford-road; (4) large number of private street works in hand and also contemplated; (5) tenders have lately been invited for an addition to the administrative block of the isolation hospital; (6) the council have lately acquired a piece of ground in Garfield-road for the purposes of a recreation ground and site for schools, containing about 7 acres, alongside the river Wandle.

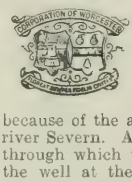
**Winchester** (Mr. Walter V. Anderson, Assoc.M.Inst.C.E., city engineer and surveyor).—The making up of several streets under the Private Street Works Act, 1892, the paving of a portion of the High-street with hard-wood blocks, and the extension of the Guildhall buildings are among the works under contemplation. The development of the new recreation ground, including bands-tand, lodge and conveniences, which are under consideration, is also proposed. Plans have been prepared for the widening of certain streets, which are under consideration. A site, containing 20 acres of land, has been decided upon for a new cemetery, and plans have been prepared and passed for the laying out and erection of the necessary buildings. Experiments for dust abatement will be carried out.

**Windermere** (Mr. Charles E. Hines, surveyor to the urban district council).—The Windermere Council, having acquired 8 acres of land adjoining the lake, have removed a large number of unsightly structures which obstructed some of the fine views, and are extending the public lake frontage, constructing a new promenade and boulevard, and widening and improving several roads in the vicinity of and leading to the lake-side at a cost of £10,316, of which £4,400 is for land. These works will, it is expected, be completed by the end of June. The construction of the new works of sewerage and sewage disposal will be commenced during the coming year. The disposal works are to be constructed outside the district in another county, and at a distance of 4 miles from the Windermere Council's district. The estimated cost of the works is £38,000. The council are also considering a proposal to purchase the gas and water undertakings, and will probably promote a Bill in the 1913 Session of Parliament for that purpose.

**Wirksworth** (Mr. J. F. Wardle, engineer and surveyor to the urban district council).—During the year it is expected that a start will be made with the proposed new scheme of sewerage and sewage disposal, the estimated cost of which is £9,000. The site for the sewage outfall works has been given to the town by Mr. G. H. Wheatcroft, J.P. A length of new 12-in. surface-water drain is proposed to be laid at Steeplegrange. A considerable amount of tar-paving was done last year, and as this proved very successful it is proposed to do more this year. Several lengths of gravel footpaths will be asphalted. A new council school, to accommodate 300 children has just been completed.

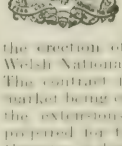
**Wokingham, Berks** (Mr. C. W. Marks, M.Inst.M. and C.E., M.R.San.I., borough engineer and surveyor).—During the year, in addition to the completion of contracts now in hand, further street improvements, estimated to cost over £2,000, will probably be carried out. The completion of the purchase of some 23¾ acres of land by the council will enable the same to be laid out for the purposes of depot, recreation ground, and allotments. A scheme for considerable extensions to the sewerage system and the provision of additional pumping plant is being prepared to provide for the development taking place in outlying parts of the district. The provision of public conveniences for both sexes is approaching completion. The tar-washing of the surface of the main and district roads will probably be again carried out as last year.

**Wolverhampton** (Mr. George Green, M.Inst.C.E., borough engineer and surveyor).—Besides the completion of the electricity station extensions, new playground for children, and the laying out of two new streets in connection therewith, at a total cost of £10,000, Wolverhampton will carry out several improvements and new streets, and also consider the advisability of providing a municipal cemetery, and the abolition of the pan system, in addition to improving the surface of the roads consequent upon the heavy vehicular traffic in the borough.



**Worcester** (Mr. T. Cainк, Assoc.M. Inst.C.E., city engineer, waterworks engineer and surveyor).—The chief work of engineering interest will be the completion of the deep outfall sewer to the sewage works, which it has been necessary to construct because of the abandonment of the syphon under the river Severn. A screening chamber is being provided through which the sewage will pass before it enters the well at the works. Owing to the depth of the sewer the screens will be placed at a depth of 63 ft. below the surface of the ground, and lifted for the purpose of cleansing by duplicate electrical hoists. The main portions of the disintegrating tanks, which were originally provided in accordance with the requirements of the Local Government Board, are being converted into storm-water tanks. The remaining portions of the tanks containing the upward flow gravel screens are being retained for breaking up the putrescible solids. Some important street improvements will be carried out in the centre of the city—namely, the widening of the High-street and the removal of the Bell Hotel to increase the width of Little Angel-street.

**Worthing** (Mr. Frank Roberts, Assoc.M.Inst.C.E., borough engineer and surveyor).—The following works will probably be taken in hand by this council during the coming year: Extension of refuse destructor, erection of underground conveniences, erection of firemen's cottages, the making up of a considerable number of streets (under the Private Street Works Act, 1892), extension of sewers and water mains, and important street widenings.



**Wrexham** (Mr. John England, borough engineer and surveyor).—During the coming year the surveyor's department will be engaged upon the making up of several streets under the Private Street Works Act, also the laying out of the park, but the work is being greatly delayed owing to a portion of the ground being required for the erection of the pavilion in connection with the Welsh National Eisteddfod, which is being held here. The contract for the covering over of the vegetable market being completed, it is intended to proceed with the extensions at an early date. Plans are being prepared for the culverting of a portion of the river Gwenfro, a distance of 300 yds. The work to be done in reinforced concrete, thereby forming a footway to connect Brook-street and Tuttle-street. The scheme for erecting new abattoirs has recently been revived, and plans and estimates are being prepared for an extensive scheme, in which is included a number of workmen's dwellings. Application has recently been made to the Road Board for grants towards improving two dangerous street junctions, and it is expected that a substantial sum will be allowed, and the work carried out early in the year.

**Yorkshire, East Riding** (Mr. ALFRED BEAUMONT, county surveyor).—The principal works to be carried out, beyond the ordinary direct maintenance of the main roads and county bridges, are a new steel girder bridge over the river Hull at Hull Bridge, estimated to cost £8,600, a reinforced concrete bridge at Watton, and a new pumping station at Brough, at a cost of about £3,000.

**Yorkshire, West Riding** (Mr. F. G. CARPENTER, county surveyor). It is anticipated that an expenditure of about £251,755 will be incurred in respect of the maintenance and repair of the main roads in the Riding, the mileage of which is 1,094. This amount is inclusive of provision for tar-spraying, the use of tar or other bituminous binders, rebuilding of burr and fence walls, various road widenings and footpath improvements, sett paving works, as well as ordinary maintenance. Schemes are at present being prepared for the widening and reconstruction of several bridges.

**Ystradgynlais** (Mr. T. WATKINS, surveyor to the rural district council).—The sewerage scheme submitted by Mr. Gerald Swayne, of Victoria-street, Westminster, was considered by the assessors to be the best, and has been adopted by the council, and will be carried out this year. Plans of new council offices (by Mr. Cook Rees, architect, Neath) have been approved by the council, and will be proceeded with as soon as approved by the Local Government Board. Two new bridges will have to be built in Cwmtwrch to replace the present timber structures, which are getting unsafe for the increasing traffic. These are joint bridges with the Pontardawe District Council. Works of water supply are to be constructed to supply Penycae district. Tar-spraying will be carried out on a large scale in the coming year.

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**Sewage Disposal at Pontardawe.** The carrying out of the Ystalyfera sewage scheme adopted by the Pontardawe Rural District Council will be commenced next month. The works will be situated near Cwm Irfon Farm, Godregraig, and the town will be drained on the main system at the upper and lower ends of the district. The scheme is estimated to cost £18,000, and is the largest yet undertaken by the council.

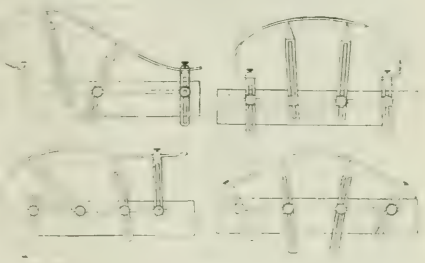
**High-pressure Gas Lighting.** A deputation from the Corporation of Glasgow, who visited a number of cities in England and on the Continent in order to inquire into the lighting of streets by high-pressure gas, have reported generally in favour of the system. They advise that a gas-driven compressor, having a capacity of 5,000 cub. ft., should be erected; that lamps of 4,300 and 2,800 candle power should be provided in the immediate neighbourhood; that other streets in the vicinity should be supplied generally with lamps of 2,800-candle power; that several lamps should be suspended above the centres of streets so that tests may be made regarding the value of such lamps and those placed alternatively on either side; and that ultimately the compressor should be dispensed.

**Drainage Works and Sanitary Fittings.**—When a book reaches a third edition its usefulness is proved. In this case* each succeeding edition has been revised, and the text received additions. This shows that the author is fully alive to the necessity of keeping his work up to date. Mr. Maxwell has long been known as an independent thinker and an increasing worker, so that his writings give what has been proved from trial and experience, and are not mere adaptations from previous books. One of the curses of the time is the publication of screeds from other lands, where the conditions must necessarily differ from those existing here, and these screeds oft-times expressive, are forced down the throats of a British student public as conveying intelligent information about matters of sewage and other things which the learned man wants to know. Our experience is that, with a few exceptions, all students should avoid text-books that come from other countries, translated or otherwise. Mr. Maxwell deals with English conditions, experience, and practice—the [illegible] mentioned are of English make and typical [illegible] reader can study for and examine. Taking the book as a whole the information is [illegible] the style simple and clear the [illegible] ments not involved.—*Contractor Record*.

* "Drainage Work and Sanitary Fittings." By Wm. H. Maxwell. Price 2s. net. London: St. Bride's Press, Limited, 21 Bride-lane, E.C.

## HARLING'S ADJUSTABLE CURVE RULER.

Mr. W. H. Harling, 47 Finsbury-pavement, London, E.C., has placed upon the market an adjustable curve ruler—the "J.R.B."—which has been invented as the result of a long-felt want for a flexible curve which could be used without the necessity of pinning down or weighting, and which could be relied upon to give natural sweeps or curves without kinks or bumps. This instrument is claimed to answer both these requirements; it can be made in any length, and is practically universal, as curves of any shape or design, either single or double, long or short, may be described. The



instrument is easily adjusted, and can be used for duplicating or reproducing with either pen or pencil, and in the matter of durability leaves nothing to be desired.

The accompanying diagrams show several different methods of using the ruler. The flexible strip is attached to the end arms of the instrument in the manner depicted. One arm must then be firmly clamped to the base board, when the other arm should be moved until the flexible strip forms the required curve, the second arm is then also firmly clamped. The pointers are then brought up to the inner edges of curve and clamped, when it will be found that the flexible strip supported by the pointers may be drawn against without fear of flinching.

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## THE MACHINE BRUSH FOR COUNTRY ROADS.

### ITS ADVANTAGES OVER MANUAL LABOUR.

A plea for the adoption of the machine brush on the roads of county districts is made in a recent article in the *Standard*. It is pointed out that in such places one seldom sees anything except the hand brush and the iron scraper employed for the purpose of removing mud from the surface of these highways, and that while the most energetic roadman in the country cannot get over more than 100 or 200 yds. of surface in the course of a day, the machine brush, which involves no more cost in the matter of human labour, will do its many miles.

"There is, of course," the article states, "the question of capital outlay to consider, as also the cost of the daily keep and hire of the necessary horse; but provided that enough work can be found for the machine, the latter must in the end come out very much cheaper than manual labour when the amount of work accomplished in each instance is taken into consideration. There seems to be no reason why the machine brushing of country roads should not be arranged under some such co-operative plan as that now in vogue with regard to the steam roller, each parish contributing something towards the capital cost and the expense of upkeep, and taking its share of the machine's services. . . . The roads would be cleaner, and being relieved from the wear and tear of the ruinous iron scraper, as well as the destructive action of the mud, they should last longer and need less extensive repair."

It is noted in the article from which we quote that there are at least two or three enterprising rural authorities employ them [illegible] England who have adopted machine methods of road cleaning in preference to manual labour, and the question is asked why if the K[illegible] district council can as a result keep its roads always passable, other rural authorities should not do the same.

# Literature of Municipal Engineering in 1911.

**[Any book included in this summary will be forwarded, post free, on application to the St. Bride's Press, Limited, 24 Bride-Lane, Fleet-street, E.C. The published price must be enclosed.]**

For many years past we have included in our Annual Special Issue a summary of the literature of municipal engineering and kindred subjects for the past year. It will be observed that Town Planning continues to provide a subject for authors, but books on rating and assessment are conspicuously absent, after the number published in 1910. The references which are given in brackets are to the volume and page of THE SURVEYOR in which a review has appeared. If any reader should wish for a more complete list of technical literature than that which is given below, a letter to the publishers of any of the following works asking for their complete lists would produce the desired result.

## Annuals and Year Books.

ENGLISHWOMAN'S YEAR-BOOK AND DIRECTORY. Price 2s. 6d. nett. London: Adam & Charles Black. (Vol. xxxix., p. 85.)

HAZELL'S ANNUAL. Price 3s. 6d. nett. London: Hazell, Watson & Viney, Limited. (Vol. xxxix., p. 85.)

LOCAL GOVERNMENT ANNUAL AND OFFICIAL DIRECTORY. Price 1s. 6d. London: *Local Government Journal* Office. (Vol. xxxix., p. 179.)

LOCKWOOD'S BUILDERS' AND CONTRACTORS' PRICE-BOOK FOR 1911. Edited by F. T. W. Miller, A.R.I.B.A. Price 4s. London: Crosby Lockwood & Son. (Vol. xxxix., p. 400.)

LONDON STATISTICS. Vol. XX., 1909-10. Compiled by the Statistical Officer of the London County Council. 592 pp. Price 5s. (Vol. xxxix., p. 16.)

MUNICIPAL YEAR-BOOK. Price 10s. 6d. London: Edward Lloyd, Limited. (Vol. xxxix. Supplement, February 24th.)

SHAW'S TITHE RENT-CHARGE TABLE FOR 1911. By P. W. Millard, LL.B. Price 1s. London: Shaw & Sons. (Vol. xxxix., p. 446.)

SPON'S ARCHITECTS' AND BUILDERS' PRICE-BOOK AND MEMORANDA. By Clyde Young, F.R.I.B.A., and Stanford M. Brooks, L.R.I.B.A. Price 2s. 6d. nett. London: E. & F. N. Spon, Limited. (Vol. xxxix., p. 517.)

THE ARCHITECTS' AND SURVEYORS' DIRECTORY, REFERENDUM AND DIARY FOR 1911. Edited by Albert C. Freeman. Price 15s. London: Jas. Truscott & Son, Limited. (Vol. xxxix., p. 387.)

THE ARCHITECTS' REFEREE. Vol. II., 1911. Price 10s. 6d. London: S. H. Benson, Limited. (Vol. xl., p. 288.)

THE DIRECTORY OF CONTRACTORS AND PUBLIC WORKS ANNUAL, 1911. Price 15s. London: The Contractors' Chronicle, Limited. (Vol. xxxix., p. 891.)

THE "PRACTICAL ENGINEER" POCKET-BOOK AND DIARY FOR 1911. Price 1s. 6d. nett. London: The Technical Publishing Company, Limited. (Vol. xxxix., p. 400.)

THE "PRACTICAL ENGINEER" ELECTRICAL POCKET-BOOK AND DIARY FOR 1911. Price 1s. 6d. nett. London: The Technical Publishing Company, Limited. (Vol. xxxix., p. 387.)

THE SOCIAL GUIDE, 1911. Edited by Mrs. Hugh Adams and Edith A. Browne. London: A. & C. Black. (Vol. xxxix., p. 577.)

THE WRITERS' AND ARTISTS' YEAR-BOOK, 1911. Price 1s. net. London: A. & C. Black. (Vol. xxxix., p. 85.)

TRANSACTIONS OF THE ASSOCIATION OF WATER ENGINEERS. Vol. XV. Edited by Percy Griffith, M.INST.C.E., F.G.S. London: The St. Bride's Press, Limited. (Vol. xl. Supplement, July 28th.)

WHERE TO LOOK. Price 2s. nett. London: St. Legar Press & Stamp, Limited. (Vol. xxxix., p. 577.)

WHITAKER'S ALMANAC, 1911. Price 1s. paper, 2s. 6d. cloth. (Vol. xxxix., p. 179.)

WHITAKER'S PEERAGE, BARONETAGE, KNIGHTAGE AND COMPANIONAGE FOR 1911. (Vol. xxxix., p. 296.)

WHO'S WHO, 1911. Price 10s. nett. London: A. & C. Black. (Vol. xxxix., p. 85.)

WRITERS' AND ARTISTS' GUIDE. Price 1s. London: James Willing, 1911. Limited. (Vol. xxxix., p. 85.)

## Applied Mathematics.

APPLIED MECHANICS AND MECHANICAL ENGINEERING. Vol. III. By Prof. A. Jamieson (eighth edition). Price 5s. London: Messrs. Chas. Griffin & Co., Limited. (Vol. xl., p. 589.)

HYDRAULICS. By Prof. Hector J. Hughes and Arthur T. Safford. Price $3.75. New York: Macmillan & Co. (Vol. xl., p. 693.)

STRESSES AND THRUSTS. Fourth edition. By G. A. T. Middleton. Price 4s. 6d. nett. London: B. T. Batsford. (Vol. xl., p. 649.)

## Architecture and Building.

A GLOSSARY OF BUILDING CONSTRUCTION FOR BEGINNERS. By C. H. Gregory. Price 3s. 6d. nett. London: J. Haslam & Co., Limited. (Vol. xxxix., p. 872.)

BUILDING CONSTRUCTION AND DRAWING. Elementary Course. By Charles F. Mitchell, assisted by George A. Mitchell. Eighth edition. Price 3s. London: B. T. Batsford. (Vol. xl., p. 755.)

EXAMINATION WORK IN BUILDING CONSTRUCTION. By Prof. Henry Adams. Price 2s. 6d. nett. Published by the Author. (Vol. xxxix., p. 872.)

HOUSES, VILLAS, COTTAGES AND BUNGALOWS FOR BRITISHERS AND AMERICANS ABROAD. By G. G. Samson. Price 3s. 6d. nett. London: Crosby Lockwood & Son. (Vol. xxxix., p. 53.)

SCHOOL PLANNING AT HOME AND ABROAD. By William H. Webb. Price 1s. nett. London: The Sanitary Publishing Company, Limited. (Vol. xxxix., p. 891.)

SOME SMALL HOUSES, ILLUSTRATED. By Walter Gray Ross, Associate of the Royal Institute of British Architects. Price 2s. 6d. nett. The Homeland Association, and Frederick Warne & Co. Vol. xxxix., p. 386.)

THE ARCHITECTS' LIBRARY: BUILDING CONSTRUCTION (Vol. I.). Price 18s. nett. London: Longmans, Green & Co. (Vol. xxxix., p. 516.)

THE PRINCIPLES OF PLANNING BUILDINGS. By Percy L. Marks. Third edition. Price 12s. nett. London: B. T. Batsford. (Vol. xxxix. Supplement, June 30th.)

## Biography.

REMINISCENCES OF PUBLIC LIFE IN SOUTHAMPTON FROM 1866 TO 1900. By Sir James Lemon. Southampton and Winchester: Henry March Gilbert & Son. (Vol. xxxix., p. 446.)

WILLIAM FORD STANLEY: HIS LIFE AND WORK. By R. Inwards. Price 2s. 6d. nett. London: Crosby Lockwood & Co. (Vol. xxxix., p. 872.)

## Electrical.

ARC LAMPS AND ACCESSORY APPARATUS. By J. H. Johnson, A.M.I.E.E. Price 1s. 6d. nett. London: Constable & Co., Limited. (Vol. xxxix. Supplement, May 26th.)

ELECTRICAL MINING INSTALLATIONS. By P. W. Frendemacher, A.M.I.E.E. Price 2s. nett. London: Constable & Co., Limited. (Vol. xl., p. 589.)

ELECTRIC WIRING, FITTINGS, SWITCHES AND LAMPS. By W. Perren Maycock, M.I.E.E. Price 6s. nett. London: Whittaker & Co. (Vol. xxxix., p. 846.)

MILL AND FACTORY WIRING. By R. G. Devey, A.M.I.E.E. Price 2s. nett. London: Constable & Co., Limited. (Vol. xl., p. 589.)

MOTOR, SECONDARY BATTERIES MEASURING INSTRUMENTS AND SWITCHGEAR. By S. Kenneth Broad B.Sc., A.M.I.E.E. Price 1s. nett. London: Constable & Co., Limited. (Vol. xxxix. Supplement, May 26th.)

## Highways.

NOTE ON HIGHWAYS. Price 3d. nett. London: The St. Bride's Press, Limited. (Vol. xxxix., p. 387.)

THE SECOND IRISH ROAD CONGRESS, 1911. RECORD OF PROCEEDINGS. Price 1s. Dublin: Eason & Son. (Vol. xl., p. 559.)

## Housing and Town Planning.

A PRACTICAL GUIDE IN THE PREPARATION OF TOWN PLANNING SCHEMES. By E. G. Bentley, LL.B., and S. Pointon Taylor, A.R.I.B.A. Price 5s. nett. London: George Philip & Son, Limited. (Vol. xxxix., p. 577.)

CIVIC ART: STUDIES IN TOWN PLANNING, PARKS, BOULEVARDS AND OPEN SPACES. By Thomas H. Mawson, Hon. A.R.I.B.A. Price £2 10s. nett. London: B. T. Batsford. (Vol. xxxix. Supplement, June 30th.)

FIRST GARDEN CITY, LIMITED, BUILDING REGULATIONS. Price 6d. Published by the Company. (Vol. xxxix., p. 891.)

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CONSERVATION BY SANITATION. By Mrs. Ellen H. Richards. Price 10s. 6d. nett ($2.50). New York: John Wiley & Sons. (Vol. xxxix., p. 516.)

DOMESTIC SANITATION AND PLUMBING. Part II. By A. Herring-Shaw. Price 7s. 6d. nett. London: Gurney & Jackson. (Vol. xxxix., p. 85.)

DRAINAGE WORK AND SANITARY FITTINGS. By William H. Maxwell, ASSOC.M.INST.C.E., borough and waterworks engineer, Tunbridge Wells. (Vol. xl. Supplement, October 27th.)

ELEMENTARY SCIENCE APPLIED TO SANITATION AND PLUMBERS' WORK. By A. Herring-Shaw. Price 4s. nett. London: Gurney & Jackson. (Vol. xxxix., p. 53.)

POCKET NOTE-BOOK FOR DAIRY AND COWSHED INSPECTORS. By J. Storey. London: Sanitary Publishing Company, Limited. (Vol. xxxix., p. 873.)

TOWN SCAVENGING AND REFUSE DISPOSAL. By Hugh S. Watson. Price 3s. 6d. nett. London: St. Bride's Press, Limited. (Vol. xxxix., p. 387.)

## Legal.

A TREATISE UPON THE LAW OF LIGHT. By R. G. Nicholson Combe, M.A., LL.M. Price 25s. London: Butterworth & Co. (Vol. xxxix., p. 750.)

DIGEST OF THE LOCAL GOVERNMENT CASE LAW OF 1910. By "Nomos." Price 5s. nett. London: The Local Government Review, Limited. (Vol. xxxix. Supplement, May 26th.)

LOCAL GOVERNMENT, 1910. Edited by Alexander Macmorran, K.C., and Kenneth M. Macmorran, M.A., LL.B. Price 12s. 6d. nett. London: Butterworth & Co. (Vol. xxxix., p. 577.)

NOTES ON THE LAW OF PRIVATE STREET WORKS. By J. B. Reignier Conder. Price 3s. 6d. nett. London: The St. Bride's Press, Limited. (Vol. xxxix., p. 387.)

THE HOUSING OF THE WORKING CLASSES ACTS, 1890-1909, AND TOWN PLANNING. By C. E. Allan, M.A., LL.B., of the Inner Temple, Barrister-at-Law; assisted as to the practice by F. J. Allan, M.D., D.P.H., medical officer of health to the City of Westminster. Third edition. Price 12s. 6d. London: Butterworth & Co.: Shaw & Sons. (Vol. xl., p. 453.)

THE LAW RELATING TO ENGINEERING. By L. W. J. Costello, M.A., LL.B., Barrister-at-Law. Price 5s. Published by the Society of Engineers and the Junior Institution of Engineers. (Vol. xl., p. 589.)

THE LAW RELATING TO THE PAVING AND SEWERING OF NEW STREETS AND PRIVATE STREETS. By Joshua Scholefield and Gerard R. Hill. Price 10s. 6d. nett. London: Butterworth & Co. (Vol. xxxix., p. 872.)

THE OVERSEERS' HAND-BOOK. Seventh edition. By W. W. Mackenzie, M.A., Barrister-at-Law. Price 5s. nett. London: Shaw & Sons; and Butterworth & Co. (Vol. xxxix., p. 16.)

## Local Government.

PROBLEMS OF LOCAL GOVERNMENT. By G. Montagu Harris, M.A. Price 10s. 6d. nett. London: P. S. King & Son. (Vol. xxxix., p. 872.)

URBAN DISTRICT COUNCILS: HOW THEY WORK AND HOW TO WORK THEM. By J. M. M'Lachlan. Price 1s. nett. London: P. S. King & Son. (Vol. xl., p. 288.)

## Materials.

A SHORT SPECIFICATION. By James Cubitt. Price 5s. nett. London: Crosby Lockwood & Son. (Vol. xxxix., p. 544.)

BRICKS AND TILES. By Edward Dobson. Twelfth edition. By Alfred B. Searle. Price 3s., or in extra cloth binding, 3s. 6d. London: Crosby Lockwood & Son. (Vol. xl., p. 755.)

COAL-TAR EXAMINATION: Methods and Apparatus for Distillation Test, Specific Gravity Determination, Estimation of Free Carbon, and Evaporation Test. By John Hutchinson. Price 1s. London: Published by the Author, 20 Tothill-street, Westminster, S.W. (Vol. xxxix., p. 600.)

DIAGRAM FOR ASCERTAINING FROM THE ANALYSIS THE HYDRAULIC MODULUS OR RATIO OF LIME TO SILICA AND ALUMINA (in accordance with the British Standard Specification for Portland Cement, revised 1907). Arranged by D. B. Butler, ASSOC.M.INST.C.E., F.C.S., assisted by C. J. Fenwick, A.R.C.S. Mounted on stiff cardboard, 22 in. by 17 in., 2s. 6d. nett. London: John J. Griffin & Sons, Limited. (Vol. xxxix., p. 16.)

MODERN MANUFACTURE OF PORTLAND CEMENT. Part I. By Percy C. H. West. Price 12s. 6d. nett. London: Crosby Lockwood & Son. (Vol. xxxix., p. 53.)

THE COMPOSITION AND STRENGTH OF MORTARS: Report on the Results of the Experimental Investigations Conducted by the Science Standing Committee of the Royal Institute of British Architects. By W. J. Dibdin, F.I.C., F.C.S. Price 5s. Published by the Royal Institution of British Architects. (Vol. xl. Supplement, October 27th.)

THE GEOLOGY OF BUILDING STONES. By J. Allen Howe. Price 7s. 6d. nett. London: Edward Arnold. (Vol. xxxix., p. 85.)

## Miscellaneous.

ADDRESSES TO ENGINEERING STUDENTS. Edited and published by Waddell & Harrington, Kansas City, Mo. Price $1. (Vol. xl., p. 649.)

AGRICULTURAL EDUCATION. Price 1s. Reading: University College. (Vol. xxxix., p. 206.)

AMERICAN CIVIL ENGINEERS' POCKET-BOOK. Price $5 nett. New York: John Wiley & Sons. London: Chapman & Hall, Limited. (Vol. xxxix., p. 481.)

BACTERIOLOGICAL AND ENZYME CHEMISTRY. By Gilbert J. Fowler, D.SC., F.I.C. Price 7s. 6d. nett. London: Edward Arnold. (Vol. xxxix., Supplement, May 26th.)

BUILDING IN LONDON. By Horace W. Cubitt, A.R.I.B.A., P.A.S.I. Price 31s. 6d. nett. London: Constable & Co. (Vol. xl., Supplement, October 27th.)

JUVENILE LABOUR EXCHANGES AND AFTER-CARE. By Arthur Greenwood. Price 1s. nett. London: P. S. King & Son. (Vol. xxxix., p. 891.)

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MOTION STUDY. By F. B. Gilbreth. Price 4s. 6d. nett. London: Constable & Co., Limited. (Vol. xxxix., p. 872.)

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QUANTITY SURVEYING. By George Watson, M.R.SAN.I. Price 6d. nett. London: John Dicks' Press, Limited. (Vol. xxxix., p. 516.)

RETURN OF OUTDOOR MEMORIALS IN LONDON. Prepared by the Clerk of the London County Council. Price 1s. 6d. (Vol. xxxix., p. 16.)

THE DEVELOPMENT OF THE TELEPHONE IN EUROPE. By H. L. Webb, M.I.E.E. London: Electrical Press, Limited. (Vol. xxxix., p. 872.)

THE DISTINGTON MULTIPLE BOILER EXPLOSION AND OTHER MULTIPLE BOILER EXPLOSIONS. By Edward G. Hiller, B.SC., M.INST.C.E., M.I.MECH.E. Price 1s. Manchester: Taylor, Garnett, Evans & Co., Limited. (Vol. xxxix., p. 386.)

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WELL BORING FOR WATER, BRINE AND OIL. By C. Isler. Price 10s. 6d. nett. London: E. & F. N.

Spon, Limited. (Vol. xxxix. Supplement, May 26th.)

### Reinforced Concrete.

A SPECIFICATION FOR REINFORCED CONCRETE WORKS. By A. A. H. Scott and P. M. Fraser. Price 3s. 6d. nett. London: Witherby & Co. (Vol. xxxix., p. 872.)

REINFORCED CONCRETE CONSTRUCTION: ELEMENTARY COURSE. By M. T. Cantrell. Price 4s. 6d. nett. London: E. & F. N. Spon, Limited. (Vol. xl., p. 692.)

REINFORCED CONCRETE CONSTRUCTION IN THEORY AND PRACTICE. By Henry Adams, M.INST.C.E., &c., late Professor of Engineering at the City of London College, and Ernest R. Matthews, ASSOC.M.INST.C.E., &c., borough engineer and surveyor of Bridlington. Price 10s. 6d. nett. London: Longmans, Green & Co. (Vol. xl., p. 692.)

THE PRACTICAL DESIGN OF REINFORCED CONCRETE BEAMS AND COLUMNS. By W. Noble Twelvetrees, M.I.MECH.E., author of "Structural Iron and Steel," "Concrete-Steel," &c. Price 6s. nett. Whittaker & Co. (Vol. xl., Supplement, September 29th.)

### Sewerage and Sewage Disposal.

ECONOMY IN SEWAGE DISPOSAL. By C. Chambers Smith, M.INST.M. AND CO.E., F.R.S.A.I. Price 1s. nett. London: The Sanitary Publishing Company. (Vol. xl., p. 237.)

MODERN METHODS OF SEWAGE PURIFICATION. By G. Bertram Kershaw. Price 21s. nett. London: Charles Griffin & Co. (Vol. xxxix., p. 274.)

SEWERAGE SYSTEMS: THEIR DESIGN AND CONSTRUCTION. By Hugh S. Watson, ASSOC.M.INST.C.E., with legal notes by Elidyr B. Herbert, Barrister-at-Law. Price 10s. 6d. nett. London: Crosby Lockwood & Son. (Vol. xxxix., p. 386.)

THE SEWERAGE OF SEA COAST TOWNS. By Henry C. Adams, ASSOC.M.INST.C.E., M.I.MECH.E., M.I.E.E., Price 8s. nett. London: Crosby Lockwood & Son. (Vol. xl., p. 559.)

WATER SUPPLY AND SEWAGE DISPOSAL. Handbuch der Hygiene, issued by "Wasser und Abwasser," and published by S. Hirzel, Leipzig. (Vol. xl., p. 559.)

### Surveying.

FIELD AND COLLIERY SURVEYING. By T. A. O'Donahue, M.I.MECH.E. Price 3s. 6d. London: Macmillan & Co., Limited. (Vol. xxxix., p. 386.)

PLANE SURVEYING. By Alfred E. Phillips. Price 6s. nett. London: Crosby Lockwood & Son. (Vol. xxxix., p. 16.)

SURVEYING SHEETS FOR PROFESSIONAL AND EDUCATIONAL USE. Price 1s. 6d. nett. London: Crosby Lockwood & Co., Limited. (Vol. xl., p. 288.)

### Topography.

PRATT'S ROAD ATLAS OF ENGLAND AND WALES FOR MOTORISTS. Price 2s. 6d., post free. (Vol. xxxix., p. 891.)

STANFORD'S INDEXED ATLAS OF THE COUNTY OF LONDON, with Parts of the Adjacent Boroughs and Urban Districts. Price, cloth 7s. 6d. nett, half morocco 10s. 6d. nett. London: Edward Stanford. (Vol. xxxix., Supplement, May 26th.)

WHERE SHALL WE LIVE? A GUIDE TO THE RESIDENTIAL LOCALITIES IN AND AROUND LONDON. Edited by Percival Reid and A. H. Abercrombie. Price 6d. nett. London: The Homestead Association, Limited. (Vol. xxxix., p. 872.)

WHERE TO LIVE ROUND LONDON (NORTHERN SIDE). Third edition. Price 1s. nett. London: The Homestead Association, Limited. (Vol. xxxix., p. 274.)

### Valuation.

THE VALUATION OF REAL PROPERTY. By C. A. Wells. Price 7s. 6d. nett. London: Crosby Lockwood & Son. (Vol. xxxix., p. 16.)

THE VALUATION OF UNDEVELOPED LAND. By F. H. Lightbody, with Tables by D. E. Wallace. Price 5s. nett. Edinburgh and London: William Green & Sons. (Vol. xxxix., p. 56.)

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**Royal Institute of British Architects.** The prize [illegible] students of this body will be decided on the 5th prox. Prizes will also be awarded and the Royal Gold Medal be conferred.

## THE GOOD ROADS MOVEMENT IN THE UNITED STATES.

### ITS PROGRESS AND PRESENT STATUS.

In a pamphlet which is part of the Year-Book of the United States Department of Agriculture for 1910, Mr. Logan Waller Page, Director of the Office of Public Roads, traces the history of roads in that country from the time when the early settlers just began to feel the need of roads of a better class than Indian trails and the paths used by wild animals. One of the earliest of the incentives to road making was the struggle which began between the French settlers in the Mississippi valley and on the Canadian border, and the English colonists, advancing from the Atlantic seaboard. Roads to the frontier were needed for the transport of troops and munitions of war, and roads from one settlement to another enabled the colonists to rally to defend themselves when attacked.

With the growth of trade, roads had to be provided for transport of goods, and the first road law, based upon English precedent, was passed by the Virginia House of Burgesses in 1632. In this period, "The Period of Colonial Existence," the various laws were, writes Mr. Page, "very crude, and were productive of very little in the way of accomplishing an improvement of road conditions." In some of the colonies, however, the work done was by no means insignificant, especially, perhaps, in Maryland. The next period, "Early National Existence," up to 1800, saw the construction of a number of important trunk roads on the turnpike system, while later, beginning in 1806, "appropriations" were made from time to time, the first being for the great national road from Maryland to the Mississippi. At the end of the war the drain on the national revenues was such that "the subject of national participation in road improvements dropped out of the public mind."

The next period, from 1800 to 1890, was not favourable to road development. The old system of "extreme localisation" was revived, the work being done by the "towns" in the North and East and by the counties in the South and West. In 1904 only 7·14 per cent of the 2,151,000 miles of roads in the United States were "improved." In the United States an "improved road," it seems, is one which is reasonably good, and the rest are regarded as bad. This view, however, does not seem to take into account the value of "fair-weather roads," and generally the tendency in the United States, a tendency shared by the author of the pamphlet before us, is to underestimate the value of roads of a humble class, and the results which may follow local enterprise in road making and maintenance.

Just as the welfare of a country depends upon the extent and nature of home trade, as well as upon the value of exports and imports, so does the welfare of a neighbourhood depend upon by-roads, summer roads, and footpaths, as well as upon the main routes which link it with the rest of the country. There seems to be some danger of over-centralisation of highway administration in the United States. The figure for total annual expenditure in 1904 represents, Mr. Page calculates, about $27, or £5 12s., cash cost per mile, though no doubt much of this was wasted in expenditure, the figure is not such a very low one for a mileage of over 2,000,000, if we assume that a considerable proportion of this consisted of fair-weather roads and mountain roads.

Under the head "State Aid" Mr. Page gives an account of the manner in which State highway departments have been created. Under the Highie-Armstrong Act the State of New York agrees to pay "to any town the county 40 per cent. until the county" has paid one-half of the cost of State roads in its borders in accordance with the provisions and further enacts that it may grant New York State control over every mile of its public highways. State aid and State supervision have been adopted in one form or another in thirty-one States, though in four of these the work of the State is limited to investigation and supervision, or even in the supply of convict labour only. In Georgia there are about 4,500 convicts working on the roads. Some of the States are adopting a vigorous policy of trunk road improvement, sums varying from $470,000 to $2,400,000 having been voted to this purpose, while California has decided to issue $18,000,000 of bonds for the building of trunk roads in the State. Reforms are rapidly being carried out, and "in every State the sentiment is strongly in favour of effective highway legislation."

# Rodbridge, Long Melford.

## FERRO-CONCRETE REPLACES TIMBER STRUCTURE.

The old timber bridge over the river Stour, forming one of the chief means of communication between the counties of Essex and Suffolk, has recently been replaced by a substantial ferro-concrete structure, a photograph of which appears with these notes.

The bridge, which has taken about seven months to construct, owing to the delays occasioned by the floods during the winter of 1910-11, is built on Hennebique principles, the distance between the abutments being 100 ft., and the width between the parapets 25 ft., a footpath 5ft. wide being formed on one side of the bridge only.

The testing of the bridge was carried out by means of traction engines, deflectors being placed as shown on Fig 1, and first one, then two abreast, and finally three engines passing over the bridge together, making a total load of 35 tons.

The readings of the instruments are recorded below:

| | X2. | X1. | Y2. | Y1. |
|---|---|---|---|---|
| Single engine ... | $\frac{1}{64}$ in | $\frac{1}{64}$ in | $\frac{1}{64}$ in. | $\frac{1}{32}$ in |
| Two engines abreast and one behind ... | $\frac{3}{64}$ in. | $\frac{1}{32}$ in. | $\frac{1}{64}$ in. | $\frac{1}{16}$ in. |

The results are exceedingly satisfactory, the maximum deflection being $\frac{1}{16}$ in. when all three engines passed over the bridge together. On the loads being removed all the instruments returned to zero, no permanent set showing in the ferro-concrete work at all, the maximum deflection recorded being equivalent to $\frac{1}{5760}$ of the span as against $\frac{1}{800}$ of the span allowed by the contract.

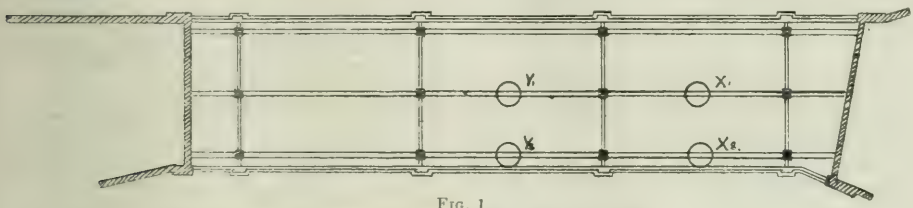



FIG. 1

The main beams, which are seen in the illustration, are arched, and are supported directly by twelve ferro-concrete piles 18 in. square, spaced three abreast in three rows. The decking is 5½ in. thick under the roadway and 4 in. thick under the footpath, while the parapet, which is also in ferro-concrete, is 4½ in. thick and 3 ft. 6 in. high.

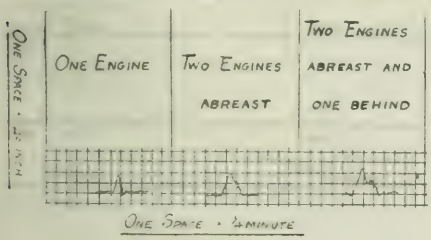
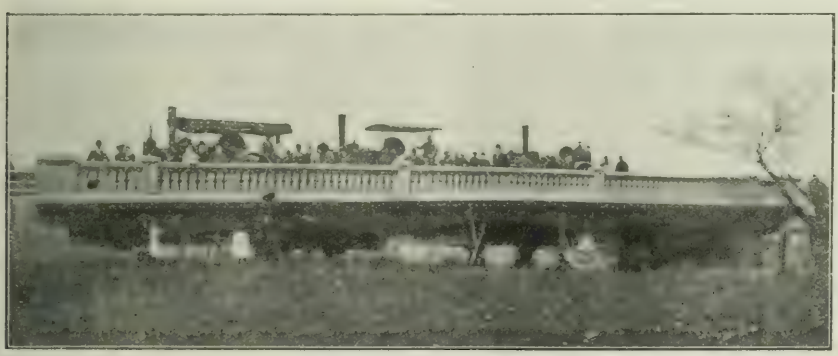



FIG. 2.

ELEVATION OF RODBRIDGE DURING TEST.



RODBRIDGE UNDER TEST LOADS

The abutment walls and wing walls under the approaches to the bridge are in ordinary concrete. The bridge takes a new form of construction for the district, and the official testing and opening ceremony was the occasion for a large assemblage of representatives of the two county councils concerned, including the chairmen of the respective Highways and Bridges Committees, Mr. P. J. Sheldon (surveyor to the Essex County Council), Mr. A. A. Hunt (surveyor to the West Suffolk County Council), Mr. T. A. Watson, ASSOC.M. INST.C.E. (Messrs. Holloway Bros., London, Ltd.), and Mr. William Binns (Messrs. L. G. Mouchel & Partners).

A record of the vibration set up in the bridge under the different loads was made at the time of the test by an automatic vibration recorder set up under the middle of the centre span, the results being given in Fig. 2.

The ferro-concrete details for the work were prepared by Messrs. L. G. Mouchel & Partners, Westminster, S.W., the whole of the works being carried out by Messrs. Holloway Bros., Limited, of Lambeth, S.E.

## THE THIRD INTERNATIONAL ROAD CONGRESS.

As our readers are already aware, it has been decided, on the invitation of H.M. Government, to hold the Third International Road Congress in London, in June, 1913, to continue the studies already undertaken regarding the construction and maintenance of roads and bridges, in view of modern methods of locomotion. The leading foreign Governments have intimated their intention of sending delegates, and it is anticipated that there will be a large attendance of the representatives of many local authorities, engineering, and other societies, and of road users both at home and abroad.

At a meeting held last October at the offices of the Road Board, which was attended by representatives of the principal associations of local governing bodies, and of the various technical societies and organisations whose interests in roads, an Executive Committee was formed for the purpose of organising the Congress, and a provisional programme was drawn up, which, it was estimated, would require a sum of £5,000 to carry out.

The Government have intimated their intention to contribute £500 towards this amount, and it is necessary to raise the balance by the help of subscriptions and donations from societies and individuals interested in the work of the congress.

Donations of £500 each have been voted by the Royal Automobile Club and the Society of Motor Manufacturers, and subscriptions have already been promised or received from the Scottish Automobile Club, the Institution of Automobile Engineers, the Road Surveyors' Association of Scotland, the Auto-Cycle Union, the Commercial Motor Users' Association, the Car and General Insurance Corporation, the Clee Hill and Cleobury Mortimer Stone Companies' Association, and the Corporations of Liverpool, Reading, Rochester, Darlington, Hythe, Gloucester and Derby.

The congress is the third of the series of International Road Congresses, the first of which was held in Paris in 1908, on the invitation of the French Government, for the purpose of considering the best ways and means of coping with the great wear and disintegration of roads caused by the increase of vehicular traffic, more especially of motor traffic, which has taken place during recent years.

The second congress was held in Brussels, in 1910. Both the Paris and the Brussels congresses were most successful, and much interest is felt in the prospects of the London congress of 1913, not only by reason of the great improvements effected in English and Scottish roads by the extensive adoption of bituminous binding which has given Great Britain a leading position in the development of modern methods of road construction, but also because much new experience and many data have been accumulated since the date of the last congress, the presentation and discussion of which should make the London congress a notable event in the history of road engineering.

An organising council has been formed by representatives of local authorities, and of engineering, scientific, automobile, and other kindred societies. General and executive committees have been elected to carry out the work of organising the congress, with Sir George S. Gibb, chairman of the Road Board as chairman; Lord Montagu of Beaulieu, Mr. Joynson Hicks, M.P., and Mr. F. Berryman as vice-chairmen; Sir Charles Rose, M.P., as honorary treasurer; Mr. Thos. Jeffreys, secretary of the Road Board, as honorary secretary; and Mr. Montagu Harris (secretary of the Concrete Cement Association) as deputy honorary secretary. The membership of the congress is open to all, the individual membership subscription being £1 and the honorary secretary will supply forms of application for membership and any information desired on application to him at the Road Board Offices, Queen Anne's Chambers, Westminster, S.W.

The subscription covers full membership, and entitles the member to take part in all the proceedings and excursions connected with the congress, to receive the daily reports published during the congress, a copy of the full report of the discussions and proceedings of the congress, and further, a number of the various papers on a different subject sent out by members. These papers will comprise reports by leading authorities from all parts of the world on experiments and recent experiences in road engineering, methods of preventing dust and mud, the laying of light railways and tramways on roads, the choice of surfacing materials, the influence of weight and speed of vehicles on roads and bridges, the conditions to be fulfilled by horse-drawn or mechanically-propelled vehicles in order that they may not damage or suffer damage from the roads, &c. They will, therefore, be of great value, not only to local authorities and their officers, but also to road engineers, motor designers and manufacturers, and to every user of roads who is interested in their proper and efficient upkeep.

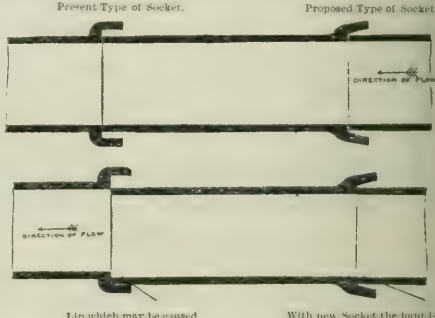
## STANDARDISATION OF VITRIFIED WARE PIPES.

### PROPOSED IMPROVED FORM OF SOCKET.

The draft specification prepared by the Standardisation Committee of the Institution of Municipal and County Engineers is now being considered by a Sectional Committee of the British Engineering Standards Committee, and objections (chiefly by the manufacturers represented on the committee) are being raised in reference to certain of the proposals embodied in the draft specification. One of the proposals to which the Standardisation Committee attach considerable importance, and to which objection is being taken, is that dealing with the proposed form of socket.

It has long been admitted that the present design of socket leaves much to be desired, and, after prolonged consideration and discussion, the Standardisation Committee decided to suggest, for inclusion in the Standard Specification, a modified form of socket having, in their view, many advantages over the old form, including the following:—

(1) It is only necessary to push home the spigot to obtain a true invert to ensure the pipes being concentric, whereas with the old form this result can only be attained by the exercise of the greatest care;


Present Type of Socket.
Proposed Type of Socket.
DIRECTION OF FLOW
DIRECTION OF FLOW
Lip which may be caused by careless workman-ship
With new Socket the joint is practically self-centreing.

in fact, it is comparatively rare to find drains and sewers, except those laid under the most constant and careful supervision, free from obstructive "lips" in the invert.

(2) The pushing home of the spigot also leaves a clear, regular space all round for the jointing material, whereas with the old form the space is frequently very irregular, rendering it difficult to properly fill the joint.

(3) The new socket is stronger, and so designed that the greatest strength is at the point of greatest stress.

(4) There is less risk of jointing material entering the pipe and forming an obstruction.

(5) Less jointing material is required.

(6) There is less risk of the joint being disturbed after the pipes are laid and before the cement has set.

The opinions of members of the institution as to which form of socket it is desirable should be included in the Standard Specification were asked for in a circular which was issued last week by the secretary, Mr. Thos. Cole. The accompanying sections showing the proposed improved form of socket are reproduced from the circular in question.

**Belfast Improvement Scheme.** The final award of the arbitrator regarding the claims for compensation in connection with the Belfast Corporation's improvement scheme under the Housing of the Working Classes Act has now been received. The total amount of the claims was £240,000, and the valuers for the corporation estimated the sum that should be paid at £81,800. The total of the arbitrator's award is £95,000.

# The Decay and Preservation of Timber.

By WILLIAM RANSOM, ASSOC.M.INST.C.E.

As soon as timber is felled a chemical process known as eremacausis gradually comes into operation. This is really a slow combustion caused by particles of the wood uniting with the oxygen of the air. Wood consists of a multitude of cells filled with the special sap appertaining to its kind. When the life of the tree ceases the sap cannot resist the action of the air and of moisture, and the process of oxidation slowly commences. The sap juices ferment and decompose, assisted by the moisture in the timber. When wood has been thoroughly seasoned by the extraction of its moisture, decay cannot be set up without the presence of external moisture. Perfectly dry wood will last indefinitely, as, for instance, the wood that has been discovered in the Egyptian catacombs.

Timber, when immersed in water containing air, will have its woody fibre gradually converted into humus. If the timber be alternately wet and dry, or the oxygen frequently renewed, the decay will be more rapid. If the wood be immersed in deep water, or where the oxygen is not renewed, the change is gradual. Wood may, under such circumstances, last for almost an indefinite period. The elm piles of old London Bridge were found in a good condition after 800 years, while there are frequent cases of old oak canoes being found in sound condition after having been embedded for 1,000 years in the bottoms of lakes.

The decay of timber generally appears in one of two forms—dry rot or wet rot. The first is caused by a bacterial growth which attacks the timber externally, and the second is a chemical decomposition of the sap and fibre.

Wet rot is an oxidation, as already described. The oxygen combines with carbon and forms $CO_2$, and with hydrogen to form $H_2O$. The hydrogen is more rapidly oxidised than the carbon, which, being in excess, appears as a brown coloured powder. Wet rot can occur in the living tree, and is communicated to unattacked wood by actual contact. The conditions necessary for wet rot appear to be an excess of moisture and the presence of oxygen to start the process of oxidation.

Dry rot is due to a fungoid growth, which requires the favouring conditions of a warm and moist atmosphere, absence of ventilation, and the presence of sap to enable it to attack timber. It is a disease which appears to be increasing in modern buildings, because so much timber is used which has been imperfectly seasoned, and therefore contains an abundance of moisture. Furthermore, less care is frequently taken to allow free access of air to play about the timber used for constructional purposes.

Timber may be infected in the forest when it has been felled and allowed to remain for some time. The infection can be detected by the presence of red stripes in the sawn wood. If the timber be thoroughly seasoned the germ of the disease is killed, but if this be not affected it will rapidly germinate when given favourable conditions. The disease is also spread by the spores of the fungus being scattered from infected timber and attacking new timber which may be placed in positions likely to encourage the growth of the spores. These can only germinate in moisture containing an alkali, and therefore timber should not be placed upon mortar.

Timber should never be placed in stuffy places, or where the air cannot have access. Where this is unavoidable a coating of methylated spirits containing corrosive sublimate is found to be of great value.

The fungus consists of a white fringe of mycelium surrounding what is known as the fruiting patch. This adheres in irregular patches to the timber, and when fully developed is covered by a network of brown ribs containing a great number of spores, appearing in the form of a fine powder, which is soon diffused upon the surrounding timber. The mycelium spreads out in all directions, over walls and through crevices, to find fresh wood to devour, but meanwhile being supplied with food and moisture from the parent plant through cord-like strands. Once the fungus has obtained a foothold in a house the whole of the timber may be speedily attacked. Whenever the growing mycelium finds a new source of food, a fresh centre is started for the growth of the fungus. The mycelium frequently appears in pale grey sheets. The scientific name of the growth is Lacrymans, signifying weeping, and refers to the power which it possesses of extracting moisture from the atmosphere. This frequently hangs in drops from the fungus, and, of course, hastens the decay of the timber, which subsequently becomes dry and friable; hence the popular name of dry rot. The fungus is so infectious that the destruction of all attacked timber is the safest course. Carbolic acid, creosote, and carbolineum are able to check the growth of the mycelium, but once the growth has started in a house it is very difficult to kill all the germs or spores which are likely to restart the growth if conditions of ventilation, &c., are not made unfavourable for their development.

Beyond the ravages of ordinary decay, timber is liable to the attacks of various insects and worms. The dusky and yellow ants will attack soft woods, and the black carpenter ants will attack hard and tough wood.

In the tropics the white ant, or soft-bodied termite, is very destructive to soft woods. In salt water timber can be attacked by several worms. The Teredo Navalis is a submarine, clear-water worm, which bores along the grain. The worms are sometimes 2 ft. long and ¾ in. in diameter. Greenheart wood is said to offer the most resistance to attack. The natural enemy of the worm is another species called Lycoris Fucata, which attacks and kills the navalis and then occupies its home. The Limnoria Terebrans is a marine wood louse which attacks all woods except teak and greenheart. It does its work on the surface, just under the level of neap tides, and does not object to foul salt water. The Chelura Terebrans is a wood-boring shrimp which tunnels just under the surface, and works in pure salt water at the level of neap tides. Fresh water does not appear to contain any serious enemies to timber.

*(To be concluded.)*

## THE TESTING OF MATERIALS.

### MR. P. C. COWAN ON THE USE OF LOCAL STONE.

In the course of an address on Monday at the opening of new engineering laboratories at University College, Cork, Mr. P. C. Cowan, D.SC., president of the Institution of Civil Engineers of Ireland, alluded to the practical need which had arisen for testing materials, so that the engineer might justly proportion the dimensions of machinery or structures. Actual experience of success and failure, gained in a long period of time, afforded the best means of judging the qualities of a material or a structure, but they could not always wait for the test of time, engineers being called upon to apply new materials to new needs with the limiting conditions that there should be no failure, and no unnecessary expenditure.

There was a wide field for fruitful effort in the testing of road materials, and it was gratifying that work in this direction was now undertaken in many parts of the kingdom, including Cork. The Road Board had arranged for the installation at the National Physical Laboratory of carefully designed plant and apparatus, by means of which great additions to our knowledge of road materials and road construction would be gained. In many parts of Ireland people seemed inclined to spend unnecessarily large sums of money on bad materials, because they were produced locally. In co. Down, however, after comparative tests of the best stones in the county and of Welsh stones, it was proposed to import for use on some main roads Welsh stones which had given results in testing three times as favourable as the best local stone. He did not expect that this policy need be followed in many parts of Ireland, but there was no doubt that local authorities should seek for and use the best stones within a reasonable distance.

**Snow Removal in Birmingham.**—Nine inches of snow fell in Birmingham on Wednesday and Thursday of last week, and 2,000 men with 450 carts were occupied all day in clearing the huge accumulation from the centre of the city. It is estimated that the total cost of clearing away the recent snowfall was nearly £10,000.

## ASSOCIATION OF CONSULTING ENGINEERS.

### OFFICIAL REPORT OF INAUGURAL MEETING.

We have received the official report of the inaugural meeting of the Association of Consulting Engineers which was held on Monday, the 15th inst., for the purpose of formally receiving the rules which had been drawn up by the committee appointed for this purpose at the opening meeting some eighteen months ago. Between sixty and seventy engineers were present. The chair was taken by Mr. James Swinburne, who was supported by the majority of the committee, which consists of the following engineers: Messrs. John S. Alford, H. Percy Boulnois, Edward M. Eaton, Robert Hammond, Joseph H. Harrison, Baldwin Latham, Charles Lomax, Sidney R. Lowcock, Ernest L. Mansergh, Arthur J. Martin, Thomas L. Miller, William M. Mordey, William H. Patchell, W. Llewellyn Preece, Henry Rofe, John F. C. Snell, E. Herbert Stevenson, James Swinburne, A. A. Campbell Swinton, G. Midgley Taylor, and Alfred H. Dykes (hon. secretary).

The Chairman, in opening the proceedings, said that it was his first business to explain the objects of the association, but that he did not think he need say very much in that direction, because they all knew what the objects were. The association should have been launched fifty years ago; in the present state of things, however, it was very difficult to form an association in such a way as to be satisfactory to everybody. At the same time he was of opinion that if consulting engineers did not take this opportunity of uniting themselves together there was no chance of their ever doing so. It behoved them, therefore, to proceed very carefully and to build on sure foundations. Most institutions had begun by taking in everyone they could get, with the idea that the more members they got the more powerful the institution would be, and the result was that after they had been in existence some time they had to narrow down. He thought that they should, in the present case, go to the other extreme. If they began by making it very small, perhaps in the opinion of many too small, then, when the association was in active existence, it could always enlarge itself in any direction it desired, should it be thought advisable. One of the qualifications for membership in the rules was that the applicant should be a full member of the institution controlling the branch of engineering in which he practised.* It was true that the rules provided that, in addition, members should be of such standing as, in the opinion of the committee of the association, entitled them to admission to the association; but in the initial stage in which they were at the moment (namely, of having formed the association and appointed the committee, drawn up rules and received applications for membership, but not having yet actually any members), the committee were of opinion that it would be wise to adopt some recognised standard of qualifications and to limit the first members to those possessing the qualification of corporate membership of the Institution of Civil Engineers. They were aware that this restriction might be criticised by some people, who might say that they were mechanical engineers or electrical engineers, and of eminence in their profession, and did not see why the fact that they had not joined the Institution of Civil Engineers should prevent them from joining the association. On the other hand, it must not be overlooked that the Institution of Civil Engineers was not only the oldest institution, but was the parent engineering institution, and that the majority of consulting engineers already belonged to it in addition to the institutions representing the particular branch in which they practised. If any competent consulting engineer who was not a member of the Civils felt aggrieved that he could not belong to the association, surely it was not asking a very great deal of him to ask him to join the Civils. If the association, starting as a young society, could use a body like the Institution of Civil Engineers, which had always been fairly strict in the selection of its candidates, and was getting stricter every year, and thus throw the responsibility of deciding as to a candidate's qualifications upon an established institution, leaving the association merely to decide as to his qualifications in other respects, they were solving one of the greatest difficulties. Later on, when the committee would be in a position to lay before the [illegible] consulting engineers in general, and when the members had had time to become acquainted with the working of the association, they might find it advisable to make some change, but that was a matter for the future. At any rate, the present committee felt strongly that the lines he had indicated should be followed for the moment; he himself believed that they were the right lines, and probably the permanent lines. There was another direction in which they thought the committee ought to be very narrow, which was also a matter of considerable difficulty, and that was with regard to the admission to the association of engineers, many of whom were of the highest eminence, who were receiving a salary and were giving practically the whole of their time to some corporation or some public body. The committee wished to be logical in carrying out their idea of starting on the narrowest lines, and felt that they should confine the association initially to those regularly in practice as consulting engineers and having their own separate office and staff. The association did not aim at stopping competent consulting engineers who might not join them from doing consulting work, nor did they wish to claim a monopoly. The committee felt, however, that engineers falling within the class he had outlined were entitled to associate themselves together and to form an association which would gradually, through its own standing and character, become recognised as *the* body of consulting engineers.

After the proposed rules had been introduced by Mr. Midgley Taylor and Mr. S. R. Lowcock, a general discussion took place, the speakers being Messrs. B. M. Jenkin, W. Fairley, A. Williams, A. G. Hansard, Cawley, Robert Hammond, E. J. Silcock, H. P. Boulnois, A. S. E. Ackermann, H. P. Raikes, F. W. Hodson, Moss Flower, Druitt Halpin and P. Griffith. The main points to which speakers referred were the scope of the association, the desirability or otherwise of the membership being restricted to corporate members of the Institution of Civil Engineers, registration of consulting engineers, solicitation of work and the desirability of consulting engineers being free from trading or manufacturing interests. In the course of the discussion the chairman pointed out that the rules were put forward subject to legal revision.

In conclusion, at the suggestion of Mr. Lomax and Mr. W. Duddell, the chairman put a motion to the meeting to the effect that corporate membership of the Institution of Civil Engineers be a condition of membership of the association† (with discretionary power to the committee) and that the committee have power to elect members from among those who have applied. This motion having been duly carried, the proceedings terminated with a vote of thanks to the chairman.

It is hoped that all consulting engineers possessing the necessary qualifications will join the association and communicate at once with Mr. A. H. Dykes, the hon. secretary, at 11 Victoria-street, Westminster S.W. This will enable a list of first members to be made without delay. A meeting of members will then be called to ratify the rules and to appoint the Executive Committee.

† This point was dealt with in our next week's issue of The Surveyor, p. 56.

* Rule 4 (a) as read reads as follows: "He shall be a full member of the Institution representing the particular branch of the profession in which he practises and a corporate member of the Institution of Civil Engineers."

## THE SURVEYORS' INSTITUTION.

### MR. JULIAN ROGERS' PAPER.

Owing to the necessity for providing for the usual features of this special issue of The Surveyor, we are regretfully compelled to hold over until next week the paper on "An Evening in the Institution Library," read by Mr. Julian C. Rogers.

**Yorkshire Town Planning Conference.**—The interest taken in the subject of town planning by the local authorities in Yorkshire was shown last Friday, when over a hundred representatives met at Leeds Town Hall to discuss the machinery of the new Act with Mr. H. R. Aldridge, the secretary of the National Housing and Town Planning Council. Some time ago a representative conference was held in the city, and one of the results of it was the formation of a Yorkshire Advisory Town Planning Committee, by which the local authorities might be brought into touch with one another on the subject, and also with the National Council. The recent conference was held under the auspices of this County Committee, and Mr. Aldridge dealt fully with the case for town planning, and with the way local authorities should set to work to put the Act into operation.

# Institution of Municipal Engineers.

## WESTERN DISTRICT MEETING AT BIRMINGHAM.

A meeting of the Western District of the above institution was held on Thursday, the 18th inst., at the White Horse Hotel, Congreve-street, Birmingham, for the transaction of business and the discussion of papers. The chair was taken by Mr. Henry Hulse, borough surveyor and engineer of Droitwich (chairman of the Western District), and the attendance included Messrs. Henry C. Adams (vice-president), A. Smith (Bromsgrove), Arthur Parker (Oakham), G. F. Taylor (Leamington), R. W. Hartley (Erdington), J. Turner (South Wigston), H. E. Gilkes (Birmingham), Robert Green (Birmingham), H. B. Binks (Birmingham), W. E. Coles (Stratford-on-Avon), J. W. Fawell (Birmingham), E. W. Webb, F. S. Gilbert, W. E. Farrer (Birmingham), John Brook (honorary district secretary), B. Wyand (secretary of the institution), and others.

Previous to the formal business, the members were entertained to lunch by Mr. W. E. Farrer, of the Star Sanitary Works, Cambridge-street, Birmingham. Upon the conclusion of the repast,

The CHAIRMAN remarked that they had got through a very pleasant portion of their business, and he was sure they would join with him in thanking Mr.

MR. HENRY HULSE,
Borough Surveyor and Engineer, Droitwich.
(One of the readers of papers at last week's meeting of the Institution of Municipal Engineers at Birmingham.)

Farrer for his hospitality. The reason why they had met in Birmingham on a Thursday instead of Saturday (as settled at the previous meeting) was that Mr. John Brook, hon. secretary of the Western District, concluded that they would obtain a better attendance and more profitable meeting if they met at Birmingham on Thursday, and but for the unfortunate weather of the last thirty-six hours this anticipation would probably have been fulfilled. Turning to their host, Mr. Farrer, it was very pleasing to hear that business with him was progressing so satisfactorily that he was about to remove his premises to a site with many thousands of feet increased area. They wished that his success would continue to grow, and, in the language of one of the characters in Pickwick, that his volume of business would "swell wisibly."

Mr. R. GREEN seconded the vote of thanks to Mr. Farrer.

Mr. W. E. FARRER, in reply, said it was a great pleasure to him to be allowed to entertain the members of the institution, and he hoped the discussions they would have would amply repay them for the discomfort they had experienced in coming such a long distance in such disagreeable weather. When they visited his works he would be able to show them some of the inner details of machinery for the treatment of sewage, including his rotary distributor, all the component parts of which they would be able to handle.

Mr. J. BROOK, hon. district secretary, then read the minutes of the last meeting, which were duly confirmed, after which the chairman, Mr. Henry Hulse, presented his paper, entitled "The Institution and its Benefits to Members," which was printed in THE SURVEYOR last week.

### DISCUSSION OF MR. HULSE'S PAPER.

Mr. R. GREEN, in opening the discussion, said he had been very much struck with that part of the paper where the author alluded to the fact that if an officer did his duty he often made enemies. That was the case, as he (the speaker) knew, and when he saw an officer was in trouble with his council, as they did in the papers, he always sympathised with him. He was not an officer himself—he sometimes wished he was, because an officer was always busy with his work, while consulting engineers were not always busy—but if he was, he would not hesitate to make enemies, because he should consider it his duty to do so. Councillors should rely upon their officer, and support him in the interests of the ratepayers, and if the officer, in his anxiety, made a mistake, he ought not to be dropped, but, on the contrary, supported. He would venture to suggest that what they as professional men wanted was that the *Journal* of the institution should be instructive; and in order the more fully to accomplish this, members should contribute papers as frequently as possible—not necessarily long papers, but descriptive of works the details of which would be of use to them in their profession. Mr. Hulse's paper was well worthy of being thoroughly discussed, for it discussed many of the difficulties they had to contend with, and as they wished their institution to be second to none, it was to be hoped members would not hesitate to debate the many points raised by the author. He moved a vote of thanks to Mr. Hulse for his able paper.

Mr. G. F. TAYLOR said it seemed to him that the success of the institution depended largely upon the quality of the occupants of the presidential chair. If they could only get the best men in the country in the chair they would do a great deal to improve the institution. His remarks were not, of course, intended to reflect upon the gentlemen who had held the office of president, or the present president, for they had fulfilled the conditions he indicated; what he wanted to convey was that it was essential that they should obtain the services of the very best men from time to time. Another thing he would like to see done. He did not know what was going on behind the scenes, but he would like to see the institution take more action than was taken in the larger movements that were going on. A Road Congress, for example, was going to be held in London. He did not know whether the institution had any official connection with that congress, but, personally, he should like to see it take a leading part in the organisation of it. He was present at the Brussels Congress, and he did not notice that the institution was very much to the fore. He hoped to see it take a more prominent part in the next congress.

Mr. J. TURNER remarked that unfortunately he had only been able to peruse the paper during the last few minutes, and he was therefore not in a position to offer any comment or criticism. It occurred to him that there might be members similarly situated to himself, and he thought it would be convenient if they were invited to send their comments to the secretary for publication in the *Journal*. If this were done, members might be stimulated to write criticisms after they had read the paper at their leisure.

Mr. A. SMITH thought the question of the recognition of the municipal engineer by the Local Government Board was worthy of their consideration. In days gone by, when a particular scheme had to be carried out, engineers were called in by the councils. Now municipal surveyors were all supposed to be engineers, whether they were or not, and they had to perform the duty formerly done by the engineer. For this they did not receive any recognition from the Local Government Board. Personally, when he had had to get out plans, he never got anything for his work, and he had had to do work in an outlying district adjoining his own, for the supervision of which

he got nothing, though he had made a charge. He thought that the services of the surveyor in preparing schemes ought to be recognised. It was extra labour which they were supposed to squeeze in somehow between their ordinary duties, which, by-the-bye, were always being increased.

Mr. John Brook observed, speaking of rural districts, that it was very unfair that a man holding the office of local surveyor or engineer should be called upon to prepare schemes at all, because while he was engaged in such work he must of necessity be neglecting the legitimate work he was engaged to carry out. He quite agreed that if he was, so to speak, forced into such special work, he ought to be paid for it. It was not part of his duty, and he should therefore be specially remunerated. He was not alluding to urban districts, for he was unable to speak for them. The urban surveyor was supposed to carry out the work of his district, and his duties were confined to his district. It was not so in rural districts, where the surveyor had a number of parishes to supervise, and no matter how smart a man was, he must neglect the work in some of them if he had schemes to prepare. It appeared to him that if a scheme became necessary the members of the outside profession ought to have a chance of preparing it.

Mr. Henry C. Adams said the chairman had requested him, in addition to discussing the paper, to reply on behalf of the council to some of the points raised in the course of the discussion. First of all, it was suggested they should get the best men to fill the presidential chair. Certainly they did not want figure-heads; they wanted a working president, not an ornamental one. Without going too much into the personal question, it might be remarked that they had in their present president a real live man, who knew what to do, who was sharp and business-like, and was of great value to the institution. If instead of such a man they had an ornamental president, they might rely upon it that the institution would go back instead of progressing, as it was at present. The author of the paper referred to the services of the secretary, Mr. Wyand. Those who had worked shoulder to shoulder with that gentleman could appreciate the immense service he had rendered, and was still rendering, to the institution. Referring to the work of the district committees, they had in connection with their institution ten districts, in each of which there was a committee carrying on work all over the country more or less as though they were independent societies. One central institution could not do the work of these ten technical societies, which were in touch with different phases of the work, and were, so to speak, catering for one and all. There was in each case a local executive committee, and this decentralising system had proved very advantageous. The question had been raised whether they should further subdivide the Western District, and that was a matter to be considered. That district extended from Birmingham to the extremity of Pembroke, and such being the case it could hardly be expected that many members who were so far away from the place of meeting could attend that day. The membership of the institution was approaching the figure of 1,000, and in that connection he would like to say that they had taken a very strong line indeed in connection with subscriptions. When a man applied for election, and was admitted, and did not pay his subscription within two months, his election was cancelled, and he had to apply again for membership. They did not give credit to new members. Some members were careless in paying their subscriptions, and their rule was that if a member was two years in arrear he was struck off the roll. He was at liberty to join again, but it was desirable it should be known that they did not want to carry a lot of dead-heads; on the contrary, they wished their list of members to be a real live one. In connection with the institution's library, Mr. Hulse in his paper rather missed the point. They had a good library, and of those who made use of it 90 per cent resided in the country; the London members made little use of it. The reason it was so popular was that it was worked upon such an easy plan. All a member had to do was to send a postcard to the secretary, upon the receipt of which the books or works were forwarded by post, and all a member was asked to do was to pay the return postage. So that if they wanted to look up information with respect to a subject they had only to make application to the secretary. This was not the usual custom, but they prided themselves as an institution in doing things differently to other people, in profiting by the mistakes of others and thus doing well. He thought it was a good idea that the members generally should be invited to send criticisms on the papers read to the secretary for publication in the *Journal*, and he was quite sure that if the criticisms were sent along, and they were worthy to be reproduced, it would be to the advantage of the members to read them. This, of course, depended upon themselves. If they had remarks to offer, let them send them up; and if they were not reproduced they would have cause of complaint. With respect to the remarks about the Road Congress, such an organisation was a big affair. It was generally taken up by professional bodies for a specific object. But the members must not think this institution had not taken an interest in these congresses, for they had sent delegates to half-a-dozen of them, and special reports were sent in, some of which were reproduced in the *Journal*. At the Brussels Congress, for example, seven members attended, and four of them reported their impressions in the *Journal*. They had found a difficulty in getting up meetings—they had that difficulty in London. In addition to being vice-president, he was also chairman of the South-Eastern District, and they found so much difficulty in arranging formal evenings that they started what they termed "discussion evenings." They met in a private room, and a member opened by reading some notes he had prepared. Nobody stood up to speak, but talked as they liked, and the points raised were either pulled to pieces or threshed out. These informal evenings had been extremely useful, for members took part in the discussion who probably would not talk at what was called a public meeting. He threw out the suggestion whether this plan might not be adopted in that (the Western) district. The reading of papers and notes required a certain amount of time and preparation, but every man had one particular part of his work in which he took an interest more than another, and if he would submit to his colleagues the information he had accumulated on that point it would prove interesting, and give them in concise form such knowledge as was available, while in time there was collected a very useful body of information on many subjects. The attendance at meetings was small in common with the attendance of other societies. He belonged to other societies, and almost without exception there were complaints with them about the small attendance of members at meetings. And there was, after all, a good reason for this. Attendance was often made at great inconvenience, and, in addition, municipal officers were not overpaid, and other professional people did not find they were living in wealth, and this might have the effect of preventing them travelling long distances. He thought, however, they might expect a recovery from the present condition of things, and that they would have better attendances in the future. There was also the question of superannuation and security of tenure. They often spent an hour or two at council meetings discussing that subject in various aspects. They were amalgamated with the National Association of Local Government Officers, and Mr. Winter Gray was prominently connected with it. He gave them information as to the progress of things, and if it were not for the congestion of Government business there would have been something satisfactory to report; but, as they knew, Parliamentary business was in a very doubtful state. Then he came to his final point—viz., the calling in of private engineers. As one of those individuals, he found it difficult to say what he felt on that subject. There was one point of very questionable morality, to his thinking, and this was when an officer subsidised by one district, from which he received an official salary, carried out work in other districts, and did it cheaper than the recognised rate—cheaper than an independent engineer would charge. Why should that other district have the advantage of his services? He quite recognised that the work was forced upon him, and that he could not keep out of it, but he had never seen the advantage to the man. To do the work he had to stay up late at night, because his ordinary duties took up his time during the day, and if the scheme was a failure he got all the blame. He knew the case of a man who went out of his way to carry out certain work. Owing to carelessness, things went wrong; the man got the "sack," and his chief assistant was also dismissed. If in such circumstances a private engineer made a mistake, he would have to bear the blame, but the effect would not be so disastrous to him as it was to the officers he alluded to. He therefore did not think it was desirable for the municipal engineer to carry on outside work. No man could expect to be an expert in every subject within professional practice, and it was not good to a profession for a man to attempt to do anything and everything no matter what.

The CHAIRMAN thanked the members for the reception they had accorded his paper, and he would at once say that if those who had not taken part in the discussion had any suggestions to make they should send them along to Mr. Wyand. There were several points in connection with the subject dealt with in his paper that he did not touch, one being the recognition of municipal engineers by the Local Government Board. This was, he thought, not so much a question of remuneration as of principle. There were other officers in the service of a council whose extra services were recognised, but the hard-worked engineer and surveyor was barred. He did not see that the independent engineer had any reason to object to the municipal engineer being paid for a scheme, because if the councils knew they had to pay a percentage to the permanent officials they would perhaps give the outside engineer more consideration than at present. As Mr. Smith had remarked, the routine work of municipal service was increasing year by year, and other special works were added to that.

The members, having paid their visit to the Star Sanitary Works, assembled later at tea, after which the meeting proceeded to the

## DISCUSSION OF MR. JOHN BROOK'S PAPER.

Mr. BROOK, in the course of an explanatory statement, said it was a somewhat difficult matter to prepare a paper of this description, because the conditions and interests differed so much. There were in the institution rural engineers, borough engineers, highway surveyors, and, he believed, mechanical engineers. It was therefore difficult to select a paper that would prove attractive to all, and he could only hope they would find the paper he had prepared sufficiently interesting to lead to a useful discussion. He wished particularly to point out that in his paper he was dealing absolutely with rural districts; it applied solely to places where no sewers were in existence, and where other forms of disposal were not possible. It was necessary to state that his remarks with regard to the disposal of wastes were limited, for the simple reason that the time at his disposal was short, and he was afraid that owing to his serious illness he might have been prevented from completing the paper. That explained, however, why he had not gone more fully into details. He should like to add that the form of disposal he dealt with was first introduced twenty-one years ago. It had been under long trial, and so far he had not seen anything he could recognise as an improvement upon it. He should like also to point out that there was no ventilation shown in the drawing, that being purely an omission.

The CHAIRMAN moved a vote of thanks to Mr. Brook for his paper, which, he said, dealt with things of every-day occurrence, knowledge, and practice, especially to the rural section of municipal surveyors. He had taken notice of the point with reference to ventilation, but as Mr. Brook had explained that that was an omission in the drawing, it would, of course, be met. No doubt the pail-closet was a very great nuisance, particularly when little or no cleansing was done, and the receptacle was scarcely ever charged with any kind of deodorant. He knew of one district where the pail was changed weekly, and brought back after being treated with a certain quantity of sulphuric acid. That had the effect of keeping down the smell, as the sulphuric acid appeared to absorb the ammonia and checked the foulness of the pail. Mr. Brook insisted that every house should be provided with a good and efficient drain, and he (Mr. Hulse) would urge that rain water should, as far as possible, be excluded from the cesspools. That raised the question of separate drains for rain water, and such drains had been adopted by certain councils within the last twelve months.

Mr. ROBERT GREEN said he felt bound to pay his tribute to the author for his interesting paper, which was the result of many years' experience, and they could thus rely upon the contents. He (Mr. Green) should like to ask the chairman to what law he referred in the matter of the separate drain, because his experience was that the Local Government Board would not help a local authority to provide separate drains. These could only be provided by a special Act of Parliament. In that neighbourhood (Birmingham) they obtained a special Act. It was (the speaker continued) very important that drains should be properly laid. They should be 6 in. in diameter, laid with a cement joint, and the smoke or water test applied before they were covered over. Then, as to cesspools, he was acquainted with a case where there was one cesspool to four, five, six, or seven houses. To his mind there should be one cesspool to one house. He supposed it did not matter so much in rural districts about receptacles for daily use, but it was different elsewhere, and he thought they ought to be prohibited. It was a very offensive and insanitary arrangement to deal with the daily flow. He was sorry he could not agree with Mr. Hulse that the rain water should be kept out. He thought they should use the rain water that fell from roofs to flush the main sewers and keep the branch drains in a proper state. Mr. Brook did not refer to any special method of emptying cesspools, and it would therefore be appropriate if he (Mr. Green) alluded to the Merryweather vacuum cleanser. The makers claimed that by their system the work could be done at half the cost of the ordinary process, and it was adapted not only for emptying cesspools but also gullies. If he might say so, it would have been more instructive to those who were consulting engineers if Mr. Brook had put in one or two dimensions showing what the sizes were, because there was no scale; and it would have been interesting if he had also given some idea as to the cost.

Mr. H. E. GILKES remarked that he had had a good deal of experience in laying drains, and he found that the minimum gradient for ordinary house drains should be one in forty-eight, and where the house drain was of inordinate length the main drain should be laid to a fall of not less than one in forty. If it was less there was a tendency not to get sufficient clearance. As to cesspools, he endeavoured, as far as possible, to obtain a cesspool for each house, with a capacity of about 900 gallons, which allowed for ten or fourteen days' use.

Mr. G. F. TAYLOR was of opinion that to permit drainage into rural ditches was objectionable, and should not be allowed.

Mr. A. SMITH said that a rural district occupied a wide area, and the question of the disposal of wastes in them opened up a very wide subject. They all had their own particular systems of disposal—privies, drains, ashpits, &c.—and they were always doing something, and, as it were, never doing anything, for somebody was always wanting something done. A system of emptying privies—ordinary privies and ashpits—which he found all right for a time was as follows: He had men in different parts of the district, and he adopted a circular routine. The work went on night and day, starting with one district, and working gradually all through from end to end. He found this much better than waiting for people to report, for in many cases they would not take the trouble to report. His district consisted of parts that were rural and parts that were very much urban. Speaking of the rural portions, their great object was to do away with the privies as rapidly as possible. If they had a very bad privy cesspool, they knew it was apt to be a great nuisance, and when they had proved a nuisance they told the landlord he must have a water-closet. They could not, however, insist upon this by the Public Health Act, which sanctioned a privy. He (Mr. Smith) persuaded the owners that it would improve the value of their property, and that better facilities of sanitation would enable them to get better tenants; and he was bound to say he had met with some success in pursuing this policy. He wondered whether Mr. Brook had had any trouble with infectious disease, such as typhoid fever? The excreta of the patients was difficult to deal with, especially in rural districts. In one district he had a very serious outbreak, and he found it necessary to take special precautions. He went so far as to get special pails painted red and served out to the houses where the patients were, besides supplying carbolic acid. The pails were removed every twenty-four hours. It was, of course, a serious matter to put the excreta in an ordinary privy, and if it was put on the land they did not know what would happen. Fortunately he was able to obtain the use of an old clay pit for a few years, and the difficulty was got over. With reference to a destructor for rural districts, why should not several districts join together and have a scheme after the manner of a joint isolation hospital? The difficulty would, of course, be the distance to be travelled in some cases. He confessed he was not so keen about 6-in. drains as some people; he would rather have a 4-in. drain, provided it was satisfactory, for it appeared to him that the smaller the diameter of the pipe the more cleansing was the water passing through it. As to tests, the hydraulic test was very much in force in some districts. Per-

sonally he had the smoke test, and he thought it was quite severe enough. In testing they knew the joints were all right on the top, but the question was how were they underneath? If the man who was laying the drain knew it was to be tested, his experience was he would take great care in laying it.

Mr. W. E. Farrer, called upon by the chairman, remarked that Mr. Brook, in his paper, had outlined a type of closet that one might pass, if he might use the word with privilege, no matter how much one might object generally to the earth-closet as a whole. There was an earth-closet on the market in which the urine was separated from the solids. It was emptied twice a week, ashes being used occasionally, and earth occasionally. It was constantly dry, and by means of a contrivance at the back offensive smells were kept down; and in due course the whole matter was taken into the garden, very much to the advantage of the garden. In the ordinary type of earth-closet the difficulty was with the earth and ashes. As to drains, he agreed there was no necessity for large drains where small ones could be used. He knew of a large asylum with 5 miles of drains, the largest of which was 7 in. in diameter. For the most part they were 4 in. to 6 in., but 7 in. was the largest, and his own feeling was that for a small house a 4-in. drain was amply large enough. Although he agreed with the hydraulic test, it was an unfair test to apply to some drains referred to in the paper. To conform with the by-laws of a town, by all means apply the water test, but very few drain pipes stood that test. With respect to tinware refuse, he thought the method of its disposal might be improved upon in rural districts. There was a demand for this class of ware, for it was turned into a marketable commodity—steel sheets, and so forth. But reverting to the general topic dealt with by the paper, why, he would ask, have ashpits or earth-closets? They could deal with all these matters by means of the ordinary water-carriage system. Every house had water, and why not deal with the water from the proper sanitary standpoint? To-day was not the same as twenty-five years ago. Then it was not understood that offensive matters could be effectively dealt with; to-day it was simply a question of running them into a tank. To construct this tank on proper lines, all the solid matter should pass away, and by means of a small filter the residue could be dealt with in such a manner that the liquid would pass away as a purified effluent. That was one of the simple points of sanitation that should commend itself to the rural surveyor. No matter how small the installation, they could obtain satisfactory results by the use of the filter. They could then drain ditches without any offence, and pass the liquid away, and nobody would know it to be anything else than ordinary rain water. It was an accepted fact that the whole of the solids were not absorbed, but the time would come when they must be removed, and when their manurial value would be demonstrated on the garden or agricultural land. Care should be taken not to utilise rain water or service water, otherwise they would scour themselves out. In small cottages the quantity of water was small, but where a group of two, three, or possibly more, houses could be combined, and the sewage dealt with as one system, they could effectually get rid of all the difficulties that the earth-closet had brought with it. Where there was a difficulty of obtaining the water-carriage system, it seemed to him they could not do better than put down the earth-closet described in Mr. Brook's paper. The whole arrangement of the scheme, including aëration, was about as clear and simple as it was possible to be, and he thought they would agree that the general health of the rural community could be improved if the system suggested could be generally carried out.

Mr. John Brook, in reply to the discussion, alluded to the question of flies, and remarked that they were very undesirable things to have about a residence, but he was rather afraid it was difficult to keep them out of the ordinary privy. With reference to pail-closets, he dealt with them in his district by a system of scavenging, and it worked very well; but he confessed he was averse to the pail system because in hot weather they were the worst fly propagators it was possible to have. As to the construction of cesspools, he did not go into particulars, because he could have written a paper on cesspools alone. Many cesspools were sunk in an impervious soil, and were thus a source of great danger to the water supply. The plan was to select the proper land and make it absolutely watertight. For cottages it was an expensive matter to put down cesspools. The construction of a cesspool cost £6, and it was therefore obvious they could not be provided for small cottages. He quite agreed that the system mentioned by Mr. Farrer whereby the urine was separated from the solids was an excellent one. Mr. Green had asked what had been his experience of the system he (Mr. Brook) advocated. He could only say that wherever it had been introduced it had given general satisfaction. He had never had any trouble with the closets, and as a matter of fact people seemed to like them, and generally used them properly. He might say that before they adopted the by-laws there was no regulation time for removal, which took place at any time of the day. He had the water test in his district, and when a complaint was dealt with a footnote appeared on the official notice to the effect that the drains would be subjected to the water test. As to the cost of the closet, that depended so much upon the district where they were erected. If they were near a railway it was an easy matter to get the material, but if it had to be conveyed seven or eight miles, the cost was proportionally increased. As to the remarks of Mr. Farrer with respect to the water-carriage system, he might say that where they had public sewers in his district they always had that system. The question of providing a cistern in a small cottage was not easily settled, if they remembered that, as was the case with one tenant he interviewed, the rental was £2 a year, and the tenant received back 2s. as a gift. On a house of such a rental it was not possible to get a great amount of money spent. It was no new experience with him for a landlord to spend a total of five years' rental upon the sanitary improvement of one cottage. On paper it looked all right, but experience taught him not to expect too much from property owners, especially at the present time, when things were unsettled. He found the best method of procedure was to appeal to the owner. By that means he invariably got more done than by adopting legal process. As to typhoid, he was glad to say they did not deal with such a disease in his district. They had not had to deal with a case for two or three years, and then it was a patient that somebody had been kind enough to send them. When they did have it, he adopted a special form of typhoid bucket, with an airtight lid, and gave a liberal supply of disinfectants. They had a very good hospital for the treatment of such cases, but it was rarely in use now. They did not get many baths in cottages with a rental under £2; still, they had a good number of baths in the district in good class property, and they would notice he recommended in a good class house that a proper system of disposal should be adopted. He might state that he had been very successful with a system of sub-irrigation. This consisted of a cesspool drained into a chamber with outlets to a sub-irrigation drain. The outlets worked alternately, and did the work well where a suitable subsoil existed. He agreed that refuse tips were a difficult matter to deal with. It was very difficult to get them, but he quite agreed that much good might be done by collecting the tins for commercial purposes. With respect to a distributor, that was next to impossible, because a rural council had to look twice before they went into such a scheme. Already their expenses were heavy, and they had to do a lot with a low rateable value. When a district containing 4,000 inhabitants could only produce £14 for a penny rate, it would be admitted that it was not possible to do much.

The Chairman remarked that in his case they had a considerable area of sewage farm, a large portion of which was low-lying. Here they disposed of dry refuse, and raised the ground to a better condition for cultivation, because the ground became aërated on being turned over. They knew exactly what such a system of refuse disposal would cost.

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In the course of the day a visit was paid to the works of Mr. Farrer, who explained in detail the parts and working of the "Facile" rotary sewage distributor. The working is variously automatic, continuous, and intermittent. Various other manufactures for lavatorial purposes were inspected in the extensive works and showrooms.

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**Hove Railless Traction Bill.**—The Hove Corporation Railless Traction Bill, and the Brighton District Tramways Bill came before the Examiners for both Houses of the House of Commons on Monday. The Parliamentary Agents submitted proofs of compliance with the Standing Orders of Parliament, and, there being no opposition, the Bills were allowed to proceed for first reading when the Session opens.

# Law Notes.

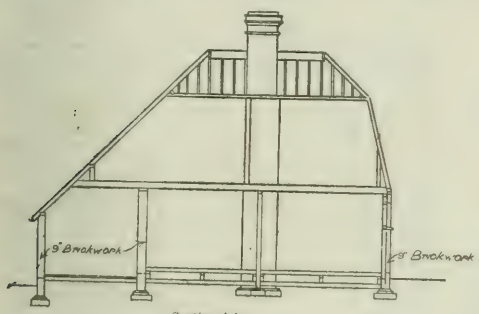
EDITED BY J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

*The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, one side only) should be addressed to "The Law Editor," at the office of* THE SURVEYOR, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

## QUERIES AND REPLIES.

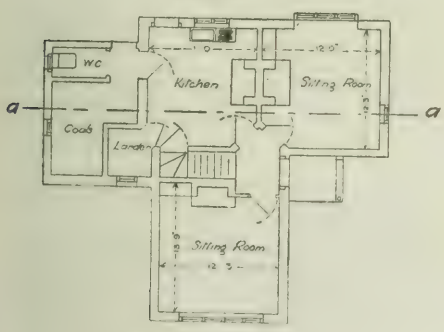
*In order to avoid confusion querists are requested to use distinctive words as* noms de plume. *The letter* X, *combinations such as* X.Y.Z., *and words such as* "engineer" *and* "surveyor," *should never be used.*

BUILDING BY-LAWS: ROOMS IN ROOF.—"Trunot" writes: There have been submitted for approval plans of a house (copy forwarded) showing the first-floor rooms constructed wholly in a roof of an outline something like a "mansard." The external sides of the first floor are to be constructed of timber framing covered with tiles externally and lath and plaster on match-boarding internally. As this is a point which may be of considerable interest in view of the present tendency to build cheap houses, I shall be glad if you will say (1) Whether these external sides of the first floor come under the by-laws in force in the district (copy of by-laws enclosed) relating to the construction of external walls. In other words, are the sides external walls or part of a roof? (2) If part of a roof, whether there is anything in the by-laws to prevent the external sides of the ground floor being similarly constructed; the whole of the building being thus one "in a roof."

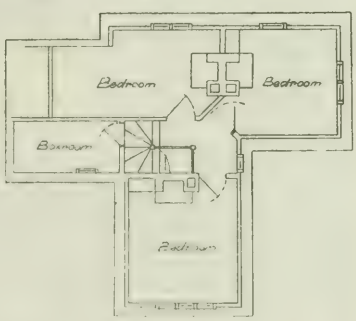


Section AA.

Front Elevation.



Ground Plan.



First Floor Plan.

PLANS, &C., ACCOMPANYING QUERY ON ROOMS IN ROOF.

(1) Although the point is not free from doubt, I think that, reading by-law 11 as a whole, upon a reasonable interpretation the construction proposed is not in accordance with the requirements of that by-law. Those requirements are briefly that (except as hereinafter specified) a building shall be enclosed with walls of bricks or other incombustible material. The exceptions are certain specified buildings of two or more storeys, as to which it is provided that the external walls of the topmost two storeys (whether wholly or partly in the roof or not) may be constructed of timber framing covered with tiles, subject to compliance with certain rules. I think this shows the intention of the by-law to be that, in other than the excepted cases, an upper storey shall be enclosed with walls of brick, &c. The present building does not appear to come within the exception. (2) I think this would clearly be a contravention of the requirement that a building shall be enclosed with walls of brick, &c. to be properly and solidly bedded in mortar or cement on the top of the wall. (29) A person who shall erect a new building shall not construct any party wall of such building so that any opening shall be made or left in such wall.

There is no doubt that if the buildings had been originally constructed as now proposed to be altered they would have contravened the by-laws. If Part III. of the Public Health Acts Amendment Act, 1890, has been adopted, by-laws could be made under sec. 23, sub-sec. (4), which would prohibit the proposed alteration. If there are no such by-laws in force the question is whether the proposed alteration constitutes the erection of a new building. This is a question of fact (*James* v. *Wyvill* 48 J. P., 725). I think there is evidence to support a finding of fact in this case that a new building is being erected, seeing that the character of the upper portion of the two houses is being entirely changed. But it would be for the magistrates to decide in the event of proceedings being taken. If the alterations do amount to the erection of a new building then, in my opinion, they are a contravention of the by-laws. I do not think sec. 23 clause (*d*), of the Act of 1907 is applicable, inasmuch as the alteration is not an "addition" to, but rather a subtraction from, the existing buildings.

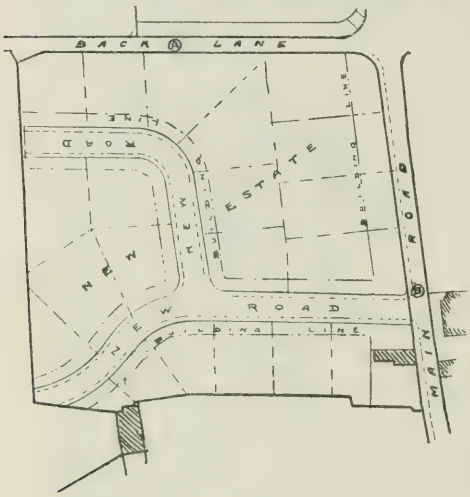
BUILDING BY-LAWS.—"H. R." writes: I shall be pleased to receive your opinion, through the columns of your valued paper, as to the power of my council in the following case, the Public Health Acts Amendment Act, 1907, being in force. A proposed alteration is taking place at certain premises in this town in which it is desired to take the party wall of adjoining houses down as far as the first floor joists, and make one large room over both houses for public purposes, one house still being separately used on the ground floor as a dwelling-house. How are the by-laws Nos. 27 and 29 affected? these (so far as material to this point) reading as follows: (27) Every person who shall erect a new building shall cause every party wall of such building to be carried up at least as high as the under side of the slates or other covering of the roof of such building. He shall also cause the slates or other covering of the roof

PRIVATE STREET WORKS: RAISING MANHOLE COVERS: CONNECTION OF RAIN-WATER PIPES.—"Craven" writes: My council having adopted the Private Street Works Act, 1892, I am preparing plans, specifications, estimate, and provisional apportionment for a certain street which has already been foul-water sewered

by the council. The proposed works include paving and a surface-water sewer. Your opinion is asked upon the following: (1) Can the cost of altering or raising the manhole covers on the foul-water sewer, to meet the new level of the street incidental in the paving, be included in the estimates and apportioned among the frontagers? (2) Can the cost of connecting existing rain-water pipes to the new surface-water sewer be included in the estimates, and apportioned among the frontagers? The rain-water pipes at present either deliver over the surface of the footpath or into the subsoil of the street.

(1) This would appear to be incidental to the levelling and paving of the street, and in my opinion should be chargeable against the frontagers. If, however, any frontager objected to the work as "unreasonable," the ultimate decision would rest with the magistrates. (2) I do not think the cost of this is chargeable against the frontagers.

LAYING OUT NEW STREETS.—"R. E. W." writes: The accompanying sketch shows an existing back lane and main road, marked A and B respectively. The owner of the adjoining land has submitted plans to the local authority for laying out the new estate as shown with new roads, and has marked out proposed building plots and building lines, with a 36-ft. road-




way. The existing main road and back lane are much narrower than 36 ft. (1) Does the laying out of the new estate make back lane and main road become new streets? (2) Can the local authority compel the owner of the new estate to give frontage in main road and back lane so as to make each a 36-ft. roadway?

(1) The laying out of the estate would not of itself constitute the laying out of the main road and back lane as new streets. (2) Not unless and until something is done which amounts to laying out these roads as new streets.

ALTERATION OF AREA: COMPENSATION TO SURVEYOR.—"Senex" writes: Can you give me any information as to what compensation can be claimed by a surveyor who has had his salary reduced through annexation of a portion of his district by an urban authority? (1) Can one obtain the whole reduction of salary? (2) Can one claim, in addition to this, for extra work caused by the discharge of an assistant through such extension? The Extension Order states that the compensation is based upon sec. 120 of the Act of 1888.

Under sec. 120 of the Local Government Act, 1888, the compensation is *not to exceed* the amount which, under the acts and rules relating to the Civil Service, is paid to a person on abolition of office. In fixing the amount, regard is to be had to (1) the direct pecuniary loss suffered, (2) the conditions of the appointment (as for life, for a fixed term, &c.), (3) the nature of the office, (4) duration of the service, (5) any additional emoluments consequent on the change, (6) any emoluments which the officer might have acquired if he had not refused to accept a new office, and (7) all the other circumstances of the case. The practice of the Treasury on the abolition of an office in the Civil Service is to grant as compensation one sixtieth of the annual salary and emoluments for every year of service plus the following additional allowance:- for twenty years' service and upwards, ten-sixtieths; fifteen, but under twenty years, seven-sixtieths; ten, but under fifteen years, five-sixtieths; under five years, one sixtieth. The maximum compensation on reduction of salary would therefore appear to be (for twenty years' service) half the amount of the reduction.

PRIVATE STREET WORKS: REMOVING STUMPS.—"Notash" writes: I am obliged for your reply in the issue of THE SURVEYOR of December 15th. It fairly well clears the ground, but, may I ask, is there any fear of the owners—who have objected under sec. 7 (a) of the 1892 Act—being successful in an action for damages, which they threaten to enter, in case the council remove the stumps after declaring the street a highway under sec. 19? They argue that the land on which the stumps are erected has never been dedicated as part of the streets. The stumps are fixed across the carriageways, and consist of posts 6 in. square, 3 ft. apart, with an iron rail running through the top. The footpaths are open for pedestrian traffic.

In my opinion there is no fear of the owners being successful in an action for damages if the council remove the stumps after having completed the works and having declared the street to be a highway repairable by the inhabitants at large. The question of dedication or non-dedication is quite irrelevant. As regards street A, it cannot be contended that the site of the stumps does not form part of the street, and the powers of the Act are exercisable with respect to all "streets" (as defined by the Act) whether dedicated or not. As regards street B, the stumps are either on that street or on the public road. In the former case they are in the same category as the stumps on street A; in the latter case the council can remove them under their general powers as highway authority.

ELECTRIC LIGHTING: REINSTATING FOOTPATHS.—"Interested I." writes: My council have, with the approval of the Electric Light Company, who have powers to lay their cables in this district for lighting purposes, reinstated the public footpaths (paving, &c.), broken up by them in laying their cables. The account for the costs of carrying out the works, plus 10 per cent—the latter being establishment charges—has been sent in to the company, and the company have expressed their willingness to settle the account, less 10 per cent. Can you inform me whether my council have the power to charge this; if so, under what Act? Could you also quote me a case or two that has been decided on the point I raise?

In the absence of anything to the contrary in the company's special Act, their powers and duties as to breaking up streets are similar to those of gas companies under secs. 6 to 12 of the Gasworks Clauses Act, 1847 (incorporated with the Electric Lighting Act, 1882, by sec. 12 of that Act). Under sec. 10 of the Act of 1847 they are bound to reinstate the pavement without delay; and under sec. 12, in case of delay the highway authority can do the necessary work and recover the expense of executing the same from the company. If the council have acted under this section I do not think they can recover anything beyond the cost of the work, though I can find no decided case upon the point. If, however, the council did the work by arrangement with the company, it depends upon the terms of that arrangement whether or not the extra 10 per cent can be charged.

HIGHWAY: BOUNDARY: DITCH: "T. N." writes: A is the owner of building land adjoining the highway from which it is separated by a quick-set hedge and ditch, the ditch being on the road side of the fence. Several houses have recently been built on the estate facing the road, and iron fencing is to be put up in place of the hedge. The rural district council have allowed A to put in drain pipes and fill up the ditch to the level of the roadside. A now wishes to enclose the filled-up ditch by setting his new iron fence 4 ft. forward from the line of the old hedge. Can he legally do so? The old parish award describes the road as 40 ft. wide. It is now 48 ft. from hedge to hedge, including the ditch, or 40 ft. wide from ditch to ditch.

A can erect his fence as proposed unless the ditch was dedicated as and formed part of the highway. The award would I think be presumptive evidence that the ditch did not form part of the highway, and if in addition to this the owner of the land has for many years exercised acts of ownership over the ditch without any interference by the highway authority, the presumption would be strengthened. See *Thorne v. Field* (33 J.P., 727). If, however, the ditch was necessary for preventing the overflow of water on to the highway, it may be that it formed part of the highway and in that case A cannot erect his fence on the site. See *Chorley Corporation v. Nightingale* (THE SURVEYOR, Vol. XXX., p. 271). The question is one of fact.

WATER SUPPLY.—"Interested II." writes: A certain urban district, conducting its own waterworks under the provisions of the Public Health Act, charges the uniform sum of 8s. 8d. per annum for every cottage under £10 annual value, and refuses to accept of the owner the amount of water rate thereon as prescribed by sec. 56 of the Public Health Act, 1875, although no specific "agreement" has been entered into as between owner and town council beyond the fact of the cottages being supplied with water without compulsion. Has the town council such power of charging this fixed sum, and, if so, whence is it derived? Should water agreements be under seal, or at least in writing?

The power given to local authorities by sec. 56 of the Public Health Act, 1875, to charge a water rate is optional and not compulsory. An urban authority is not bound to charge by rate in their district or in any contributory place unless required to do so by ten persons rated to the relief of the poor in the district or by five persons so rated in the contributory place, under sec. 10 of the Public Health (Water) Act, 1878. The council can only charge by rate or by agreement. Agreements should be in writing, but they need not be under seal in urban districts where the amount does not exceed £50.

ROADSIDE WASTES. "Grip" writes that a large number of the country roads in his county are not 20 ft. wide in carriageway, but that on each side there are grass wastes of good width. Sometimes drivers of

vehicles, to avoid vehicles proceeding in opposite directions, run one of their wheels on the grass. The drainage of these roads is by grips cut into the wastes, and since in many places the grass is above the road, these grips are 1 ft. deep or more, and have been so for many years. (*a*) If an accident were to occur by vehicles being upset in encountering such grips, would the highway authority be responsible? (*b*) Also, are such authorities able to fix stones on grass verges to prevent vehicles leaving the metalled portions of narrow roads, especially on hills?

(*a*) If the highway authority themselves cut the grips, or gave permission for them to be cut, they might be liable. (*b*) Assuming the grass verges to be parts of the highway, the authority have no right to obstruct them by fixing stones thereon.

PROPRIETARY MATERIALS: CONTRACT.—"Audit" writes: An urban authority wishes to purchase a special road material which is manufactured by one firm only. Is it necessary to advertise for tenders, knowing that the total cost of such material will exceed £50? Do you consider it legal to issue a series of orders, each amounting to less than £50 in value, to cover the total quantity, the whole of the material being for one road; also, if it is compulsory to have a contract prepared between the local authority and the proprietors?

If the total cost will amount to £100, or upwards, tenders must be invited under subsec. (1) of sec. 174 of the Public Health Act 1875. If the total cost will exceed £50, there must be a sealed contract under subsec. (4) of the same section. If it is intended to spend more than £50 at one time, I think that to issue a series of orders for smaller sums would be an attempt to evade the Act. Possibly the seller could compel payment in spite of the absence of a sealed contract. See *Lawford v. Billericay Rural District Council*, 1903, 1 K.B., 772). But in the event of the council having any cause of complaint (such as, *e.g.*, quality of the material, non-delivery, &c.) the absence of a sealed contract might place them in a difficulty.

PUBLIC FOOTPATHS.—"B." writes.—I shall be glad of any information you can give me on the following subject: My council have not had conferred upon them the powers of a parish council for the repair of public footpaths under secs. 13 and 33 of the Local Government Act, 1894, and questions have arisen: (1) As to the liability of the council for the repair of public footpaths and bridges? (2) As to the liability of the council for any accidents that may occur, providing (*a*) such powers have not been obtained, and (*b*) after such powers have been obtained?

(1) With regard to public footpaths dedicated before 31st August, 1835, the council, as highway authority, are liable to keep them in repair. The council are not liable to repair footpaths dedicated after that date unless the formalities of sec. 23 of the Highway Act, 1835, or of some other Act, have been observed, so as to impose this liability on the highway authority. The liability as to bridges forming part of the highway (and not being county bridges) is similar. (2) The council are not liable for accidents due to mere neglect to repair, either before or after such powers have been obtained.

COMPENSATION TO OFFICERS.—"Cymro" writes: Would district highway surveyors (South Wales) appointed previous to the passing of the Local Government Act, 1894, having received notice from the district council to terminate on March 31st next their appointments as surveyors of highways and to vacate and relinquish such offices on that date, with a view to rearranging salaries and duties (the clerk adds in a letter), be entitled to superannuation or compensation in the event of such rearrangement proving unsatisfactory to the officers and supposing they discontinue their duties at the expiration of the notice?

If the notice to determine the appointment was given in pursuance of or in consequence of the Act of 1894, the officer would be entitled to compensation for any direct pecuniary loss, having regard to the conditions of his appointment, the duration of his services, the amount of the fresh salary offered and all the other circumstances of the case.

HIGHWAY: FOOTPATH CROSSINGS.—"Urban" writes: Will you kindly inform me through your paper whether local authorities can compel owners of property to repair private footpath crossings in adopted streets? If so, I shall be glad if you will refer me to the statute conferring such powers.

Assuming that by a "private footpath crossing" is meant a portion of the public footpath so constructed or paved as to afford convenient access for vehicles to adjoining property, in the absence of special agreement I am not aware of any statutory or other obligation on the part of owners to keep such crossings in repair.

IRISH COUNTY COUNCILS.—"Melrose" writes: Could you inform me what are the principal Acts under which the county councils of Ireland work? and could you recommend me a good practical guide to legislation the scope of which would meet the requirements of an aspirant for a county surveyorship in Ireland?

The principal Acts are the Local Government (Ireland) Acts of 1898, 1900, 1902 and 1906. I am sorry that I do not know any book which would meet "Melrose's" requirements.

SEWERAGE: WATERCOURSE.—"Perplexed" writes: In an old country village most of the houses (about forty) drain into a watercourse, which is covered in in some places, but mostly open. (1) In your opinion is this a public sewer? (2) If not, can the rural district council compel the owners to cut off the drains from their property now discharging into the watercourse without the council first providing other means of drainage for the village, such as a proper sewer? There are no other methods of disposal.

(1) The mere fact that sewage has been discharged into a watercourse for a number of years is not of itself sufficient to make it a "sewer." (*Yorkshire West Riding Rivers Board v. Gaunt*, 1906; 70 T.L.R., 140.) It is a question of fact and of degree. (*Newcastle-upon-Tyne Corporation v. Hoosemans*, 83 J.P., 85.) Each case must be decided on its own facts and circumstances. See *Attorney-General v. Leeds Corporation*, noted in this column on Sept. 8th last. (2) If the stream is not a "sewer," the owners can be compelled to cut off their drains by proceedings under the Rivers Pollution Prevention Act, 1876. But inasmuch as it is the duty of the council to make such sewers as may be necessary for effectually draining their district, the council would have to provide a proper sewer.

PRIVATE STREET WORKS: PREMISES BENEFITED BY WORKS.—"Enquirer" writes: An urban authority has decided to put in repair a certain street (black on accompanying sketch). Under the Private Street Works Act, 1892, sec. 10, can the property marked A be charged under the greater or less degree of benefit

derived? The property in question makes use of the street for all purposes; in fact, it is the only way to it. Would it be equitable to make a charge on this property A for this portion, seeing that in future the street may be continued to this point, and A would be called upon to pay the full frontage?

If the property will, in the opinion of the authority, be benefited by the works, they have apparently power under sec. 10 of this Act to include it in the provisional apportionment. But it would be open to the owner, under sec. 7, to object on ground (b), and if he did so, such objection would have to be decided by the magistrates. Personally, I do not think this is the sort of case intended by sec. 10 (though the words of the section seem wide enough to include it), and it certainly does not seem equitable that this property should be charged both now and in the future also.

HOUSE DRAINAGE: SEPARATE DRAINS.—"Secundus" writes: Is a local authority—(1) urban or (2) rural—where the general drainage is on the combined system empowered to require drainage on the separate system—(*a*) at its discretion, or (*b*) by defining a district within its area for this method of treatment—and, if so, under what Act is the power conferred?

As regards houses about to be erected or re-erected after being pulled down, an urban authority can require a separate drain for each house under sec. 25 of the Public Health Act, 1875. (*Woodhead v. Yeadon Local Board*, 1899, 1 Q.B., 491; *Yeadon Local Board v. Sharp*, 18 T.L.R., 129.) The powers of this section may be conferred upon a rural authority by the Local Government Board. As regards existing houses, if the drains are insufficient the authority (urban or rural) can require new drains to be provided under sec. 23 of the same Act, and in that case a separate drain for each house could be enforced. Or if the drains, though sufficient, are not adapted to the general sewage system, the authority (urban or rural) could provide new drains at their own expense under sec. 24.

HIGHWAY: CUTTING TREES.—"Dry-well" writes: I have recently issued notices requiring the cutting, trimming and lopping of trees in this district, and several objections have been made on the ground that the trees are "ornamental." Can you refer me to any decision or definition as to the meaning of the term "ornamental tree"? The notices were served in accordance with the Highways Act, 1835, sec. 65. Your opinion, or that of any fellow-surveyor, will be esteemed.

There does not appear to be any decision as to the meaning of the expression "trees planted for ornament" as used in this section. Presumably it would be a question of fact in each particular case whether a tree or trees in respect of which exemption was claimed had been planted for ornament, and this would be for the magistrates to decide upon the evidence.

**We have to draw the attention of queriats to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.**

# Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

## THE MONTHLY PREMIUM.

Mr. W. E. BLIZARD (Southampton) has selected the following books in respect of the premium for December:—

"Notes on Irrigation Works," by N. F. McKenzie (Constable).

"The Theory of Design of Structures," by E. S. Andrews (Chapman & Hall).

"The King's Highway," by R. Kyves (St. Bride's Press).

## QUESTIONS.

This week answers are invited to the following questions:—

**219. Tram Rails.**—Describe an accurate, practical method of measuring the wear of a steel-girder tram rail. (T. R.)

**223. Reinforced Concrete Bridge.**—Design a reinforced concrete bridge to carry a 36-ft. main road over a river (at right angles), single span 60 ft. between abutments, 36 ft. wide, 20 ft. from mean surface of water to the crown of arch. Banks 5 ft. above mean water level; foundations 15 ft. clay, then hard red sandstone. Allow for usual main road traffic, and show calculations. (A. P., *Liverpool*.

**224. Town Planning.**—What are the chief points to be considered in laying out a new town?

**226. Sewage Pumping.**—Show calculations arriving at the diameter of a sewage pumping main sufficiently large to meet the requirements of the Local Government Board for a population of 4,500 upon the partially separate system, the velocity through the main being at the rate of 4 ft. per second, the water supply of the district being at the rate of 16 gallons per head, the population being distributed in 1,000 houses scattered over about 4 miles of roads, the pump well being so situated that an overflow, if allowed by the Local Government Board, could be arranged so as to discharge into a brook near to. ("Student.")

**227. Refuse Disposal.**—Describe, with illustrations, the most efficient and economical form of refuse destructor for a village of 500 inhabitants. (M.Inst.Mun. and C.E., *Newcastle*.)

**228. Cost of Roads.**—What is the cost per square yard, complete, of constructing roads in (*a*) asphalte, (*b*) woodblock, (*c*) granite-pitching, (*d*) macadam, (*e*) cobblestone (*f*) tar-macadam? ("Brazilian.")

## REPLIES TO QUESTIONS.

**218. Aqueduct.**—What are the maximum centres at which the supports may be placed to carry a steel tube 2 ft. in diameter, full of running water, for a distance of 180 ft. at a height of 60 ft. above ground? (E. M. D., *Wood Green*.)

The following additional reply has been received since our last issue:

The question as given by the querist is incomplete, as the thickness of the steel tube is not given, and this will to a great extent determine the spacing of the supports. The tube may be freely supported between the supports, or it may be supported by trussing, depending on whether a wide or close spacing is desirable. Assuming the tube to be formed of ¼-in. Siemens steel plating, and taking it as freely supported between supports, the calculations would be as follows:

*Weight of tube per foot run.* Sectional area = $\pi \times 24 \times 0.25 = 23.56$ sq. in. Taking steel at 2.5 lb. per cubic foot, and allowing say 5 per cent. for lap and rivets, the weight of the tube per foot run will be 61 lb.

*The weight of the water per foot run* = 3.14 cub. ft. $\times$ 62.5 lb. = say 196 lb.

The total weight to be carried per foot run = 196 + 61 = 257 lb. per foot run. Anything in the way of cradles, bracing, or bolting, &c., which will probably increase the weight, must be added here.

Let $l$ = the maximum safe span.

The tube may be considered as a continuous beam of hollow circular section. The maximum bending moment will occur over the support, and may be taken roughly at $\frac{wl^2}{10}$, the actual bending moment depending on the number of spans between supports. The section modulus

$$Z = \frac{I}{y} = \frac{\pi}{32}\left(\frac{D^4 - d^4}{D}\right) = \frac{3.1416}{32}\left(\frac{24.625^4 - 24^4}{24.625}\right) = 143.$$

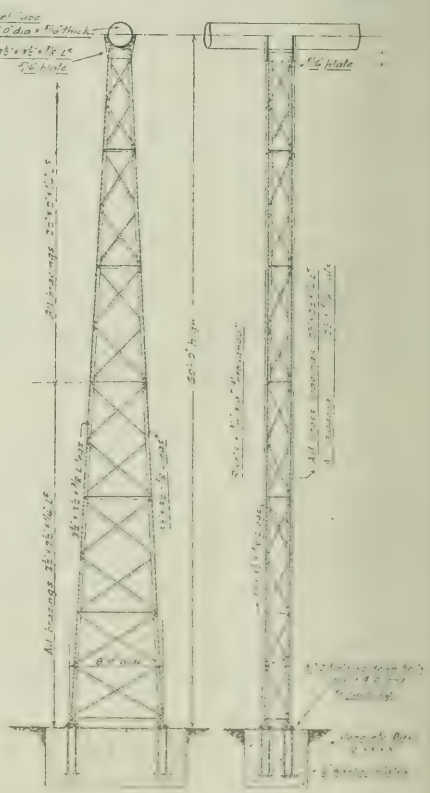
Allowance must be made for loss of strength by riveting, say 60 per cent efficiency of the solid plate. Taking a safe working stress of $f = 6\frac{1}{2}$ tons per square inch, we now have: Bending moment = moment of resistance

$$\frac{wl^2}{10} \times 12 = fZ$$

$$\therefore l = \sqrt{\frac{10fZ}{12w}} = \sqrt{\frac{10 \cdot 6.5 \cdot 2,240 \times 143 \times 6}{12 \times 280}} = \sqrt{3.718}$$

= say 60 ft. maximum safe span centres of supports.

The load due to snow lying on the pipe may be neglected, as it will not occur with the maximum



wind pressure. The wind will tend to bind the tube to the supports between the supports. Taking the wind at 40 lb. per square foot, the pressure on the semi-cylindrical surface of the tube will be $\frac{40}{2} = 20$ lb. per square foot. The wind pressure per lineal foot will then be $20 \times 2 = 40$ lb., and the stress induced in the tube due to wind pressure is obtained by the formula

$$\frac{M}{I} = \frac{f}{y} \quad \text{i.e.} \quad \frac{12w}{10} = \frac{f}{1} \quad \therefore f = \frac{12w}{10Z}$$

Then $f = \frac{12 \times 40 \times 60 \times 60}{10 \times 143 \times 6} = 2,014$ lb. per square inch, and $\frac{2,014}{2,240} = 9$ tons per square inch.

The maximum stress in the tube due to the combined vertical and horizontal bending moments $= f$ maximum $= \sqrt{6{\cdot}5^2 + {\cdot}9^2} = \sqrt{43} = 6{\cdot}55$ tons per square inch. The tube must also be tested for deflection. The total maximum resulting load due to dead and wind loads will be 283 lb. × 60 ft. = 16,980 lb. = say 7·6 tons. Maximum deflection in inches

$$= \frac{wl^3}{384\,EI} = \frac{7{\cdot}6 \times 720 \times 720 \times 720}{384 \times 12{,}000 \times 1029{\cdot}6} = {\cdot}6 \text{ in.}$$

This is well within the usual allowance for beams of $\frac{1}{40}$ in. per foot of span, which would give $1\frac{1}{2}$ in.

The maximum safe span may therefore be taken as 60 ft. to centres of supports.

*Supports.*—The supports for the tube, being 60 ft. high, should take the form of a braced tower, as shown in the sketch. The total dead load due to tube, and water supported by each tower will be $280 \times 60 = 16{,}800$ lb. = 7·5 tons, and add for weight of tower say 2·5 tons, giving a total dead load on each tower = 7·5 + 2·5 = 10 tons.

The wind pressure at 40 lb. per square foot on each tower will be as follows:—

(*a*) On tube = 40 lb. per lin. ft. × 60 ft. = 1·07 tons.

(*b*) On tower = 50 sq. ft. + 50 per cent for 2 side = 75 sq. ft. at 40 lb. = 1·35 tons.

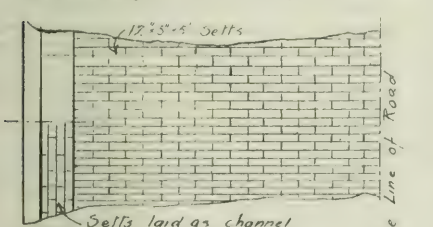
The maximum compression in each leg at base of tower $= \frac{10}{4} + \frac{(1{\cdot}07 \times 60) + (1{\cdot}35 \times 30)}{8 \times 2 \text{ legs}} = 2{\cdot}5 + 6{\cdot}5 = 9$ tons on an unsupported length of 5 ft., requiring a 3½-in. × 3½-in. × ⅜-in. angle. The maximum shear at the base on each side of the tower $= \frac{1{\cdot}07}{2} + \frac{1{\cdot}35}{2} = {\cdot}54 + {\cdot}68 = 1{\cdot}22$ tons.

∴ The tension and compression in the lower bracings $= \frac{1{\cdot}22 \times 8{\cdot}5}{8} = 1{\cdot}3$ tons, requiring 2½-in. × 2½-in. × ½-in. angle. In the upper half of the tower the bracings may be reduced to 2½-in. × 2-in. × ½-in. angle.

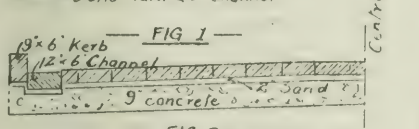
The general arrangement of the tower will then be as shown in sketch, which gives all particulars as to scantlings, &c. (T. M., *Manchester.*)

**225. Road Construction.**—Specify the construction of a new stone-pitched road to bear heavy town traffic, and draw a section of same. (T. R.)

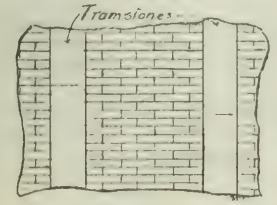
Excavate the ground to an average depth of 18 in.



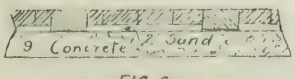

— FIG 1 —




— FIG 2 —




— FIG 3 —




— FIG 4 —

for carriageway, —— feet wide to contour, as shown on drawings, cart away and dispose of surplus earth. Fill in to carriageway with cement concrete, 9 in. (or 12 in.) thick, composed of 1 part of Portland cement and 5 parts Thames ballast, formed to a cross-fall of ⅜ in. to 1 ft. from the crown of the road to the side channels, with the crown rounded off 2 ft. each side of the centre. Lay 3 in. × 5 in. deep × 12 in. long Aberdeen (or Leicester or Cornwall) granite setts in parallel courses, touching and bedded on 2-in. fine sand (or hoggin or ballast) and grouted up with cement-grout composed of 1 part cement and 1 part sand, and well ram. Each stone to be fairly dressed and squared the full width.

Form side channels with 12-in. × 6-in. Aberdeen granite, laid flat, in lengths of not less than 3 ft., finely axed top and side faces, bedded on sand and grouted in cement, as shown on drawings.

Form kerb with 9-in. × 6-in. Aberdeen granite laid on edge, projecting 6 in. above the level of the channel, in lengths of not less than 3-ft. finely axed top and side faces, laid as shown on drawings. The outer edge of the kerb to be chamfered off 1 in. wide.

The above are specification clauses for granite sett pavings in accordance with the usual practice.

The channels may, if preferred, be laid with setts, but it is not so clean as flat stones in long lengths. The alternative methods are shown in Fig. 1.

Other stone may be used in place of granite, but granite is far superior. The usual sizes of granite-pitching are as follows:—

Guernsey granite 5 in. × 6 in. deep, 4 in. × 7 in. deep, 3 in. × 5 in. deep.

Aberdeen granite 5 in. × 6 in. deep, and 3 in. × 5 in. deep.

The length of the pitching varies from 8—14 in. long.

In the case of narrow roads, tram stones, about 12 in. × 6 in. deep, laid like channels, about 4 ft.—6 ft. centres (the distance apart of the wheels of an average van), are very useful, as they tend to concentrate the traffic into lines. They do not make nearly as much noise as small setts, and the small sett paving in between the tram stones gives just as good a foothold for the horses. This arrangement is shown in Figs. 3 and 4. (J. A. R., *Milton Regis.*)

## INSTITUTE OF SANITARY ENGINEERS.

### FORTHCOMING MEETINGS.

At Caxton Hall, Westminster, on Wednesday, January 31st, Mr. A. J. Martin will deliver his presidential address to the members of the Institute of Sanitary Engineers. The Hon. Sir John McCall, Agent-General for Tasmania, will take the chair at 8 p.m.

A sessional meeting will be held at the Royal United Service Institution, Whitehall, on Monday, February 12th, when a paper on "Hospitals and Sanatoria" will be read by Messrs. A. Alban H. Scott (Fellow) and F. C. Davies (medical officer, Battersea Tuberculosis Dispensary). Mr. Edward White, J.P., chairman, London County Council, will take the chair at 8 p.m.

A sessional meeting will be held at Caxton Hall, Westminster, on Monday, February 26th, when a lecture on "Sanitary Building Construction" will be given by Prof. Henry Adams, M.INST.C.E., M.I.MECH.E. Mr. Edwin T. Hall, F.R.I.B.A., F.R.SAN.I., will take the chair at 8 p.m.

A sessional meeting will be held at Caxton Hall, Westminster, on Monday, March 11th, when a paper on "The Modern Home" will be read by Mr Percival M. Fraser, A.R.I.B.A. The chair will be taken at 8 p.m.

## CORRESPONDENCE.

"*All truth is precious, if not all divine.*"—COWPER.

### DESIGN OF PRIVIES AND ASHPITS.

*To the Editor of* THE SURVEYOR.

SIR, I feel sure that all interested in sanitation will be glad to hear what success attends the erection of privies and ashpits from Mr. Brook's excellent design in this week's SURVEYOR.

The end elevation certainly possesses the charm of novelty in arrangement. Its utility, however, is a matter of opinion.—Yours, &c.

T. HALL.

Hampstead, N.W.
January 19, 1912.

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Earby U.D.C.** (January 23rd. Mr. R. H. Bicknell).—£300 for the purpose of sewering at Green End.—Mr. J. E. Aldersley, surveyor to the council, explained the scheme, which is for the proper drainage of houses in Rushton-street at present drained into a cesspool. Owing to the boggy character of the ground, the proposed sewer is to be laid so as to rest on the clay bed underlying the bog, and is to be encased in concrete.

**Hammersmith B.C.** (January 8th. Mr. A. A. G. Malet.)—£4,356 for the provision of public conveniences in the Broadway.—It was stated that in connection with the widening of the Broadway at a cost of £45,000 a subway from north to south is being constructed, the scheme including the provision of lavatories. Mr. H Mair, borough surveyor, gave evidence respecting the construction of the subway and lavatories. The inspector: The question of acquiring any land does not come into this application? The surveyor: No, sir. The town clerk said that the London County Council would contribute two-thirds of the net cost of the improvement. In answer to further questions, the surveyor said all the land necessary for this purpose had been acquired. At present the sum of £1,400 had been paid to the contractor on two certificates for work done. They had been pressed very much by the London County Council to go on with the work. They were employing direct labour to expedite the making up of the north side of the road. The whole of the Broadway would have to be repaved. Mr. Malet: Have you any loan in connection with this improvement? Mr. A. G. Keen, the accountant, said they had taken up three loans on the improvement, which came to £26,000. In answer to the inspector, Mr. Thompson, the town clerk, said they were waiting for the sale of land to see what amount of money would be required. There was no loan in respect to the road-work.

**Larne R.D.C.** (January 11th. Mr. A. D. Price).—£600 to acquire lands in the townland of Limmary otherwise than by agreement in connection with a new water scheme for the town of Carnlough.—The clerk, Mr. Samuel M. Wallace, stated that on August 23rd, 1911, the council agreed to apply for a Provisional Order, and Mr. O'Neill was asked to supply plans with an estimated cost of the proposed scheme. In 1910 the council endeavoured to purchase by agreement a portion of ground, but the terms were so exorbitant the council could not accept them. The estimated population of Carnlough was 639, with an increase of 200 in the summer months. The council charged no water rates. John Dempsey, water inspector, in reply to Mr. M'Ninch, said there was a scarcity of water in several streets in the summer. Dr. Magowan (Glenarm) said he had reported a shortage of water in 1909, and frequently since, and there had not been an adequate supply for a considerable time. He considered that the Grove spring was perfectly pure. Mr. M'Cann—Is the present supply sufficient for the town of Carnlough? Witness—Oh, yes; but not for the houses adjoining. From a public health point I would go in for a good water supply.

**Leicester T.C.** (January 14th. Mr. M. K. North). £17,350 for the purposes of a public hall.—The town clerk, Mr. H. A. Pritchard, gave a history of the proceedings connected with the undertaking, pointing out that Leicester had no public hall capable of holding a large number of people. The hall which it was intended to build would provide accommodation for 3,000 seated and for 4,500 altogether. Mr. Stockdale Harrison, architect, who submitted and explained the designs for the new hall, said in reply to the inspector that he was sure the scheme could be carried out for the amount stated. The site was an excellent one. Replying to Councillor Yearby, who opposed the scheme, he said he thought the life of the hall would be fifty years or over, and it would not be very expensive to keep in repair.

**Sheffield T.C.** (January 17th. Mr. T. Adams).—This was an inquiry in respect of the corporation's application for authority to prepare town planning schemes for three areas within the city boundaries. These areas are at Greystones and Dannerdale (180 acres), Sandygate (104 acres), on the western side of the city, and Firth Park, Wincobank, and Shiregreen (527 acres), on the eastern side. The inquiry was attended, in addition to many of Sheffield's public men, by prominent officials and corporation members from Liverpool, Birmingham, Leeds, Stockport, Halifax, York, Newcastle-on-Tyne, and Rotherham.—The town clerk said the Bannerdale and Greystones area comprised land ripe for building purposes, and if it was to be developed in relation to that of adjoining areas it must be developed under a town planning scheme.—Alderman H. K. Stephenson, chairman of the Improvement Committee and the Town Planning Sub-Committee, said the chief reason for a town planning scheme was to prevent the continued "over-development," which had been going on in areas immediately adjoining that proposed to be dealt with.

### APPLICATIONS FOR LOANS.

**Bracebridge (Lincs) U.D.C.**—£300 for new municipal offices.

**Bromley T.C.**—£377 for making up a road.

**Cardiganshire C.C.**—£800 for the improvement of Rhyd Bridge.

**Cleckheaton U.D.C**—£910 for alterations at the public baths.

**Croydon T.C.**—£950 for sewerage works.

**Huddersfield T.C.**—£8,770 for the provision of workmen's dwellings, and £15,500 for sewage disposal works

**Mansfield T.C.**—£130 for works at Carter Lane School.

**Navan U.D.C.**—£1,250 for alterations at the waterwork. and for additional plant.

**Shildon (Durham) U.D.C.**—£3,000 for the purchase of land for a recreation ground.

**Stone R.D.C.**—£4,500 for a sewage disposal scheme.

**Surbiton U.D.C.**—£14,770 for the purchase, &c, of the recreation grounds and allotments at Tolworth.

**Tralee U.D.C.**—£3,000 for a new technical school.

### LOANS SANCTIONED.

**Blean R.D.C.**—£19,940 for sewerage and sewage disposal purposes.

**Brighton T.C.**—£5,200 for the extension of the enclosures on the western esplanade.

**Bromley T.C.**—£272 for surface-water drainage.

**Buxton U.D.C.**—£5,000 for the mineral-water pump-room, £2,300 for filters at the Lightwood reservoir, and £465 for scavenging plant.

**Croydon T.C.**—£13,468 for the erection of an elementary school.

**Herefordshire C.C.**—£1,000 for alterations at the secondary school.

**Nantyglo and Blaina (Mon.) U.D.C.**—£17,000 for the erection of seventy workmen's dwellings, making roads, and the purchase of land.

**Newton (Lancs) U.D.C.**—£1,060 for the purchase of two steam motor wagons.

**Newtownards U.D.C.**—£1,400 for the provision of a roof over the Ballycullen reservoir.

**Risca U.D.C.**—£2,950 for the erection of sixteen dwellings.

**Southend T.C.**—£1,433 for road improvement purposes.

**Tottenham U.D.C.**—£700 for an improvement at the junction of St. Ann's and Seven Sisters roads; £400 of the £700 will be spent in the purchase of the land, the balance going to the cost of the work.

**Warrington T.C.**—£21,992 for street improvements.

**Watford U.D.C.**—£5,536 for works of paving.

### FORTHCOMING INQUIRIES.

| JANUARY. | £ |
|---|---|
| 30. **Rishton.** For sewerage purposes (Mr. F. H. Tulloch) | 400 |
| 30. **Taunton.** For the purposes of electricity undertaking (Mr. T. C. Ekin) | 2,500 |
| 30.—**Wednesfield.** For bridge-widening purposes (Mr. A. W. Brightmore) | 350 |
| 31. **Dukinfield.** For street improvement works (Mr. A. W. Brightmore) | 3,740 |

# The Surveyor

And Municipal and County Engineer.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| | £ |
|---|---|
| 31.—**Exeter.** For the extension of the Infectious Diseases Hospital (Mr. R. Deane Sweeting) | 15,500 |
| 31.—**Llanelly.** For the provision of workmen's dwellings (Mr. Edward Leonard) | 3,432 |
| 31.—**Mansfield** For public baths purposes (Mr. Courtenay Clifton) | 620 |
| 31.—**Newquay.** For the provision of a pavilion (Mr. M. K. North) | 1,250 |
| 31.—**Rugby.** For the extension of the public baths (Mr. R. H. Bicknell) | 750 |
| 31.—**South Mimms.** For works of sewage disposal (Mr. R. G. Hetherington) | 1,800 |
| 31.—**Tynemouth.** For the purposes of the refuse depot (Mr. H. Shelford Bidwell) | 2,900 |
| 31.—**Wigan.** For laying out a recreation-ground (Mr. F. H. Tulloch) | 500 |
| 31.—**Witney.** For the purchase of an electricity undertaking (Mr. T. C. Ekin) | 6,800 |

FEBRUARY.

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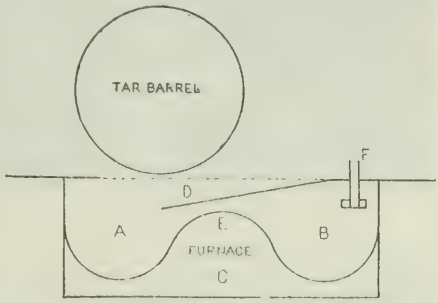
|---|---|
| 1.—**Crompton.** For laying out a recreation ground (Mr. F. H. Tulloch) | 2,500 |
| 1.—**Friern Barnet.** For the provision of allotments (Mr. R. H. Bicknell) | 2,500 |
| 1.—**Middlesbrough.** For outfall sewer purposes (Mr. H. Shelford Bidwell) | 1,156 |
| 1.—**Saltash.** For road works and the provision of a bathing place (Mr. M. K. North) | 250 |
| 1.—**Sevenoaks.** For works of sewerage (Mr. F. O. Stanford) | 1,100 |
| 1.—**Skipton.** For footbridge, depot, and stabling purposes (Mr. A. W. Brightmore) | 5,650 |
| 1.—**Surbiton.** For the purchase of land for a recreation ground and allotments (Mr. Edgar Dudley) | 14,770 |
| 2.—**Ilkley.** For works of water supply (Mr. A. W. Brightmore) | 2,100 |
| 2.—**Luton.** For the purposes of public baths (Mr. F. O. Stanford) | 15,000 |
| 2.—**Plymouth.** For the purposes of the museum (Mr. M. K. North) | 1,600 |
| 2.—**Runcorn.** For water-carriage purposes and water supply (Mr. F. H. Tulloch) | 10,000 |

## TAR-PAINTING ROADS BY HAND.

The greatly increased use of tar and tar compounds for preventing dust and preserving the roads is bringing out every year new appliances. Among the latest improvements in this connection is the new rapid heating boiler brought out by Messrs. Johnston Brothers, of 79 Mark-lane, London, E.C. Engineers and surveyors who have tar-painting work to do find that the greatest loss of time is in waiting for the tar to be sufficiently heated for use. With this new boiler no time is lost in changing the barrels. As soon as one barrel is empty a fresh one is rolled on to the platform. No pulley, crane, or other means are necessary to lift the barrel on to the boiler. As will be seen by the illustration, it can be rolled off a hand trolley, or it can be tipped from the road on to the platform. The tar runs into a heating chamber of special design.

It will be observed from the sketch that the tar, &c., first runs into section A of the heater; when section A is full the tar runs over the raised centre E into section B. The furnace C heats both sections, A and B, and being placed directly under the raised centre E, the tar flowing over this raised centre in a shallow stream is quickly heated to a high temperature. From section B heated tar is then pumped into the boiler through the suction pipe F. This suction pipe is placed over the fire-box, and is therefore kept heated, so that there is no loss of temperature to the tar when




RAPID-HEATING TAR BOILER. SECTIONAL DRAWING OF HEATING CHAMBER.

passing through the suction pipe. The temperature of the tar in the boiler is raised to any heat required.

It will be seen that the safety plate D is fixed over section B, so that no cold tar can enter that section. All tar direct from the barrel must first enter section A. It will also be seen that the suction pipe F is placed so that sufficient liquid is left in the heater to cover the raised centre E, thus avoiding any risk of burning the plates.

The heat from furnace C rising to the platform on which the barrel is placed causes the tar, &c., to flow more easily from the barrel. Most users of heavy tars and other materials have found it necessary to place the barrel on top of the boiler in order to get the contents to flow. This operation necessitates the use of planks, shearlegs, or a crane, and entails risk to the men working, and also causing loss of time.

The opening in the platform above the heater is covered by a wire strainer, and the whole top of the boiler is covered by a wire strainer (both strainers are removable). The tar, &c., is thus strained twice before being used.

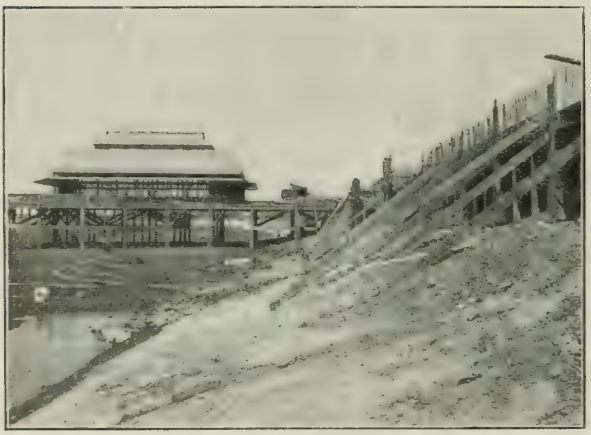
The whole contrivance is mounted on wrought-iron wheels on roller bearings, and when fully loaded and with a full barrel of tar can be easily moved by one man.

During last season some 200 councils adopted the Warriman's reservoir tar-brooms, and about 1,000,000 yds. were tar-painted with this apparatus under contract by Messrs. Johnston Brothers, the firm also supplying over sixty councils with their "1911" tar boiler and cask carrier combined.

**New Bridge at Liverpool Docks.** At a recent meeting of the Mersey Docks and Harbour Board the proceedings of the Marine Committee included a recommendation to place a new bridge 46 ft. south of the existing bridge No. 2, George's Landing-stage, and to move the last-mentioned bridge 69 ft. northward from its present position, at a total estimated cost of £8,700.

# Burnham Promenade Extension and Marine Pavilion Pier.

The January issue of *Ferro-Concrete*—a special New Year's number—contains an illustrated description of the new promenade, pier and pavilion works which have recently been carried out at Burnham, Somersetshire. The original designs provided for construction with cast-iron columns, steel beams and reinforced concrete decking, but it was afterwards decided to execute the whole in Hennebique ferro-concrete, from the plans of Mr. W. H. Chowins, engineer to the urban district council. The plans and particulars were placed before the Local Government Board, and after an inquiry held on their behalf the scheme was passed by the board, but in accordance with the attitude taken up by them in the matter of public works if proposed to be carried out in ferro-concrete, they only allowed fifteen years for repayment.



Burnham Pavilion and Pier.

The total length of the promenade extension is about 1,500 ft., and its width 20 ft. from the kerb of the new road surface to the inside of the ferro-concrete parapet. The promenade decking consists of a continuous slab, 4 in. thick, connecting 4-in. by 8-in. beams spaced 5 ft. apart centre to centre. The beams are supported at the landward end by a new concrete wall, 18 in. thick, behind the old seawall, and at the seaward end by a continuous beam, 6 in. wide by 10 in. deep, carried by columns 10 in. square, spaced 15 ft. apart. In each slab panel an opening 3 ft. 6 in. long by 1 ft. 6 in. wide is provided to permit the passage of compressed air and water in rough weather, so as to obviate undue strain on the decking. These openings are protected by gratings. All the ferro-concrete work is constructed on the Hennebique system, special care having been taken to render it monolithic throughout, so as to be able to act as a single unit in withstanding the force of the waves.

The columns are terminated by extended footings, 3 ft. square, moulded on solid concrete blocks 4 ft. 6 in. square in plan, and after construction of the columns mass concrete was filled in around them up to the level of the stone pitching. The sea front of the promenade is finished by a parapet wall 2 ft. high by 3½ in. thick, with a coping 12 in. wide.

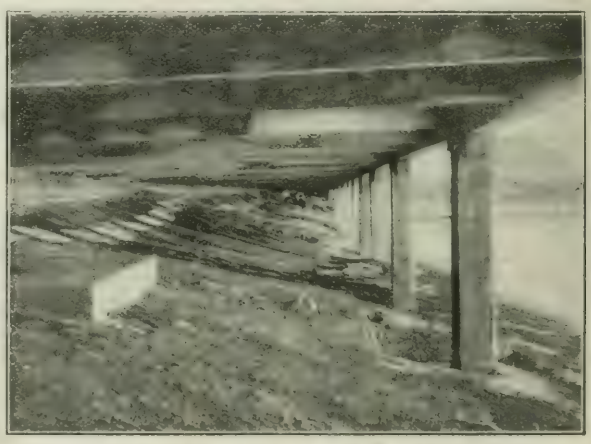
It should be noted that the parapet is really capable of acting with the beam underneath, the two members together forming a girder 3 ft. 2 in. deep, and of very great resistance to flexure. Another point is that the deck slab actually constitutes a compression flange common to all the transverse beams, thereby increasing their strength very greatly—advantages incidental to monolithic ferro-concrete, and which cannot be obtained in any ordinary method of construction, where the value of each unit must be gauged by its individual resistance. The height of the wall above the pitched slope ranges from 5 ft. 9 in. to 9 ft. 6 in., and ferro-concrete stairways are provided at intervals for access to and from the beach. In the length of the promenade are fifteen seat recesses, each 14 ft. long, which project 4 ft. in front of the general line of the promenade, and are carried from the columns on ferro-concrete brackets. The seats placed in these recesses do not interfere at all with the use of the promenade.

### Marine Pavilion and Pier.

The structure upon which the new marine pavilion is built projects over the sea 125 ft. beyond the front of the promenade extension, and is 80 ft. wide. It is supported by ferro-concrete columns, the base of each being embedded in a foundation block of plain concrete resting on solid clay. The columns are braced horizontally and diagonally in longitudinal and transverse directions, and connected at the top by main beams which carry secondary beams, the whole system being covered by a continuous slab forming the decking.

The pier decking is 4 in. thick, carried by longitudinal main beams, 8 in. by 15 in., transverse main beams, 8 in. by 17 in., and secondary beams, 4 in. by 9 in. The columns are 10 in. square, and are finished by extended bases, 3 ft. square, embedded in solid concrete foundation blocks, 5 ft. square by 4 ft. deep.

The pavilion is an ornamental steel structure, erected by Messrs. Macfarlane, of Glasgow, with seating accommodation for 500 persons, and is fitted with platform and dressing-rooms, and lavatory and cloak-rooms. The projecting verandah will cover an additional 250 persons.



View under Burnham Promenade.

The engineers for the ferro-concrete work were Messrs. L. G. Mouchel & Partners, Westminster, S.W., and the contractor for the works was Mr. Gwilym L. Morgan, of Pontypridd.

# Municipal Work in Progress and Projected.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Dudley £8,350, Ventnor £3,700; housing and town planning—Merthyr £8,789, Yeovil £24,000; roads and materials—Blackpool, Montgomeryshire, Northamptonshire, Worcester; sewerage and sewage disposal—Doncaster £5,839, Rochford, Upton £5,000; water, gas and electricity—Birmingham, Swansea.—Particulars of other works projected will be found on our "Local Government Board Inquiries" page.

## BUILDINGS.

**Bexhill T.C.**—The council have approved a report by Mr. W. T. Douglas, consulting engineer to the council, stating that, in his opinion, the time has arrived for taking steps to prevent the eastern travel of the shingle along the whole of the sea front. He suggests the depositing of stone and concrete blocks at the west bastion for this purpose. This would break the force of the waves and retain the beach material. He recommends this to be done, and also advises that the borough surveyor, Mr. G. Ball, should be instructed to prepare a scheme for generally preventing the travel of shingle, and protecting the sea front.

**Bingley (Yorks) U.D.C.**—A proposal by the Water and Fire Brigade Committee that swimming baths should be erected on a site in Leonard-street belonging to the council, at an estimated cost of £3,000, has been referred back to the committee.

**Dudley T.C.** — The Education Committee have accepted the tender of Mr. W. Deeley, Netherton, at £560, for the adaptation of the Northfield-road school, as a mixed department with 480 seats, and that of Messrs. Willett & Sons, Old Hill, at £5,279, for the building of a new infant and junior school, capable of seating 460, on adjoining land. The total estimated cost of carrying out the scheme is £8,350.

**Ellesmere R.D.C.**—The surveyor, Mr. W. H. Owen, has been instructed to prepare specifications for a 12-ft. span bridge at Llanfelin, both for a girder bridge and one in ferro-concrete.

**Laurencekirk T.C.**—The question of the provision of public slaughter-houses has been referred to the Public Health Committee for consideration and report.

**Llandrindod Wells U.D.C.**—A public library, the gift of Mr. Andrew Carnegie, has been formally opened.

**Long Eaton (Derbyshire) U.D.C.** — The question of securing a suitable site in the centre of the town for baths has been referred to the whole council in committee.

**Mansfield T.C.**—An arrangement has been come to with the Mansfield Railway Company for them to construct at their own cost a bridge carrying the road near Sherwood Hall over the line.

**Newport (Isle of Wight) T.C.**—A committee has been appointed to consider the advisability of providing baths and wash-houses for the borough.

**Ventnor U.D.C.**—A sea-wall, estimated to cost £3,700, is to be built at the Eastern Esplanade.

## HOUSING AND TOWN PLANNING.

**Aberystwyth T.C.** — An additional fifty workmen's dwellings are to be erected, and the barracks converted into flats.

**Clones No. 2 R.D.C.**—Tenders have been accepted for the erection of nine cottages, seven at prices ranging from £132 to £138, and two at £138 and £140 each.

**Dublin T.C.**—The Improvements Committee have had before them a very large housing scheme for the area bounded by Church-street, Stirrup-lane, Beresford-street, and Mary's-lane, an area which has been certified by Sir Charles Cameron, medical officer of health, as being both congested and unhealthy. The conditions of existence in this area are described in some of the official documents put before the committee as appalling. The committee have decided to recommend the council to have the entire area, which comprises about 4 acres, acquired and cleared. The plans which have been submitted show that after providing for five new roads, each 40 ft. in width, 246 two-storey cottages can be erected upon it. These cottages will each contain three rooms, including an extensive living-room, with good yard space, and necessary sanitary accommodation of a modern character.

**Guisborough U.D.C.**—A committee of the council has been appointed to consider the housing question consequent upon a report by the medical officer suggesting the repairing or closing of fifteen dwellings.

**Merthyr T.C.**—The tender of Messrs. Jones Bros., of Treharris, at £8,789, has been accepted for the erection of forty-eight workmen's houses.

**Much Woolton (Lancs) U.D.C.**—The council recently adopted recommendations from the Housing and Town Planning Committee requiring a number of improvements to be carried out at Pit-street, Gladstone-street, Mason-street, and Mill-street. It was also resolved that while back-to-back houses originally constructed as such should not be condemned on that ground alone, all houses in the district which have been converted into back-to-back dwellings should be reported, with a view to making them through houses.

**Saddleworth U.D.C.**—An extensive housing scheme has been entered upon by the council. Plots of land have been selected for purchase in Delph, Dobcross, Diggle, and Uppermill, the area amounting to about 32 acres, 26 acres of which are suitable for building. Twelve houses to the acre have been suggested, and altogether 300 houses will be erected in different parts of the district. The villages mentioned are very much congested, and there is a great dearth of workmen's cottages with suitable accommodation. The council's houses are to be of stone, every house is to have a separate yard and separate sanitary accommodation. The houses will be built in blocks of not more than six. The council have agreed to pay £200 and £300 per acre for land, and it is anticipated that £25,000 will be required for the first year, and the total cost is estimated at £60,000.

**Yeovil T.C.**—The Housing Committee have decided upon a housing scheme to consist of 150 houses, the houses to be divided into three groups of fifty each. Group 1 (to be erected during 1912)—thirty-six 5-room houses, proposed to be let at 5s. per week each; six 4-room houses, at 4s.; and eight to be let as sixteen flats, at 2s. each. Group 2 will consist of forty-eight 5-room and two 4-room houses; and Group 3 likewise. The 5-room cottages will have a frontage of 16 ft. and a depth of 25 ft., and the 4-room cottages a frontage of 15 ft. 4 in. and a depth of 20 ft. 9 in. The committee recommend that the tender of Messrs. T. H. Moggridge & Son, of Taunton, amounting to £20,748, for the houses, be accepted. The details are—Group 1, £6,848; Group 2, £6,817; Group 3, £6,813. The committee also recommend that the tender of Messrs. Steer & Pearce, of Plymouth, amounting to £2,536, for the surveying and constructing of the streets, be accepted; and that the Local Government Board be asked to sanction the borrowing of £24,035, being the sum required for the carrying out of the scheme, in addition to the cost of the land, which has already been applied for; also of a further sum of £185, required for the purpose of providing a separate system of drains for surface water.

## PARKS AND OPEN SPACES.

**Dawlish U.D.C.**—It has been referred to the Pleasure Grounds Committee to consider the question of purchasing Sea Lawn Garden and a strip of frontage to the eastward. The property has a frontage on the main Exeter-road of 750 ft., and of 650 ft. on the sea front.

**Islington B.C.**—It has been decided to purchase as an open space the land in Barnsbury-square (subject to the consent of the owners being obtained) for the sum of £2,000, and that application should be made to the London County Council for consent to the borrowing of the money. The Metropolitan Public Gardens Association have offered to renovate the garden and the seats, and the offer has been accepted.

**Long Eaton (Derbyshire) U.D.C.**—It has been decided to lay out the open space in Sawley-road in accordance with the plans of the surveyor, Mr. F. Worrall, and that recreation grounds be provided for children on the other side of the canal adjoining West Park. It has also been agreed to purchase 7½ acres of land east of the West Park from Lord Harrington for £560, the council to erect an iron fence along the boundary, to straighten the brook, and to pay all costs.

**Newcastle-on-Tyne T.C.**—A report was presented to the council last week relative to the proposed bowl-

ing green at Walker-road recreation ground, in which it was mentioned that there were in Newcastle more bowling greens than any other city of the same size. Last year the nineteen greens cost £758 for maintenance, and the income was £685, leaving a loss for the year of £73. A sum of £6,000 was invested at 3½ per cent for the construction of greens, so that the greens cost the council £300 a year.

**Ventnor U.D.C.**—The plans of the surveyor, Mr. H. H. Oakes, for the improvement in the public park, at an estimated cost of £63, exclusive of the provision of iron fencing, have been approved.

**Warrington T.C.**—The council have approved the plans of the borough surveyor, Mr. T. Longdin, for the construction of a bowling green and pavilion at Grace's Pottery, at an estimated cost of £765.

## ROADS AND MATERIALS.

**Abergele and Pensarn U.D.C.**—It has been decided to adopt a modified scheme of improvement, to cost £1,300, without calling a ratepayers' meeting, as had been previously suggested.

**Blackpool T.C.**—The corporation tramway service along the promenade, from Queen's-square to Gynn, is to be suspended while the whole of the track and carriage-drive are relaid with wood setts.

**Chertsey R.D.C.**—A horse-drawn tarring machine is to be purchased at a cost of £65.

**East Grinstead U.D.C.**—The council have passed a resolution similar to that forwarded by the Chailey Rural District Council, which asked the county council to divide into two parts the sum of £5,000, which the Road Board propose to allocate to the East Sussex County Council, and to allow half to the rural and urban councils of their area, instead of using the whole for county roads. It was decided to send copies of the resolution to the county council and the Road Board.

**Fylde R.D.C.**—A letter has been received from the Main Roads and Bridges Committee of the Lancashire County Council asking—as the committee desire to be guided largely by local opinion—whether the council preferred that the work of tar-spraying the roads should be continued or discontinued during the ensuing season. The question was discussed by the council, and farmers and others had great praise for the system of tar-spraying, and expressed their desire that the work should be continued.

**Glamorgan C.C.**—The Roads and Bridges Committee have adopted the recommendation of a sub-committee on roadmen's wages that roadmen be paid 27s. per week, "this rate to apply where the current wages in the particular district justify it." Steam roller men are recommended to receive 5s. a day on appointment, 5s. 4d. after two years, and 5s. 9d. after four years. The roadmen are also to receive suits of oilskins.

**Hereford C.C.**—The question of the maintenance of main roads by the council has been referred to the consideration of a special committee.

**Lancashire C.C.**—Having been promised by the Road Board a grant of £5,000 for the next two years for the purpose, the Main Roads and Bridges Committee have decided to circularise the various local bodies to ascertain whether they are in favour of the continuance of tar-spraying of the roads. The committee state that they have been inundated with complaints from farmers and horse owners, alleging that the tar makes the roads slippery, while, on the other hand, they have the fact that tar-spraying reduces the dust evil and lessens the damage done by motor traffic, and so lowers the cost of maintenance.

**Lancaster R.D.C.**—At a recent council meeting a letter was read from the county surveyor, Mr. W. H. Shofield, asking the opinion of the council on the question of continuing the tar-spraying of roads in the Lancaster rural district. Mr. G. Satterthwaite said, as chairman of the Ellel Parish Council, he had communicated with the county council, expressing the hope that the county council would continue the system of tar-spraying. It was a great boon indeed to the residents of Galgate. He hoped the council would strengthen the hands of the county authority. The chairman: Have you any information relating to accidents? Mr. Satterthwaite: I have only heard of one. Mr. E. Barton said tar-spraying was making their country roads into sheets of asphalte. They could not drive on them. An amendment was adopted that the county surveyor's letter lie on the table.

**Llandudno U.D.C.** A resolution has been passed authorising the application to the Road Board for a grant to construct and maintain the proposed through road to Colwyn Bay.

**Monaghan R.D.C.**—Mr. W. F. Barry, Assoc.M. Inst.C.E., county surveyor of Monaghan, was perforce called upon to inform the Monaghan Rural District Council lately that, owing to a variety of causes associated with their (the council's) road policy, the finances were in an unsatisfactory position. The course open to the council, he stated, was to obtain the sanction of the Local Government Board for a sufficient extension of their financial limit to meet all their increased liabilities. Twelve months ago he estimated the necessary increase at £1,000; that was the minimum, and he strongly recommended this course. The council, by a majority of eighteen against fifteen, refused to adopt the county surveyor's report, and after the chairman had told members who voted against the adoption that they would be held responsible for any accident that happened on the roads as a result of their vote, and that the payments to road contractors could not be made, the meeting broke up in disorder.

**Montgomeryshire C.C.**—The Main Roads Committee have agreed to apply to the Road Board for grants this year of £3,000 for making new roads and £3,000 for laying tar-macadam. The new roads suggested are from Pont Istrad to Dwyrhiw, near Llanfair, and the approaches to Cwmllinau Bridge, Cemwes. The greater portion of the money for laying tar-macadam will be spent on the main road from Welshpool to Newtown, but a certain sum will be apportioned among the towns and villages.

**Newport (Isle of Wight) T.C.**—It has been decided to include in the ensuing year's estimates £35 for the purchase of a tar-spraying machine and £50 for tar.

**Norfolk C.C.**—The Eastern Highways Committee have instructed the Road Development Committee to consider the question of improving the coastal lanes between Cromer and Hunstanton. Lord Leicester is stated to be willing to give up all the land for the necessary widenings.

**Northamptonshire C.C.**—Application has been made to the Road Board for grants towards the four schemes sanctioned by the county council at their last meeting, and the Roads and Bridges Committee recommend that additional applications should be made for financial assistance in respect of the following schemes: (1) The construction of a new by-pass road at Denton as shown on the plan now submitted to the county council, at an estimated cost of £3,000. (2) An extension of the scheme sanctioned by the Road Board for the raising of the flood area near the level crossing on the Northampton and Bedford main road by the rebuilding and widening of St. Peter's (No. 2) bridge, at an estimated cost of £550.

**Rhyl U.D.C.**—The surveyor, Mr. A. A. Goodall, stated at the meeting last week that he had repaired Church-street with limestone with the intention of reducing the slipperiness of the roads. The slipperiness of tarred roads was due, in his opinion, to two things—first, the camber or arching of the roads to get the water off, and, second, to the use of Penmaenmawr stone. Granite, such as was obtained from Penmaenmawr, was impervious to tar and to water, while the local limestone would absorb tar to a certain extent. Therefore, a road made with limestone and tarred would not be so slippery as a road made with Penmaenmawr stone and similarly treated.

**St. Helens T.C.**—Mr. J. Phythian at a meeting recently questioned the arrangement that the road foreman should provide a motor-cycle and motor-tricycle, the corporation allowing him 30s. a week. Alderman Bishop said it was a very fair arrangement. Two machines would be obtained so that one could be used whenever the other was broken down, and in the case of the tricycle the foreman could take a man with him in a case of urgency. When the foreman used a machine which belonged to the corporation there was a lot of criticism, which was unpleasant and unjustified, and if the machines were his own that criticism would be stopped.

**Selkirk C.C.**—A sum of £150 is to be spent in raising above the flood level a section of the Ettrick-road, near Thirlestaine West Lodge.

**Stoke Newington B.C.**—The Highways Committee of the London County Council recently wrote questioning the wisdom of the decision of the borough council to use 4½-in. creosoted deal blocks for a portion of the paving works to be carried out in Green-lanes, and 3-in. hard-wood sectional blocks for the remainder of the work. Unsuitability and difficulty and expense of maintenance were alleged, and the county

council committee intimated that it accordingly proposed to pave the tramway margins, for which it was responsible, with 5-in. hard-wood blocks in those portions of the road where the shallow sectional paving was employed by the borough council. The Highways and Sewers Committee of the borough council reported that a length of wood paving had been recently laid in the borough of Hackney in the manner proposed by the London County Council, and the result was very unsatisfactory, owing to the fact that a straight joint was made between the two kinds of paving, which rendered the maintenance on either side of the straight joint costly, both to the tramway authority and the borough council. Having regard to the foregoing objections to the proposed use of blocks of different depths side by side, the council have adopted the following resolution: "That the council, having entered into a contract for the laying of 3-in. hard-wood sectional blocks in a portion of the Green-lanes, the London County Council be required to lay in the tramway margins a similar paving, and in a similar manner to that proposed by this council."

**Sunderland T.C.**—A sum of £1,000 has been voted to the Highways Committee as a supplementary estimate, for the purpose of continuing the general repairs of streets and completing street works already commenced.

**Surrey C.C.**—A communication was received last week from the Road Board urging the consideration by the council of the road from Shalford to Reigate, known as the East and West road, with a view to its improvement, and a map was sent by the board indicating the principal arterial roads radiating out of London, together with a scheme of proposed new roads designed to render the use of such arterial roads more convenient. Among other suggested new roads was one leading from Beverley Bridge, along the Beverley Valley, skirting the Maldens, Tolworth and Surbiton, then running through Hook, Long Ditton and Thames Ditton, to the Ports-mouth-road at Esher. The latter road the Highway Committee considered to be of primary importance, and they proposed to have a survey made of the East and West road, and of the Portsmouth-road, and to enable them to do that they had submitted to the Finance Committee an estimate of £200 for extra professional assistance. On the recommendation of the committee the council sanctioned this proposal.

**Truro R.D.C.**—The surveyor, Mr. J. P. Carbis, has been authorised to pay "good men" on the roads 1s. a week, an increase of 1s. upon the wage hitherto paid.

**West Riding C.C.**—Alderman A. Hartley, in moving the adoption of the Highways Committee report at the council meeting last week, said that the cost of main road maintenance for the year ended March 31, 1911, was £17,580 more than the previous year, an increase of £16 1s. 5d. per mile, the lowest increase in any year since the county council was established. The total length of main roads within the West Riding repaired under the Local Government Board Act, 1888, was 1,094 miles, and in regard to the annual average cost per mile, as compared with the previous year, "disclaimed" roads in urban districts showed an average increase of £35 15s. 4d. per mile. "Unclaimed" roads showed increases of £11 4s. 5d. and £7 7s. 7d. per mile in urban and rural districts respectively. So far as he could see, they could not expect any great reduction until the council tackled the question of the proper making of the roads in the county. It was proposed to spend a further sum of £5,000 on tar-spraying approved lengths of main roads.

**Worcester T.C.**—The council are about to commence another street widening scheme with the intention of relieving traffic in the upper part of Broad-street and the Cross. The council have bought the Bell Hotel for £5,000, and of the area which the hotel and outbuildings occupy about 625 sq. yds. are to be thrown into what is now a narrow passage. This will leave the corporation with about 1,000 sq. yds. of building land. As a result of the scheme a portion of Broad-street will be made broader, and Little Angel-street, now about 9 ft. wide in places, will be widened to 36 ft.

## SEWERAGE AND SEWAGE DISPOSAL.

**Ashton-under-Lyne T.C.**—It has been decided to construct two additional sprinkler beds at the sewage disposal works.

**Doncaster R.D.C.**—The tender of Messrs. H. Arnold & Son, at £5,839, has been accepted for the construction of sewage works at Askern.

**Kingston T.C.**—The tender of Messrs. Boyd & Sons for heating work at the sewage works has been accepted at £87.

**Newry U.D.C.**—It having been suggested that the council should subsidise a proposal to deepen the river channel, it has been decided to ask learned counsel whether the council would have power to borrow the £1,200 under the Public Health Acts, in view of the fact that if a deep-water scheme were successfully carried out it would in every probability provide them with an up-to-date system of disposing of the town sewage, inasmuch as it would allow for a greater fall at the outlet works.

**Nottingham T.C.**—The new manager for the Stoke sewage farm of the corporation will receive a salary of £400 per annum, with house free of rent and rates. No perquisites of any kind will be attached to the post. A head clerk, experienced in agricultural book-keeping and accounts, is to be placed in the farm office.

**Rhymney U.D.C.**—A resolution has been adopted by the council confirming the promotion, either alone or in conjunction with the urban district councils of Gelligaer, Bedwellty, Mynyddislwyn, and Caerphilly, and the rural district council of St. Mellons, of the Rhymney Valley Sewerage Board Bill.

**Ripley (Derbyshire) U.D.C.**—The Local Government Board have replied to the council's proposal to cease emptying cesspools, and require the owners to empty their own, to the effect that in the interests of public health the proposition would not conduce to sanitary efficiency and that as there were a large number of cesspools in the council's area, the council should continue to empty them. The council have resolved to forward another letter to the board enclosing a plan showing the positions of the cesspools and sewers.

**Rochford (Essex) U.D.C.**—Consideration is being given to a large scheme of improvement at the sewage disposal works.

**Upton U.D.C.**—Mr. F. E. Wilcox (Messrs. Wilcox & Rackley) has submitted plans and estimate of the Gnarlford sewage disposal scheme. The estimate is £4,770, and it has been decided to ask for a loan of £5,000.

## WATER, GAS, AND ELECTRICITY.

**Birmingham T.C.**—Recommendations of the Electric Supply Committee have been adopted, providing that in lieu of the extensions at Dalecord sub-station, sanctioned by the council in March, 1909, the committee be authorised to provide a storage battery at a cost of £13,110, and necessary buildings at a cost of £12,130, and that application be made to the Local Government Board for sanction to borrow £19,200. It has also been agreed that, in lieu of the sub-station at Harborne, a sub-station be erected on land in War-lane, at a cost of £9,515, and that application be made for sanction to borrow that sum.—A plot of land is to be acquired in Percy-road, Greet, at an estimated cost of £5,500 [illegible] and transformers are to be provided at the Aston Manor station, at a cost of £7,531 [illegible] and converters supplied at the Handsworth station, at a cost of £4,428; and high-tension trunk mains laid from the Summer-lane generating station to the Handsworth station, at a cost of £6,000.

**Pittenweem T.C.**—The council have received a letter from the Local Government Board urging them to proceed with the improving and augmenting of their water supply, and stating that unless something is done within six weeks the Local Government Board will instruct their agents to take action against the local authority.

**Swansea T.C.**—A report with reference to the financial aspect of a proposal to spend between £45,000 and £47,000 upon extensions of the electricity undertaking is to be prepared by the town clerk.

**Warrington T.C.**—The extension of the water mains from Winwick to the greater part of the town is now complete, and the whole of the work has been done at a saving of £2,500 less than the estimate.

## MISCELLANEOUS.

**Aberdeen T.C.**—It has been decided to institute the trackless trolley system in the Footdee district of the city. The line will start from Market-street, and proceed along the quays to Footdee. The capital cost of the scheme will be about £3,000.

**Bethnal Green B.C.**—The Law and General Purposes Committee recommend the council to oppose the adop-

tion of the overhead trolley system of electric traction in connection with the proposed tramways from the West India Docks to Cassland-road, passing through Grove-road.

**Brighton T.C.**—At a special meeting of the council last week the decision to promote a Bill for a scheme of trackless traction in the district was unanimously confirmed. Alderman Wilson announced that the Brighton authorities had always intended to control the east to west traffic in the town, and took steps to do so as soon as the most suitable scheme presented itself. He said the public would soon accustom themselves to the unsightliness of overhead wires for the trolley 'buses. The interests of the town demand that such a monopoly should be vested in the local authorities.

**Paddington B.C.**—It has been decided to oppose the scheme of the London County Council to construct tramways along the Bayswater-road to Shepherd's Bush, on the ground that it would ruin high-class property, and that the Central London Tube and motor-'buses afforded every facility for transit.

**St. Pancras B.C.**—It has been agreed to oppose the London County Council's proposed tramway along Euston-road to link up King's Cross with Hampstead-road, pending a definite decision being come to as to the widening throughout of Euston-road as a metropolitan improvement.

**York T.C.**—The Tramways Committee have under consideration the possibility of utilising trackless-trolley cars for extending the system to Heworth. They have also considered the question of taking tramways down Bootham, and, by means of a bridge over the Ouse, near Clifton, extending the system to the Leeman-road area.

## PERSONAL.

Mr. C. O. Rawstron, surveyor to the Lichfield Rural District Council, has had his salary increased.

Mr. W. Fitzgerald Barry, county surveyor of Monaghan, has been appointed county surveyor of Wexford.

Mr. T. Gregory, surveyor to the Newburn Urban District Council, has had his salary increased to £250 per annum.

Mr. C. C. Hancock, assistant surveyor of Radstock, has been appointed surveyor to the Warminster Rural District Council.

Mr. R. N. Hunter, surveyor to the Oswaldtwisle Urban District Council, has been voted an increased salary of £50 per annum.

Mr. John Lewis, surveyor to the Yiewsley (Middlesex) Urban District Council, has had his salary increased by £10 per annum.

Mr. Henry Vale, for many years surveyor to the East Preston (Sussex) Rural District Council, died, we regret to state, last week.

Mr. E. J. Hunter, highway surveyor to the Chapel-en-le-Frith (Derby) Rural District Council, has had his salary increased by £35 per annum.

Mr. C. G. Bradley, engineer and surveyor to the Goole Urban District Council, has been elected a member of the Royal Sanitary Institute.

Mr. John Kennedy will deliver his inaugural address as president of the Society of Engineers at a meeting of that body which is to be held at the Institution of Electrical Engineers on the 5th prox.

Mr. E. Kitney, surveyor of highways to the Ringwood (Hants) Rural District Council, has received a formal vote of thanks from the council for the report he prepared on the condition of the main roads in the district.

Mr. G. E. Carter, surveyor to the Winchester Rural District Council, by resolution of the council, has had his position confirmed alike as to status and salary as from the period when the county council take over the main roads in the district.

Mr. G. H. Gibson, surveyor and inspector of nuisances to the Radstock Urban District Council, read a paper on "Housing and Overcrowding of the Smaller Districts," at the quarterly meeting of the South-Western Centre of the Sanitary Inspectors' Association held at Bristol recently.

Mr. George W. Melvin, of Leeds, who was for many years associated with the business department of the Horsfall Destructor Company, Limited, has now been appointed by Messrs. Bell Brothers, water-filter specialists, of Ravensthorpe and Manchester, to act as one of their outside representatives.

Mr. J. Brooke Smith, surveyor to the Tyldesley (Lancs) Urban District Council, died suddenly, we regret to state, on the 11th inst., at the age of forty-two. Mr. Smith had been in indifferent health for some time past, and last autumn he went on a cruise in the Mediterranean, but this change brought only a slight improvement. He had held the office of surveyor of Tyldesley since 1894.

Mr. Robert Dunlop Brown, ASSOC.M.INST.C.E., who has been appointed city engineer of St. Catharines, Ontario, received his early training in the burgh engineer's office, Clydebank. After four years' service at Clydebank, Mr. Brown entered the office of the Glasgow city engineer, and was employed on the main drainage works for the purification of the river Clyde, which took ten years to complete. After seven years at Glasgow Mr. Brown took up an appointment with the Considere Construction Company, Limited, of Westminster, under whom he was engaged in reinforced concrete work, and was responsible for the Dunblane Bridge, 105 ft. span over the Allan Water. Subsequently he went to Canada, and after a few months under the city engineer of Glasgow, he received his present appointment at St. Catharines. Mr. Brown is an associate member of the Institution of Municipal Engineers, the Geological Society, and the Sanitary Association of Scotland.

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The committee appointed to consider the applications for the borough surveyorship of Southport—which has been advertised at a commencing salary of £600, rising by annual increments of £50 to a maximum of £800—on Tuesday selected from among the 123 candidates for the post the following to appear before them for the final selection: Messrs. F. E. Badger, deputy building surveyor, Liverpool; Mr. F. G. Beaumont, deputy borough engineer, Wolverhampton; Mr. R. G. H. Clements, deputy borough engineer, Brighton; Mr. J. Rush Dixon, borough surveyor and engineer, Woolwich; Mr. A. D. Greatorex, borough engineer and surveyor, West Bromwich; Mr. A. E. Jackson, chief engineering assistant, Manchester; Mr. E. R. Matthews, borough surveyor and engineer, Bridlington; Mr. T. Molyneux, chief mechanical and general assistant engineer, Liverpool; Mr. T. Moulding, city engineer and surveyor, Exeter; Mr. J. S. Pickering, borough surveyor and engineer, Cheltenham; and Mr. Arthur Race, borough surveyor and engineer, Barrow.

## SOME RECENT PUBLICATIONS.*

BUILDING QUANTITIES. By H. M. Lewis. 1s. 6d. nett. London: E. & F. N. Spon, Limited.

Of the making of books on quantities there seems no end, but of the present one there is really nothing that can be said which can be construed as a welcome! There are, out of the ninety pages of which the book consists, forty pages of advertisements, and the only advantage of these to the reader is, apparently, that, should he tire in his efforts to get a cheap introduction to the profession of a quantity surveyor, he may be induced to purchase cheap treatises on other professional subjects.

The author's views on certain details of quantity surveyor's work do not accord with the accepted practice in London, and in particular he should have mentioned the agreement come to between the Surveyors' Institution and the Master Builders relative to the measuring of slating and tiling. The subject is too difficult and complex to be disposed of in so small a book, and in a text-book it can serve no useful purpose.

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Waterlow Bros. & Layton's Architects' and Surveyors' Diary, 1912.—We have used this excellent diary for many years, and hope to use it for many years to come; it is full of useful information, and for the general surveyor it is one of the best.

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**Borough Council's Motor Car.** — Poplar Borough Council decided last week to purchase a motor car at a cost of £340 for the use of the mayor and the surveyor.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President*—MR. ALBERT D. GREATOREX, M.INST.C.E., Borough Engineer and Surveyor of West Bromwich.

### COUNCIL MEETING.

At a council meeting held at the offices of the institution on Saturday, January 13th, there were present: Messrs. A. D. Greatorex (president, in the chair), Blair, Hayward, Cockrill, Carter, Pickering, Wike, Gladwell, Yabbicom, Thomas, Barber, Maybury, Elford, Stilgoe, J. A. Brodie, Chambers, Newton, Scorgie, Campbell, Thos. Cole (secretary), and H. A. Giles (assistant secretary).

Elected as Members.—Messrs. W. Dixon, engineering assistant, city engineer's office, Leeds; R. H. Winterbottom, surveyor, Wardle Urban District Council; L. G. Dashper, surveyor, Sandown (Isle of Wight) Urban District Council; W. D. R. McCurdie, city engineer, Dunedin, New Zealand; J. D. Smith, county surveyor, Kirkcudbright County Council; and S. Yonemoto, city engineer, Tokio, Japan.

Elected as Associate Members.—Messrs. E. H. Bennett, first assistant, borough surveyor's office, Derby; A. S. V. Taylor, engineering assistant, Neath Rural District Council; A. D. Braggins, assistant surveyor, Newquay (Cornwall) Urban District Council; L. McL. Hunter, assistant engineer, city engineer's office, Ottawa, Canada; D. Ll. Jones, borough engineer's office, Merthyr; H. E. Goldsmith, assistant engineer, Public Works Department, Hong Kong; A. W. D. Brown, city engineer's office, Prahran, Victoria, Australia; and W. H. Rean, borough surveyor's office, Dover.

Elected as Students.—Messrs. G. Kershaw, borough engineer's office, Brighouse; N. Hardie, borough engineer's office, Eccles; H. Leadbeater, borough engineer's office, Rotherham; and E. S. Moule, surveyor's office, Redditch Urban District Council.

Transferred to Members.—Messrs. R. B. Lees, surveyor, Bradford-on-Avon Urban District Council; A. E. Snape, Cape Town; and W. Bruce, city engineer's office, Edinburgh.

The council resolved that members and associate members affected by the federation of districts adjacent to Birmingham and Stoke be continued in their present classes.

The new Offices Committee reported progress as to obtaining more suitable headquarters for the institution.

The question of variation in period granted for repayment of loans in connection with ferro-concrete work was further considered.

The question of indexing the "Proceedings" was considered, and the secretary was instructed to report to the next meeting of council.

The consideration of draft standing orders of council was deferred.

Mr. MacBrair was, at his request, relieved from service on the Hoarding Sub-Committee.

The Standardisation Committee reported progress, and it was resolved that the opinion of members of the institution be obtained in relation to the committee's proposals as to the sockets of vitrified ware pipes.

On the recommendation of the Tramways Committee, Mr. Wakelam was asked to undertake the tabulation of replies received to queries issued in relation to corrugation of tramway rails.

The Roads Committee reported consideration of variation in weights, &c., of motor vehicles.

The president was authorised to sign and seal, on behalf of the institution, the Articles of Affiliation with the Scottish Roads Surveyors' Association.

The following gentlemen were unanimously nominated for the offices of the council, 1912-1913:—

PRESIDENT: Mr. R. J. Thomas.
VICE-PRESIDENTS: Messrs. Cockrill, Hayward and Pickering.
HON. SECRETARY: Mr. Chas. Jones.
HON. TREASURER: Sir James Lemon.

Acting examiners for the April examination were appointed.

The district nomination forms for India and Africa were ordered to be issued.

The president and Mr. J. Walker Smith were appointed delegates to the Royal Sanitary Institute Congress at York.

Further nominations as ordinary members of council were reported.

The following meetings were reported as fixtures: June 7th and 8th, Scottish meeting at Stirling; Eastern District, June 15th, at East Ham; Eastern District meeting on June 22nd, at Lowestoft.

The president's offer of a prize in books for the best paper read by a student at the next annual meeting was accepted with thanks.

### NOTICES.

Home Examinations, at Examination Hall, Victoria Embankment, March 28th, 29th and 30th.

Cape Town (South Africa) and Bombay (India) Examinations, probably on the same dates.

Candidates for these examinations must have received the council's permission to sit. Early application should be made by candidates for the Home examination, as accommodation is limited, and applications will be accepted in order of priority.

The testamur of this institution is accepted by the Local Government Board of Ireland as exempting from their examinations for assistant county surveyorships, and by the Colonial Office as exempting from their practical examination for candidates for Colonial survey probationerships in the use and adjustment of surveying instruments.

A West Midland District meeting will be held at Stourbridge, April 13th, the Paris meeting at Whitsun, and the annual meeting will probably be held July 11th, 12th and 13th.

A circular letter explanatory of the alterations in the constitution and the procedure for the formation of the new district committees will shortly be issued to members.

Members are reminded that the nominations for ordinary members of council must be received on and before February 1st.

Members desirous of submitting a paper at the forthcoming annual meeting are requested to give early information of their desire.

Premiums not exceeding 30 guineas are awarded by the council for the best papers read by members and associate members during the year, and the attention of students is particularly called to the president's prize, referred to above.

### METROPOLITAN DISTRICT MEETING.

The following is the programme of the Metropolitan District meeting of the institution which will be held at Caxton Hall, Westminster (Room 13), on Friday, February 9th:—

7.30 p.m.—Discussion on the following paper, which will be taken as read:
"The Relation of Modern Road Surfacings to Fish Life," by Mr. W. J. A. Butterfield.
8 p.m.—Adjourn to hold special general meeting [see separate agenda published in THE SURVEYOR of January 12th.]
8.15 p.m.—Tea and coffee will be served.
8.30 p.m.—Resume discussion on paper.

NORMAN SCORGIE,
Borough Surveyor, Hackney, N.E. *Hon. District Secretary.*

THOMAS COLE,
11 Victoria-street, London, S.W. *Secretary.*

## INSTITUTION OF MUNICIPAL ENGINEERS.

*President*—Mr. E. A. STICKLAND, ASSOC.M.INST.C.E., Borough Surveyor, Windsor.

### EXAMINATIONS.

The next examination will be held in May next at dates and centres to be arranged. Full particulars may be obtained of the Secretary, Institution of Municipal Engineers, 39 Victoria-street, London, S.W.

## ROYAL SANITARY INSTITUTE.

### MEETING AT MANCHESTER.

At a meeting of the Royal Sanitary Institute, to be held at Manchester, on Friday, March 8th, discussions will be opened on "The Application of the Housing and Town Planning, &c., Act, to the Development of Suburban Areas now in Process of Transition," by Mr. F. W. Platt, building surveyor, Salford, and on "The Quantity of Water available from Upland Drainage Areas," by Prof. J. Radcliffe, M.Sc. On the following day visits will be made to places of local interest.

## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned* (*No.* 1359 *Holborn*), *subject to later confirmation by letter.*

SEWAGE WORKS MANAGER.—January 27th.—Corporation of Tiverton. £100 per annum.—Mr. C. M. Hole, town clerk.

SEWAGE FARM FOREMAN.—January 27th.—Corporation of Warwick. £2 10s. per week.—Mr. B. Campbell, town clerk.

FOREMAN OF HIGHWAYS. January 27th. Corporation of Tiverton. £100 per annum. Mr. C. M. Hole, town clerk.

INSPECTOR OF NUISANCES.—January 31st.—Middlewich Urban District Council. £81 per annum.—The Clerk.

SURVEYOR AND INSPECTOR. January 31st. Loftus (Yorks) Urban District Council. £180 per annum.—Mr. Henry Hoggett, clerk.

ROAD FOREMAN.—January 31st.—Isle of Thanet Rural District Council. 25s. per week.—Mr. C. Taylor, clerk, Minster, near Ramsgate.

ASSISTANT SANITARY INSPECTOR.—January 31st. Corporation of Middlesbrough. 35s.—41s. per week.—Mr. P. Kitchen, town clerk.

INSPECTOR OF NUISANCES. February 1st.—Nailsworth Urban District Council. £100 per annum.—Mr. A. E. Smith, clerk.

ARCHITECTURAL ASSISTANT.—February 3rd.—Midland borough engineer and surveyor's office. £150 per annum.—Box 1,121, office of THE SURVEYOR, 24 Bridelane, Fleet-street, E.C.

ENGINEER'S TEMPORARY ASSISTANT.—February 3rd.—Corporation of Plymouth. £3 3s. per week.—Mr. James Paton, borough engineer and surveyor.

SURVEYOR'S ASSISTANT.—February 6th.—Herne Bay Urban District Council. 25s.—30s. per week.—Mr. G. H. Beetenson, clerk.

ASSISTANT SANITARY SURVEYOR.—February 14th.—Easington Rural District Council. £130 per annum.—Mr. J. M. Longden, clerk.

TEMPORARY ASSISTANT.—Mr. Arthur H. Thomas, county surveyor, Haverfordwest.

CLERK OF WORKS.—Doncaster Rural District Council. £3 3s. per week.—Mr. H. M. Marshall, clerk.

## MUNICIPAL COMPETITIONS OPEN.

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SWANSEA.—January 29th.—Additions to the central police and fire stations, and the erection of a new police-court, for the corporation.—Mr. A. D. Jenkins, borough estate agent, 3 Prospect-place, Swansea.

LONDON.—February 17th.—Sketch designs for new head offices, for the Port of London Authority. The Clerk.

YORK.—February 17th.—Designs are invited for a public elementary school by the Education Committee.—Mr. J. H. Mason, secretary, Education Offices, Clifford-street, York.

HALE.—Schemes invited for laying out the unbuilt-upon portion of the district, by the urban district council. Premiums are offered of £50 and £25.—Mr. J. G. Whyatt, clerk.

## MUNICIPAL CONTRACTS OPEN.

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### Buildings.

CROYDON.—January 26th.—For alterations to buildings at waterworks, for the corporation.—Mr. F. C. Lloyd, town clerk.

HORNSEY.—January 29th.—For the erection of 128 houses, and extensions of workshops, for the corporation.—Mr. E. J. Lovegrove, borough engineer and surveyor.

HEMEL HEMPSTEAD.—January 29th.—For the erection of seven cottages, for the rural district council.—Mr. T. H. Lighbody, 20 Marlowes, Hemel Hempstead.

BRADFORD.—January 29th.—For the erection of an infants' school, for the corporation.—City Architect.

WEST SUSSEX.—January 29th.—For alterations to the Flintington school, for the Joint Education Committee.—Secretary, Thurloe House, High-street, Worthing.

LEEDS.—January 30th.—For the erection of two houses, for the corporation.—Town Clerk.

NEWPORT (MON).—January 31st.—For the erection of seven houses, and other works, for the corporation.—Mr. C. F. Ward, borough architect.

LANCASHIRE.—January 31st.—For additions to a school, for the Education Committee.—Mr. H. Littler, 16 Ribblesdale-place, Preston.

DARLINGTON.—February 1st.—For extensions to engine house, for the town council.—Mr. G. Winter, borough surveyor.

SHEFFIELD.—February 1st.—For the erection of a stabling shed, for the corporation.—City Architect.

SOUTHWOLD.—February 2nd.—For the erection of a mortuary, for the corporation.—Borough Surveyor.

CARDIGAN.—February 2nd.—For the erection of a culvert bridge and wing walls, for the rural district council.—Mr. D. Davies, clerk.

BANDON.—February 3rd.—For the erection of twenty-two labourers' cottages, for the rural district council.—Mr. A. Haynes, clerk.

ST. ANDREWS.—February 5th.—For the building of a retaining wall, for the corporation.—Mr. W. Watson, borough surveyor.

MARGATE.—February 5th.—Erection of new lavatories and extension of existing lavatories, for the corporation.—Mr. E. A. Borg, borough surveyor.

TIPTON.—February 5th.—For the erection of public conveniences, for the urban district council.—Mr. W. H. Jukes, surveyor.

PEMBROKE.—February 7th.—For the erection of a school, for the Education Committee.—Mr. H. E. H. James, clerk, County Education Office, Haverfordwest.

LANCASHIRE.—February 12th.—For the completion of the Whalley Asylum, for the Committee of Visitors.—Mr. H. E. Clare, clerk, County Offices, Preston.

WHALLEY.—February 12th.—For the completion of an asylum, for the Committee of Visitors.—Mr. H. E. Clare, clerk, County Offices, Preston.

WANDSWORTH.—February 13th.—For the erection of a public convenience, for the borough council.—Borough Engineer and Surveyor.

MERTHYR.—February 13th.—For the erection of three schools, for the Education Committee.—Mr. E. Stephens, clerk.

HACKNEY.—February 15th.—For the erection of a branch library, for the borough council.—Mr. R. Cooper, architect, 12 Gray's Inn-square, London, W.C.

LANCASHIRE.—February 16th.—For the erection of an elementary school, for the Education Committee.—Mr. Harcourt E. Clare, clerk, County Offices, Preston.

NEWBURY.—February 23rd.—For the erection of twelve cottages, for the corporation.—Mr. S. J. L. Vincent, borough surveyor.

DARTFORD.—February 27th.—For the extension of the electricity works, for the urban district council.—Mr. W. Kay, clerk.

BLACKBURN.—February 27th.—For extensions of the town hall, for the corporation.—Mr. L. Beard, town clerk.

BANGKOK.—March 15th.—For the erection of an electric power station, for the municipality.—Mr. F. B. Shaw, engineer-in-charge, Municipal Electric Power Station, Local Sanitary Department, Bangkok.

### Iron and Steel.

BRADFORD.—January 27th.—For the supply of tram rails, for the corporation.—Town Clerk.

BURTON-UPON-TRENT.—January 27th.—For the supply of electricity plant, for the corporation.—Mr. T. Hall, borough electrical engineer.

STEPNEY.—January 29th.—For the erection of converting plant and switch gear, for the borough council.—Mr. W. C. P. Tapper, borough electrical engineer.

WIMBLEDON.—January 29th.—For the supply of two motor fire engines, for the corporation.—Mr. A. S. Sheldon, town clerk.

BRISBANE (Australia).—January 30, 1912.—For designs, detail, specifications, supply, erection, &c., complete under working conditions, including twelve months' maintenance, for alternatively two or three complete units of pumping plant, capable of delivering 6,000,000 British gallons of water delivered at an elevation of 400 ft. per day of twenty-four hours, for the Water and Sewerage Board.—Mr. Geo. Johnston, secretary.

STOURBRIDGE.—January 30th.—For the erection of a pumping engine, for the Water Board.—Mr. J. D. Harward, clerk.

BURNLEY.—January 31st.—For the supply of petrol-driven motor fire engine, for the corporation.—Mr. P. Thomas, town clerk.

BOURNEMOUTH. February 1st.—For the supply of pipes, bolts, cradles, &c., for the corporation.—Mr. F. W. Lacey, borough engineer and surveyor.

KENDAL.—February 1st.—For the supply of a generating set, for the Corporation.—The Clerk.

TUNBRIDGE WELLS.—February 10th.—For the supply of switch gear, for the corporation.—Mr. W. C. Cripps, town clerk.

## Miscellaneous.

BOURNE.—January 27th.—For the supply of roadmen's barrows, tools, &c., for the rural district council.—Mr. C. W. Bell, clerk.

BIRMINGHAM.—January 27th.—For the supply of uniform clothing, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

BIRKENHEAD.—January 29th.—For the supply of team, labour, and gravel for the corporation.—Mr. C. Brownridge, borough engineer and surveyor.

GLASGOW.—January 29th.—For the supply of firebricks, for the corporation.—Mr. A. W. Myles, town clerk.

MACCLESFIELD.—February 2nd.—For the supply of stone, copper slag, pipes, brushes, &c., for the rural district council.—Assistant Clerk.

DURHAM.—February 3rd.—For the supply of stone, disinfectants, cartage, &c., for the urban district council.—The Surveyor, Langley Moor, Durham.

MANCHESTER.—February 5th.—For the execution of general contractors' and plumbers' work for the corporation.—Mr. Thomas Hudson, town clerk.

GILLINGHAM.—February 6th.—For the supply of road materials, cement, requisites for precipitation works, stoneware pipes, sewer iron work, &c., for the corporation.—Mr. F. C. Boucher, town clerk.

LEWISHAM.—February 6th.—For the supply of works, paving materials, disinfectants, &c., for the borough council.—Borough surveyor.

ERITH.—February 7th.—For the supply of tar, for the urban council.—Mr. J. Kennedy Allerton, clerk.

SEVENOAKS.—February 12th.—For the supply of tar for roads, for the urban district council.—Mr. S. Towlson, surveyor.

## Roads.

SLEAFORD.—January 27th.—For the supply of granite and slag, for the rural district council.—Mr. E. Clements, clerk.

HARROW-ON-THE-HILL.—January 27th.—For the making up of three streets, for the urban district council.—Mr. John Strachan, clerk.

BOURNE.—January 27th.—For the supply of granite and slag, for the rural district council.—Mr. Cecil Bell, clerk.

BIRMINGHAM.—January 27th.—For the supply of granite kerbs, setts, crossing stones, chippings, flags, paving bricks, wood-paving blocks, ragstone, gravel, sand and slag, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

ESSEX.—January 27th.—For the supply of Norway granite kerb and setts, for the county council.—Mr. Percy J. Sheldon, county surveyor.

KETTERING.—January 29th.—For work of tar paving and the supply of granite, for the rural district council.—Mr. E. R. Lane, deputy-clerk.

WANGFORD (Suffolk).—January 29th.—For the supply of road materials, for the rural district council.—Mr. S. W. Rix, clerk, Beccles.

WANDSWORTH.—January 29th.—For making up a portion of Roehampton-lane, for the borough council.—Mr. Henry George Hills, town clerk.

DORSET.—January 29th.—For tar-spraying highways, for the county council.—Mr. W. T. Fletcher, county surveyor.

HARROGATE.—January 29th.—For the execution of private street works, for the corporation.—Mr. C. E. Rivers, borough engineer and surveyor.

DORSET.—January 29th.—For the supply of granite, quartzite, limestone, and tarred macadam, for the county council.—Mr. W. T. Fletcher, county surveyor.

LLANDAFF.—January 30th.—For carrying out street works and laying surface-water sewers, for the rural district council.—Mr. J. Holden, surveyor.

WATFORD. January 30th. For works of kerbing, channelling, &c., for the rural district council.—Mr. E. Lailey, surveyor.

EALING.—January 30th.—For making up certain roads, for the corporation.—Mr. G. E. Brydges, town clerk.

BOOTLE.—January 30th.—For the execution of private street works, for the corporation.—Mr. J. Henry Farmer, town clerk.

NORTHAMPTONSHIRE.—January 30th. For the supply of broken granite, for the county council.—Mr. C. S. Norris, county surveyor.

SWANSEA.—January 30th.—For the carrying out of private street works, for the corporation.—Borough Surveyor.

EALING.—January 30th.—For making-up certain roads, for the corporation.—Mr. Geo. E. Brydges, town clerk.

GATESHEAD.—January 30th.—For paving work in several streets, for the corporation.—Mr. N. P. Pattinson, borough engineer.

SUTHERLAND.—January 31st—February 14th.—For the reconstruction, widening, and improvement of county roads, for the county council.—Mr. A. Argo, county clerk, Golspie.

LYDD.—January 31st.—For the supply of tar, for the corporation.—Mr. Thomas Kettle, borough surveyor.

WANSTEAD.—January 31st.—For tar-dressing work, for the urban district council.—The Surveyor.

WORCESTER.—January 31st.—For the supply of road materials, including tar-macadam, for the county council.—Mr. C. F. Gettings, county road surveyor.

STOKESLEY.—January 31st—February 14th.—For work of road widening, for the rural district council.—Mr. W. H. Dixon, district surveyor, Kirkby-in-Cleveland, near Stokesley, Yorks.

HEATON NORRIS.—February 1st.—For the execution of street works, for the urban district council.—Mr. F. W. Brooke, clerk.

OLDHAM.—February 1st.—For works of paving and sewering, for the corporation.—Borough Surveyor.

LANCASHIRE.—February 1st.—For the supply of granite macadam, limestone macadam, rubble, chippings, copper slag and gravel, for the county council.—Mr. Harcourt E. Clare, clerk.

DUNDALK.—February 3rd.—For the execution of road works, for the rural district council.—Mr. P. R. Finigan, clerk.

RENFREW.—February 3rd.—For the supply of road materials, for the county council.—Mr. W. H. Hill, 15 West George-street, Glasgow.

FORFAR.—February 3rd—7th.—For the supply of road materials, in the Forfar district of the county.—Mr. Donald Ross, surveyor, Brechin-road, Kirrimuir.

CANTERBURY.—February 3rd.—For the supply of road materials.—Mr. A. C. Turley, city surveyor.

BUCKINGHAM.—February 3rd.—For the supply of granite and slag, for the rural district council.—Mr. R. C. Gordon, surveyor.

NORWICH.—February 5th.—For the supply of a road-roller, for the corporation.—Mr. Arthur E. Collins, city engineer.

CAMBERWELL.—February 5th.—For kerbing, channelling, &c., in Dovercourt-road, for the borough council.—Mr. C. William Tagg, town clerk.

SKIPTON.—February 5th.—For the supply of granite, for the urban district council.—Mr. A. E. W. Aldridge, surveyor.

SUTTON-IN-ASHFIELD.—February 5th.—For the supply of tar-macadam and broken slag, for the urban district council.—Mr. W. Burn, surveyor.

HERTS.—February 5th.—For the supply of granite and slag, for the county council. Mr. Urban A. Smith, county surveyor.

MIDDLESBROUGH.—February 6th.—For the supply of whinstone, limestone and tarred slag, for the rural district council.—Mr. W. H. Dixon, district surveyor, Kirkby-in-Cleveland, near Stokesley, Yorks.

THORNE.—February 6th.—For the supply of dross, screenings, granite and tar, for the rural district council.—Mr. Geo. Kenyon, clerk.

WEALDSTONE.—February 6th.—For making-up work, for the urban district council.—Mr. H. Walker, surveyor.

NORTHAMPTON.—February 6th.—For the supply of granite, slag and gravel, for the rural district council.—Mr. W. Fawkes, clerk.

PORTADOWN.—February 6th.—For the supply of a tar-macadam mixer, for the urban district council.—Mr. William Wilson, town surveyor.

ESCRICK.—February 6th.—For the supply of road materials, for the rural district council.—Mr. F. C. Camidge, clerk.

CHINGFORD.—February 6th.—For the supply of granites, stone ballast, hoggin, and boiler clinker, for the urban district council.—Mr. L. C. Bowen, clerk.

WORKSOP.—February 7th.—For the supply of granite and slag, for the urban district council.—Mr. G. H. Featherstone, clerk.

GRANTHAM.—February 7th.—For the supply of granite and slag, for the rural district council.—Mr. Aubrey H. Malvin, clerk.

OGMORE AND GARW.—February 8th.—For work of embanking and building proposed bridges, for the urban district council.—Mr. S. H. Stockwood, solicitor, Bridgend.

HORNCASTLE.—February 10th.—For the supply of granite, for the rural district council.—Mr. J. E. Chatterton, clerk.

WANDSWORTH.—February 12th.—For executing repairs in two roads, for the borough council.—Mr. Henry George Hills, town clerk.

SOUTHAMPTON.—February 12th.—For the hire of steam rollers, for the county council.—Mr. H. Barber, clerk.

SOUTHAMPTON.—February 12th.—For the hire of surface-tarring machines, for the county council.—Mr. H. Barber, clerk.

REIGATE.—February 12th.—For the supply of granite flints, Kentish rag-stone, tar-macadam, gravel, haulage, team labour, tools, and tar-washing surfaces of roads, for the rural district council.—Mr. Arthur J. Head, surveyor.

LONG SUTTON.—February 13th.—For the supply of granite, tar-macadam and slag screenings, for the urban district council.—Mr. S. S. Mossop, clerk.

## Sanitary.

NELSON.—January 27th.—For the construction of earthenware pipe sewer, for the corporation.—Mr. W. Shackleton, borough engineer and surveyor.

PADIHAM.—January 27th.—For the supply of filtering material, for the rural district council.—Mr. J. C. Waddington, clerk.

KEIGHLEY.—January 29th.—For laying of earthenware pipes, construction of manholes, &c., for the rural district council.—Mr. T. Burton, surveyor.

LAMBETH.—February 1st.—For removal of house refuse, for the borough council.—Mr. H. Edwards, borough engineer.

HELTON.—February 2nd.—For scavenging work, for the urban district council.—Mr. G. Young, clerk.

BARNSTAPLE.—February 2nd.—For relaying a sewer, for the corporation.—Mr. E. Y. Saunders, borough surveyor.

MANCHESTER.—February 5th.—For the supply of ventilating grids and other castings, for the corporation.—Mr. Thomas Hudson, town clerk.

EVESHAM.—February 7th.—For the construction of additional sewage disposal works, for the corporation. Mr. Thos. A. Cox, town clerk.

SOUTHEND-ON-SEA.—February 8th.—For the sewering of certain streets, for the corporation.—Mr. H. J. Worwood, town clerk.

LANCASTER.—February 9th.—For emptying cesspools, &c., for the rural district council.—Mr. G. Littlefair, sanitary inspector.

LUTON.—February 12th.—For scavenging work, for the rural district council.—Mr. W. Austin, clerk.

WANDSWORTH.—February 13th.—For the erection of sanitary convenience, for the borough council.—Mr. H. G. Hills, town clerk.

NORTHWICH.—February 16th.—For alterations to sewage outfall works, for the urban district council.—Mr. W. M. Beckett, 33 Brazenose-street, Manchester.

LEEDS.—February 19th.—For the supply of earthenware drain pipes, sewer ironwork, galvanised dirt boxes, and cement, for the corporation.—Mr. W. T. Lancashire, city engineer.

CASTLETOWN.—February 20th.—For the construction of new sewerage, for the Town Commissioners. Messrs. G. Kay & Co., 22 Athol-place, Douglas, Isle of Man.

TANGIER.—March 4th.—For the construction of a drain, for the Special Committee of Public Works.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

## Stores.

BIRMINGHAM.—January 27th.—For the supply of lias lime, Portland cement, drain pipes, gullies, gully pans, brown bricks, timber, drysaltery, castings, iron and steel ware, lamps, glass, enamelling, brooms, &c., for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

BISHOP AUCKLAND.—January 27th.—For the supply of sanitary pipes, spades, picks, kerbs, setts, &c., for the urban district council.—Mr. J. T. Proud, clerk.

CHISLEHURST.—January 30th.—For the supply of materials and labour, for the urban district council.—Mr. H. E. Knight, clerk.

MIDDLESBROUGH.—January 29th.—For the supply of annealed scoriæ (broken) and rough blocks, bricks, castings, concrete flags and kerbs, Portland cement, pitch and tar, sanitary pipes, broken slag, tarred whinstone, timber, broken whinstone and granite, setts, kerbs, brushes, bolts and nuts, disinfectants, general stores, &c., for the corporation.—Mr. S. E. Burgess, borough engineer.

DUBLIN.—January 31st.—For the supply of stores for twelve months, for the corporation.—Mr. J. G. Sullivan, borough surveyor.

CUCKFIELD.—January 31st.—For the supply of stores and team labour for the rural district council.—Mr. C. H. Waugh, clerk.

GRIMSBY.—February 2nd.—For the supply of columnar basalt macadam, drainage pipes, flags, kerbs, granite setts, pitch, tar, Portland cement, slag, bottles and corks, carbolic acid, disinfectant fluid, brushes, &c., for the corporation.—Mr. H. Gilbert Whyatt, borough engineer and surveyor.

BLACKBURN.—February 3rd.—For the supply of road materials, sewer pipes, iron castings, brooms, and other stores, for the corporation.—Mr. W. Stubbs, borough and water engineer.

BLACKPOOL.—February 3rd.—For the supply of paving setts, kerbs, rubble, flags, broken limestone and granite, stoneware pipes, bricks, ironmongery, iron castings, brooms, coal, &c., for the corporation.—Mr. John S. Brodie, borough engineer and surveyor.

HENDON.—February 5th.—For the supply of road materials, horses and carts, disinfectants, ironmongery, &c., for the urban district council.—Mr. S. S. Grimley, engineer and surveyor.

BERMONDSEY.—February 5th.—For the supply of materials and work, for the borough council. Town Clerk.

CHESHUNT.—February 6th.—For the supply of coal and coke, granite macadam, flints, gravel, sand, Portland cement, stoneware pipes, &c., for the urban district council.—Mr. J. E. Sharpe, engineer and surveyor.

GILLINGHAM.—February 6th.—For the supply of road materials, Portland cement, requisites for precipitation works, stoneware pipes, timber, sewer ironwork, coal, bricks, paints, general stores, disinfectants and forage, for the corporation.—Mr. F. C. Boucher, town clerk.

WOOLWICH.—February 7th.—For the supply of road material, forage, and general stores, for the borough council.—Mr. J. Rush Dixon, borough engineer.

KENSINGTON.—February 7th.—For the supply of work and materials for the borough council.—Mr. W. Chambers Leete, town clerk.

WOOLWICH.—February 7th.—For the supply of ballast, sand, brooms, cement, chandlery, drain pipes, forage, harness, ironmongery, road material, sewer ironwork and timber, for the borough council.—Mr. Arthur B. Bryceson, town clerk.

HUDDERSFIELD.—February 7th.—For the supply of granite setts, macadam, furnace slag, granite, flags, pitch and creosote oil, cast-iron materials, bricks, hay, straw, coal, &c., for the corporation.—Mr. J. Henry Field, town clerk.

STEPNEY.—February 10th.—For the supply of bricks, brooms, cast-iron work, colours, oilman's goods, timber, tools, ballast, wheelwright's materials, uniform clothing, disinfectants, &c.—Mr. Geo. W. Clarke, town clerk.

EPSOM.—February 13th.—For the supply of sewerage ironwork, gulley gratings, shovels, disinfectants, cement, stoneware pipes, kerbing and channelling, setts, broken granite, tar paving and tarred macadam, Thames ballast, &c., for the urban district council.

SHOREDITCH.—February 20th. For the supply of paving repairs, asphalting, broken granite, plumbers' work, smiths' work, drain pipes, drain rods, timber, sewer ironwork, lime, cement, cartage, ballast, scavenging, paints, gas mantles, printing, &c., for the borough council.—Mr. J. A. D. Milne, town clerk.

GOOLE.—February 21st.—For the supply of road materials, stoneware pipes, Portland cement, tar-macadam, brough gravel, coal, paints, bricks, and disinfectants, for the urban district council.—Mr. C. G. Bradley, engineer and surveyor.

FINSBURY.—February 26th.—For the supply of fodder, blacksmiths' work, castings, granite patent stone, cement, stoneware goods, wood-paving blocks, leather hose, brushes, brooms, tools, &c., for the borough council. Mr. George Whitehead Preston, town clerk.

## TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

ABERAVON.—For making up certain streets, for the corporation. Mr. J. Roderick, borough engineer

| | |
|---|---|
| W. H. Hill, Maesteg | £1,243 |
| C. Sayers, Maesteg | 1,201 |
| J. Davies, Aberavon | 1,122 |
| J. Thompson, Neath | 1,065 |
| Barnes, Chaplin & Co., Cardiff | 1,042 |
| Exors. of the late S. J. Rees, Aberavon | 1,040 |
| M. Cox, Port Talbot | 995 |
| A. Scott, Port Talbot* | 988 |

BINGLEY.—Accepted for paving Lime-street, and for flagging Beech street, for the urban district council. Mr. H. Bottomley, surveyor J. H. Clark & Sons, Main-street, Bingley.

BROMLEY.—For erection of a women's convenience on the Martin's Hill recreation ground, for the Corporation. Mr. G. F. Carter, borough engineer and surveyor

| | |
|---|---|
| J. D. Woodhams & Sons, Bromley | £427 |
| W. J. Penfold, Bromley | 311 |
| Lister & Co., Shoe-hill, E.C. | 300 |
| W. Gratty, Bromley | 294 |
| Treasure Bros., Orpington | 253 |
| A. P. Pomgdestre & Son, Bromley | 528 |

CAERLEON.—For kerbing and channelling works, for the urban district council. Mr. C. J. Fox, surveyor

| | |
|---|---|
| J. & W. Taylor | £205 |
| H. C. Parfitt | 200 |
| Kirby & Westacott | 203 |
| J. Matthias | 198 |
| J. Charles | 196 |
| H. J. Herbert | 193 |
| E. C. Jordan & Son | 193 |
| W. Moore | 192 |
| J. H. Dark | 191 |
| Loadbeter | 189 |
| W. E. Evans | 187 |
| J. Partridge | 187 |
| E. Marsh | 185 |
| Williams & Sons | 178 |
| E. Richards, Caerleon | 175 |
| J. Monks | 174 |
| R. & P. Hodge | 170 |
| Moulting & Whiting, Pontnewydd | 170 |
| F. C. Parfitt | 169 |
| J. Dix | 164 |
| A. S. Morgan | 162 |
| H. Smith | 160 |
| G. Vincent | 160 |

Surveyor's estimate, £187.

CROSSNESS.—For the erection of four triple-expansion engines, with condensing plants, circulating pumps, &c., for the new engine-house at the Crossness pumping station, for the county council:

| | |
|---|---|
| Gwynnes, Limited, London | £12,432 / 13,187 |
| Browett, Lindley & Co., Limited, Manchester | 10,900 |
| M. Paul & Co., Limited, Dumbarton | 10,300 |
| Bellias & Morcom, Limited, Birmingham | 10,248 |
| J. Howden & Co., Limited, Glasgow | 9,910 |
| Fullerton, Hodgart & Barclay, Limited, Paisley† | 9,506 |

CHESHIRE.—For the erection of a school, for the Administrative Sub-Committee.—Mr. H. Ferrand, clerk, Sandbach:—

| | |
|---|---|
| T. & E. Cooke, Congleton | £3,969 |
| J. Standeven, Congleton | 3,687 |
| Birchall Brothers, Middlewich | 3,677 |
| T. G. Huxley, Malpas* | 3,540 |

CROYDON.—For making-up part of a road, for the rural district council.—Mr. R. M. Chart, F.S.I., Katharine-street, Croydon, surveyor:—

| | |
|---|---|
| W. Hall, Thornton-heath | £1,086 |
| Free & Sons, Maidenhead | 1,038 |
| E. Streeter, Croydon | 1,014 |
| E. Yewen, Croydon | 933 |
| E. Iles, Mitcham and Leigh | 889 |

Surveyor's estimate, £986.

ISLINGTON.—For supply of 86,000 creosoted yellow deal blocks, for the council.—Mr. James P. Barker, borough engineer & surveyor:—

| | |
|---|---|
| Acme Flooring & Paving Co. (1904), Limited | £591 |
| Improved Wood Pavement Co. | 577 |
| W. Griffiths & Co., Limited | 574 |
| J. B. Lee & Sons, Limited | 564 |
| Burt, Boulton & Haywood | 563 |
| T. Gabriel & Sons † | 563 |

LINDSEY (Lincs).—For additions to a council school, for the Education Committee.—Messrs. Scorer & Gamble, Lincoln:—

| | |
|---|---|
| A. E. Backhouse, Thorne | £885 |
| F. Horton, Lincoln | 677 |
| F. Waite, Epworth | 620 |
| Stanley Brothers, Thorne | 608 |
| W. H. Smith & Sons, Thorne | 590 |
| T. E. Thompson, Epworth | 585 |
| S. R. & T. Kelsey, Goole | 577 |
| H. Trimmingham, Epworth | 573 |
| B. Pumfrey, Gainsborough | 566 |
| H. Kelsey, Junr., Epworth | 563 |
| Moody Brothers, West Stockwith | 563 |
| S. Lawrence, Thorne | 495 |

LONDON.—For the provision of a house for the first assistant medical officer at Long-grove Asylum, for the county council:—

| | |
|---|---|
| G. Potter, Horsham | £1,145 |
| G. Parker & Sons, Peckham | 1,072 |
| F. Potter, Sutton | 1,067 |
| Cropley Bros., Epsom | 1,040 |
| J. Carmichael, Wandsworth | 1,014 |
| Roll & Taylor, Epsom | 939 |

NORWICH.—The tender of Messrs. Babcock & Wilcox, London, for overhead coal bunkers, conveyor, induced draught fan, crane, grab, provision for dampers, and sundries, at £3,495, and for two new boilers, with super-heaters and mechanical stokers, at £8,450, and old boilers, has been accepted, subject to the following terms of payment, i.e., £2,315 on completion, £2,315 one year after completion, and the balance two years after completion.

RAWTENSTALL.—Accepted for the erection of a boundary wall, for the corporation.—Mr. J. Johnson, borough surveyor:—

Moore Brothers, Rawtenstall.

RUISLIP-NORTHWOOD.—For the construction of sewers and manholes, for the urban district council.—Mr. W. L. Carr, surveyor:—

WOOD-LANE SEWER.

| | |
|---|---|
| E. Free & Sons, Maidenhead | £362 |
| A. W. Ibbett, Clapham Common | 350 |
| T. W. Pedrette, Enfield | 348 |
| S. Kavanagh & Co., Surbiton-hill | 340 |
| Langley & Johnson, Slough | 334 |
| H. Farrow, Brixton | 318 |
| Clements, Knowling & Co., Limited, Brentford | 317 |
| H. Elliott & Co., Ealing | 313 |
| G. R. Mann, Edgware | 311 |
| A. Hyslop, Manchester | 310 |
| W. Halsey & Son, Edgware | 271 |
| Willis and Powis, Wembley* | 264 |

WOOD-LANE TO KINGSEND-AVENUE SEWER.

| | |
|---|---|
| S. Kavanagh & Son | £111 |
| A. W. Ibbett | 108 |
| E. Free & Sons | 106 |
| Clements, Knowling & Co., Limited | 97 |
| T. W. Pedrette | 95 |
| Langley and Johnson | 94 |
| H. Farrow | 90 |
| G. R. Mann | 89 |
| A. Hyslop | 86 |
| H. Elliott & Co. | 77 |
| Willis & Powis* | 74 |
| W. Halsey & Son | 66 |

HOWLETT-LANE SEWER.

| | |
|---|---|
| S. Kavanagh & Co. | £82 |
| Langley and Johnson | 70 |
| E. Free & Sons | 66 |
| W. Halsey & Son | 62 |
| Clements, Knowling & Co., Limited | 62 |
| T. W. Pedrette | 58 |
| G. R. Mann | 58 |
| A. W. Ibbett | 58 |
| H. Elliott & Co. | 56 |
| H. Farrow | 55 |
| Willis & Powis | 54 |
| A. Hyslop | 51 |

WILLSHIRE-LANE SEWER.

| | |
|---|---|
| A. W. Ibbett | £649 |
| E. Free & Sons | 586 |
| S. Kavanagh & Co. | 561 |
| Langley & Johnson | 557 |
| T. W. Pedrette | 549 |
| G. R. Mann | 531 |
| H. Farrow | 526 |
| H. Elliott & Co. | 517 |
| A. Hyslop | 500 |
| Clements, Knowling & Co., Limited | 487 |
| Willis & Powis* | 435 |
| W. Halsey & Son | 420 |

BRIDLE-ROAD SEWER.

| | |
|---|---|
| A. W. Ibbett | £380 |
| E. Free & Sons | 372 |
| Langley & Johnson | 356 |
| S. Kavanagh & Co. | 352 |
| T. W. Pedrette | 345 |
| H. Elliott & Co. | 337 |
| H. Farrow | 329 |
| Clements, Knowling & Co., Limited | 327 |
| G. R. Mann | 321 |
| A. Hyslop | 317 |
| W. Halsey & Son | 275 |
| Willis & Powis | 271 |

BRICKWALL-LANE SEWER.

| | |
|---|---|
| A. W. Ibbett | £351 |
| S. Kavanagh & Co. | 339 |
| E. Free & Sons | 329 |
| T. W. Pedrette | 313 |
| Langley & Johnson | 308 |
| Clements, Knowling & Co., Limited | 297 |
| H. Elliott & Co. | 281 |
| A. Hyslop | 276 |
| G. R. Mann | 273 |
| H. Farrow | 259 |
| Willis & Powis | 239 |
| W. Halsey & Son | 225 |

## MEETINGS.

*Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.*

JANUARY.

30.—Institution of Civil Engineers: Mr. R. J. Durley, M.INST.C.E., on "The Central Heating & Power Plant of McGill University, Montreal." 8 p.m.

31. Institute of Sanitary Engineers: Mr. Arthur J. Martin, M.INST.C.E., F.G.S., F.R.SAN.I., delivers his presidential address. Caxton Hall, Westminster. 8 p.m.

FEBRUARY.

2.—Institution of Civil Engineers (Students' Meeting): Lecture by Captain H. Liall Sankey, R.E., M.INST.C.E., on "Steam Turbines: Some Practical Applications of Theory." 8 p.m.

5.—Royal Institute of British Architects: President's Address to Students; Presentation of Prizes: Nomination of Royal Gold Medallist.

5.—Society of Engineers: Mr. John Kennedy delivers his presidential address; presentation of premiums. 7.30 p.m.

9.—Institution of Civil Engineers (Students' Meeting): Lecture by Captain H. Liall Sankey, R.E., M.INST.C.E., on "Steam Turbines: Some Practical Applications of Theory." 8 p.m.

9.—Institution of Municipal and County Engineers: Special General and Metropolitan District Meetings. Caxton Hall, Westminster, 7.30 p.m.

10.—Royal Sanitary Institute: Sessional Meeting at Nottingham.

12.—Institute of Sanitary Engineers: Messrs. A. Alban H. Scott and F. C. Davies on "Hospitals and Sanatoria." Royal United Service Institution, Whitehall. 8 p.m.

16.—Edinburgh Architectural Association: Associates' Annual Dinner. 7.30 p.m.

16.—Royal Institution: Sir John H. A. Macdonald on "The Road: Past, Present, and Future." 9 p.m.

26.—Institute of Sanitary Engineers: Prof. Henry Adams, M.INST.C.E., M.I.M.E., on "Sanitary Building Construction." Caxton Hall, Westminster. 8 p.m.

MARCH.

11.—Institute of Sanitary Engineers: Mr. Percival M. Frazer, A.R.I.B.A., on "The Modern Home." Caxton Hall, Westminster. 8 p.m.

## APPOINTMENTS OPEN.

### WATFORD URBAN DISTRICT COUNCIL
SURVEYOR'S AND ENGINEER'S DEPARTMENT.

Wanted at once, a Temporary Assistant for three months, at a salary of Three Guineas per week.

Applicants must be qualified in general municipal engineering, including sewerage waterworks, building construction, levelling and surveying, and must be good draughtsmen.

Applications, stating age, experience, present occupation, and whether the applicant is at liberty to commence duties without delay, together with three testimonials, to reach the undersigned on or before Friday, February 2nd, 1912.

Envelopes to be endorsed "Assistant."

W. HUDSON,
Clerk and Solicitor.

Council Offices,
14 High-street, Watford.
January 23, 1912.

**AGENTS** required in unrepresented districts for the Imperial Accident Insurance Co., Ltd. Est. 1878. Houses Insured against Death from Accident or Disease, Mares for Foaling and Loss of Foals. Farmers' Liability for Accidents to Labourers, Servants, and Workmen's Compensation. Claims paid, £500,000. Address Agency Manager, 17 Pall Mall East, London, S.W.

**WANTED**, Temporary Assistant; must be a quick accurate man at Bridges, Sewerage, and Levelled road Draughtsman, and accustomed to the Preparation of Quantities. Applications to state age, experience, and salary required, also two references.

ARTHUR H. THOMAS,
County Surveyor.

Haverfordwest.

### EASINGTON RURAL DISTRICT COUNCIL.
SANITARY SURVEYOR'S DEPARTMENT.

The Council invite applications for the position of Assistant Surveyor in the Sanitary Department, at an inclusive salary of £130 per annum.

Candidates must have had a previous experience in a Surveyor's or Municipal Engineer's Office, and must be good draughtsmen, accurate surveyors, experienced in the use of the level and theodolite, competent to prepare plans, sections and detailed drawings, take out quantities, prepare specifications and estimates, and be generally experienced in the design and construction of sewerage and water schemes, and have knowledge of the carrying out of private street improvement works.

Applicants should not be more than 30 years of age, and preference will be given to those connected with either the Institute of Civil Engineers, the Institute of Municipal and County Engineers, or the Surveyors' Institute.

The person appointed must devote the whole of his time to the performance of his duties, and not engage in private practice or be concerned in any other business, and must reside in the district of Easington, and keep a bicycle or other means for travelling in the district.

Forms of application may be obtained from the undersigned on receipt of a stamped addressed foolscap envelope, and must be returned filled up in Candidate's own writing, together with copies of not more than three recent testimonials, not later than Wednesday, 14th February, 1912.

Personal canvassing, either directly or indirectly, will disqualify.

J. M. LONGDEN,
Clerk of the Council.

Surveyor's Office,
Easington, Castle Eden,
Co. Durham.

### SOUTH STONEHAM RURAL DISTRICT COUNCIL (NEAR SOUTHAMPTON).
APPOINTMENT OF HIGHWAY SURVEYOR.

The above Council invite applications for the appointment of a Surveyor of Highways.

The district comprises 11 Parishes, 19,387 acres, and about 55½ miles of roads.

Salary £100, rising by £5 annual increments, to a maximum of £120 per annum, with £5 per annum travelling expenses.

Candidates must be able to ride a bicycle, and be between the ages of 25 and 35, and be fully competent to prepare estimates and keep the necessary accounts.

A Guarantee Bond for £200 (by an approved Society) will be required; the premium will be paid by the Council.

Engagement subject to three months' notice on either side.

Successful applicant to reside in or near Westend, about 3 miles from Southampton, devote the whole of his time to the duties of his office, to provide an office at his own expense. Stationery, postages, and use of telephone will be provided by the Council.

The appointment will be made on the 20th February, duties to commence on the 1st April next, and selected Candidates will have notice to attend the Council on that day at Westend. Travelling expenses allowed.

Applications, in Candidate's own handwriting, with copies of three recent testimonials, must reach me not later than 12 o'clock noon on Tuesday, the 13th day of February, 1912, marked "Surveyor."

No forms of application will be issued.

Canvassing Members of the Council strictly prohibited.

Further particulars can be had on application to me, the undersigned. Stamped addressed foolscap envelope to be enclosed.

E. T. WESTLAKE,
Clerk to the Council.

20 Portland-street, Southampton
January 22, 1912.

**WANTED**, good young Draughtsman for Architect and Surveyor's Office in Somerset. Must be used to House Planning and have some knowledge of the design of Public Waterworks. Temporary appointment not less than three, and may extend to twelve months. Apply stating age, experience, and salary required. Box 1,122 office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

# The Surveyor

And Municipal and County Engineer.

Vol. XLI. FEBRUARY 2, 1912. No. 1,046.

## Minutes of Proceedings.

**The Road Board's Specification.** In a recent criticism of Road Board Specification No. 7 we drew attention to the fact that it is impossible so to frame general directions that they shall be of the nature of specifications. This criticism does not apply, of course, to specifications Nos. 4, 5, and 6, Tar No. 1, Tar No. 2, and Pitch, but it does apply to Nos. 1, 2, and 3. It is possible to give *some* general directions for surface tarring, for surfacing with tar-macadam, and for surfacing with pitch grouting, but the actual specification suitable for a particular case cannot be extracted from such general directions. For instance, the recommendation in Specification No. 1 that stone chippings and not fine material should be used for the binding material of road crusts, which are afterwards to be tarred, applies to places where stone chips are cheap, or where the cost is warranted by circumstances and provided the road metal is one of certain kinds. It does not apply to sandstone or limestone roads, the materials for which are supplied in such sizes that, with a very little fine material to fill the minute interstices, they bind to solid crusts under the roller. Again, in specifying that the material used for blinding a freshly tarred road must be free from dust the Road Board directions fail to take account of the cases in which fine dust is itself the best blinding material, or the best having regard to cost. The objection to dust *with* chips or crushed gravel is, no doubt, that it tends to form parting films between the individual chips and the tar, but when the tar coat is thin and no attempt is being made to form a carpet layer with the chips, the presence of dust is surely no disadvantage, and *after* chips have been strewn on the tarred surface and have been under traffic for some time, there is, we believe, nothing better than dust for keeping the traffic from picking out the chips or lifting the surface on hot days.

In Specification No. 2 there are several recommendations which we regard as of doubtful value, or even wrong. There seems to be, for instance, confusion between a carpet layer of tarred material and a road crust of tar macadam. Certainly 2 in. would not be a crust in itself, and if it formed a part of a thickness of 4 in.—an arrangement not ruled out by the specification—the result would yield experience of an experimental rather than an economic importance. We regard as definitely wrong the recommendation in clause 5 that the old surface should be left "intact and unscarified," also that of clause 6, by which the crust would be made without any binder or filler except the tar, the smaller stuff, ¼ to ½ in., being "kept separate and used as top dressing." We regard with suspicion the recommendation that "too much rolling should be avoided." It suggests that the crust would not stand it, for lack of density and of packing material, and therefore that it would have a tendency to be rolled out of shape by the wheels of heavy vehicles. It is a pity, we think, that in Specification No. 3 the construction of layers of pitch-grouted macadam takes precedence of and, for the time at least, excludes the construction of single crusts pitch-grouted at the top in such a way that the whole forms one crust, spreading the loads and furnishing an alternative—a valuable alternative—to the placing of layers of tarred material on other crusts. There are very useful points in the "specification," but there are some that we do not like, such as the leaving of the old surface unscarified, which is possibly worse for a pitch-grouted layer than it is for a layer of tar-macadam, though this depends upon the condition of the old crust. In all three of these specifications there is the recommendation that trial trenches shall be made, 150 yds. apart, and we refer to this point in order to say that further consideration of the matter suggests that in many cases a longer interval than the two months which we suggested recently should be allowed to elapse before putting down the new crust across those trenches.

We had delayed criticism of these Road Board specifications generally in the hope that our readers would, on their own initiative, furnish us with their opinions on the various matters of principle and of detail involved; but not until we had ourselves reviewed Specification No. 7 did we receive any comment of the kind. With some of the views expressed by our correspondents we are not in accord; but the difference is, in several cases, rather one of interpretation than of opinion. The views of readers in this and recent issues involve some important matters of principle, a consideration of which must be deferred.

**The Institute of Sanitary Engineers.** Our congratulations are due to Mr. A. J. Martin, M.INST.C.E., F.G.S., F.R.SAN.I., on his election for the second year in succession as president of the Institute of Sanitary Engineers, and also to the members of that institute on having secured such an excellent president for a further term of office. They have evidently acted upon the proverb that "the proof of the pudding is in the eating," and having enjoyed their pudding during the past year, they very wisely adopt the same menu for the present year. A large portion of Mr. Martin's presidential address on Wednesday last was devoted to the question of standards, and he drew attention to the advantages of voluntary standardisation as compared with legal enactments. Few people refuse to admit the desirability of

having standards, but many are ready to demonstrate the difficulties of arranging standards satisfactory to all concerned. Mr. Martin not only believes in standards, but he goes farther than most people are prepared to advance at present, and suggests standards for the commodities of daily life, foodstuffs, textiles, and the like. He believes that if the goodwill of the various trades concerned could be enlisted, much greater progress could be made in this direction than by penal repression.

After dealing with standards connected with sewers and sewage disposal, the author proceeded to discuss at considerable length the qualifications of the engineer, but without making any definite proposals. He considered it impossible to frame a code of rules which shall prohibit every form of unprofessional conduct, but suggested that the real standard of professional conduct for the engineer is that he shall do nothing, either directly or indirectly, to cause work to come his way. We fear that any association of engineers which desired, and was able to insist upon, strict adherence to this rule would very soon have to close its doors for lack of members. We agree that the views of the Local Government Board upon the subject of competitive schemes, as embodied in the Board's thirty-second annual report, deserve to be more widely known; but it is the members of local authorities, rather than engineers, who need the excellent advice proffered by the Local Government Board.

The particulars given by Mr. Martin of the progress of the movement for the establishment of a National Health Week, on the lines suggested by him in his presidential address last year, are interesting as indicating how much can be done by voluntary effort when it is properly organised. In the present case these satisfactory results are due primarily to the efforts of the Agenda Club in bringing together for combined operation the various health societies, medical officers, and other interested persons. We learn from other sources that these proposals are meeting with hearty support in many quarters, and there is much evidence that the movement will be a great success. Mr. Martin modestly disclaimed priority in the idea on which his proposals were based, but it was undoubtedly the able manner in which he presented his suggestions which has led to their adoption and practical application.

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**Councillors and Surveyors.**

It is always gratifying to record the recognition by a public authority of "the services of a very old and faithful servant," but it seems that there is a kind of recognition like the quality of mercy that is strained—so strained, indeed, that it brings a very poor measure of blessing to those upon whom it is grudgingly bestowed. This is the impression conveyed by the report of a recent meeting of the Ellesmere (Shropshire) Urban District Council, from which it is gathered that the General Purposes Committee "had considered" an application by the surveyor, Mr. John Groom, for an increase of salary. The consideration they gave to the matter does not appear to have misled them into any fanciful byway of vicarious generosity, for we are told that "they recommended that an increase of 1s. per week be granted, making the surveyor's salary 23s. per week." "There's richness for you!" as Mr. Squeers might have quite enthusiastically exclaimed under some such similar conditions. A member of the council, who is manifestly of a more magnanimous type than his colleagues on the General Purposes Committee, ventured to propose that the increase be 2s. per week. He did so on the grounds not only, in the words already quoted, that Mr. Groom was a "very old and faithful servant," but also because he thought "they were paying Mr. Groom a very small wage—very little more than a labourer's wage—and they could not get another surveyor for the money." It is to be hoped that the councillor in question spoke the bare truth in making the latter assertion—this much it may be permitted to suggest in spite of the fact that the council actually did improve upon the proposition of the General Purposes Committee, and grant the increase of 2s. per week. That a new spirit having for its motive power a better appreciation of professional service must be conjured up among members of urban and rural councils is self-evident, not merely from this instance, but also from the example afforded by a proposal made at the Wellingborough Rural District Council with respect to Mr. G. F. Bearn, the surveyor of highways. This was that the appointment of that gentleman should be determined, and that one be appointed who would devote his whole time to the work of the office. If the object of this move were intended to conceal a disinclination to pay a proper salary for a whole-time officer, it is, to say the least, satisfactory to record that the council declined to entertain it. But the fact that the proposal was made and seriously discussed does not say much for the manner in which valuable professional service is viewed by a certain class of urban and rural representative men. Clearly public servants are too much at the mercy of these people, and if it be not possible to alter the nature of the councillor, it is obvious that a change is urgently called for in the system under which surveyors are engaged.

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**The Preservation of Timber.**

We publish this week a further article on the Decay and Preservation of Timber, by Mr. William Ransom, Assoc.M.Inst.C.E., in continuation of the one which appeared in our last issue. The remarkable power of wood to resist decay for a practically indefinite period when placed in favourable situations is revealed from time to time by the discovery of well-preserved specimens of the greatest antiquity. Classic illustrations of this phenomenon are provided by the wood discovered in Egyptian catacombs, and by the elm piles of old London Bridge, which were found in good condition eight centuries after they had been placed in position. A more recent example is the ancient British canoe which was lately found in the course of the excavation for the foundations of the new County Hall for London. Evidently such specimens have succeeded in resisting the three great enemies of timber—namely, dry-rot, wet-rot, and the ravages of foreign insects and worms. The first of these causes of decay is now generally recognised as being bacterial in character, the conditions favouring the propagation of the germ being lack of seasoning, absence of ventilation, and the presence of a warm and moist atmosphere. Wet rot, on the other hand, is due to a natural process of oxidation. The insects and worms which attack timber occur chiefly in salt water, the different species working at varying depths and displaying a preference for different kinds of wood. Timber may be described as the primary or elementary material of construction, and, being used in almost every conceivable kind of structure, the question of its preservation is one of the greatest importance. Mr. Ransom deals with this part of his subject in this week's article, which we venture to hope will prove not only interesting, but also practically useful to our readers.

* * *

**An Evening in a Library.**

"I love to lose myself in other men's minds," said Lamb, and we think that many of our cultured readers who delight in similar intellectual enjoyment will read with pleasure and profit Mr. Julian Rogers's notes, given elsewhere in this issue, on some of the possessions of the Surveyors' Institution library. It is a magnificent collection, splendidly housed, and should be of constant service to the members of the Institution. As Dr. Johnson

said, "Knowledge is of two kinds. We know a subject ourselves, or we know where we can find information upon it," and in this latter respect a good professional library, readily accessible and usable under the most pleasant of conditions, is invaluable. Mr. Rogers has added no little to the attractions of the one in question by his alluring glimpses of it, and he helps to its right use by the three golden rules he lays down for wise reading. We are tempted, however, to cavil at the idiosyncrasy he expresses in the words, "Personally I have no liking for note-making, and never found any advantage in adventitious aids of this kind." This, while permissible to a Woodall or a Macaulay, is not, we think, an example for general application. Reading maketh a full man, and writing an exact man, and on this score of exactitude we should rather counsel the readers to make full and judicious notes, believing that the process aids materially to memorise them, and gives them an after-value, if methodically stored, in the all-important verification of references. This, however, is but an aside. We have nothing but welcome for Mr. Rogers's charming literary excursion, and cordially hope that he may pursue the subject further in later papers on the same lines.

* * *

**Costly Street Improvements.**

In our issue of last week there appeared a letter addressed by Sir George Gibb, the chairman of the Road Board, to Alderman Pain, of the Surrey County Council. The letter was mainly concerned with removing a misapprehension which had arisen in regard to the proposed improvement of the Shelford-Reigate road, but it contained an incidental reference to an important question of general policy with reference to street improvements. Sir George Gibb expresses the opinion that "it would no doubt be most expedient and wholesome if it were possible, by the influence either of public opinion or of law, to secure that new buildings should not be erected close up to the roadway. The possibility of the need for future widenings should always be taken into consideration in laying out land for building." It is, in our view, hardly likely that this very desirable object can be generally attained by the mere force of public opinion. What is needed is general legislation dealing with the subject. Until this is obtained, however, a far-sighted policy in regard to street improvements by local authorities will result in the saving of thousands of pounds to the next generation of ratepayers. In the matter of street improvements it is necessary to look far into the future if a really economical policy is to be pursued, and widenings are to be secured without the unnecessary expenditure of vast sums of money in the purchase of costly buildings.

* * *

**Rural Housing.**

It has been suggested to us from time to time that the publication of drawings and particulars of workmen's dwellings, designed for actual erection and not merely as hypothetical cases, would prove of general interest, and it is with pleasure that we reproduce this week drawings and a description of the cottages to be erected by the Hemel Hempstead Rural District Council in connection with a small housing scheme at Chipperfield. The scheme, which has been prepared by the surveyor to the local authority, Mr. Thomas H. Lighbody, M.S.A., and has received the sanction of the Local Government Board, provides for seven cottages at a total estimated cost of £1,150—£980 for buildings and £170 for the purchase of land. The buildings are in compliance with the local by-laws; but, as there is no available sewerage system, the sink drains will discharge into a large cesspool, and the soil will be removed by the conservancy system. The estimated rental required to make the scheme financially sound is 4s. 3d. per cottage per week. The present undertaking is experimental, and if it succeeds, as to which, it appears, no doubt is entertained, it will be followed up by operations on a more extensive scale.

* * *

**Rural Water Supplies.**

A conference on the question of the water supply of rural districts which was held last Saturday at Cambridge afforded a welcome evidence of the fact that public opinion is alive to the importance of this subject. Professor Kenwood, the medical officer of health for Bedfordshire, touched the heart of the matter when he said that, quite apart from legal obligation, it should be the chief concern of every sanitary authority to provide and maintain a suitable water supply. We do not suppose that it will be disputed by any one that the primary duty of a sanitary authority is to safeguard the public health of its district. This duty unfortunately entails expenditure of public money for its efficient discharge, and we have often pointed out in these columns that a policy of economy at the expense of public duty is a foolish policy. Well-water supplies are not infrequently polluted, and are often intermittent. The remedy for the existing state of affairs is, as Professor Kenwood said, not an easy matter. The problem is, however, very largely one of finance, and much could be done by means of judicious State-aid. Meanwhile co-operation between villages can effect much, especially if all available rain-water be collected in storage reservoirs.

* * *

**The Institution of Municipal Engineers.**

We have already commented upon the paper which Mr. Henry Hulse, the Borough Engineer and Surveyor of Droitwich, read at the recent Western District meeting of the Institution of Municipal Engineers at Birmingham. The subject—"The Institution and its Benefits to Members"—provoked a good discussion, and the authorities invited criticism of the existing methods. This is exactly as it should be. Those who are really desirous of improvement in regard to any matter ought always to recognise the value of intelligent criticism. In the case of the Institution, however, no very serious criticisms were forthcoming. On the contrary, the members generally expressed great satisfaction with the manner in which the affairs of the Institution are being conducted. Such questions as the position of a surveyor who finds himself in conflict with his council, Government recognition, and extra remuneration for special work were mentioned, and Mr. Henry C. Adams dealt fairly and ably with the question of the calling in of private engineers. Altogether the discussion was of a very useful character.

* * *

**The Value of the Conference.**

This is the age of conferences, and the engineer who desires to keep himself informed of the latest and most up-to-date methods and ideas in regard to professional practice cannot afford to neglect the conference as a means of information. In the case of public officials such conferences are entirely for the benefit of the authorities, and it seems only reasonable that they should pay the expenses incurred by their officers in attending them. The County Councils of Warwickshire and Rutlandshire have passed resolutions in reference to this matter, and it would be well if other authorities followed suit. The suggestion is of a very mild character—namely, that the Local Government Board should take such steps as they deem best with a view to the alteration of the law to enable county councils to defray the reasonable expenses of their officials in attending conferences held for the purpose of discussing matters connected with their duties. We hope that the board may be induced to take some action in the direction indicated.

# Workmen's Cottages in Rural Districts.

## HEMEL HEMPSTEAD EXPERIMENTAL SCHEME.

The accompanying plans illustrate a small housing scheme which the Hemel Hempstead Rural District Council propose to carry out at Chipperfield, and which, if satisfactory—as there is every reason to believe it will prove—will be followed by more comprehensive projects for the better housing of the working classes in other parts of the district.

The plan shows a terrace of seven cottages designed by the surveyor to the council, Mr. Thos. H. Lighbody, M.S.A., in strict accordance with the local by-laws and the housing regulations of the Local Government Board. The Board have approved of the scheme, and sanctioned a loan of £1,150 for the carrying out of the work—£980 for buildings and £170 for the purchase of land.

The site, which is approximately nine-tenths of an acre, and rather exposed, is practically flat, and about 3 ft. above road level.

There being no sewers in this part of the district, the sink drains will discharge into a large cesspool, fitted up with a pump, and pail-closets will be provided. A scavenging scheme is in operation at Chipperfield by which the pails will be periodically emptied and disinfected.

The rain water will be collected at the rear in butts, and in the front discharge into the ditch, which will be piped in.

Provision has been made for easy access to the cesspool by a cartway running direct up to it from the public road.

Gravel paths will be laid down to the front of the cottages, and at the sides and rear an impervious paving will be provided.

All external walls will be 9-in. solid brickwork, rendered in two coats with cement to a finished thickness of 1 in.; a bead will be run about 1 ft. 3 in. above ground level, and all below this tarred.

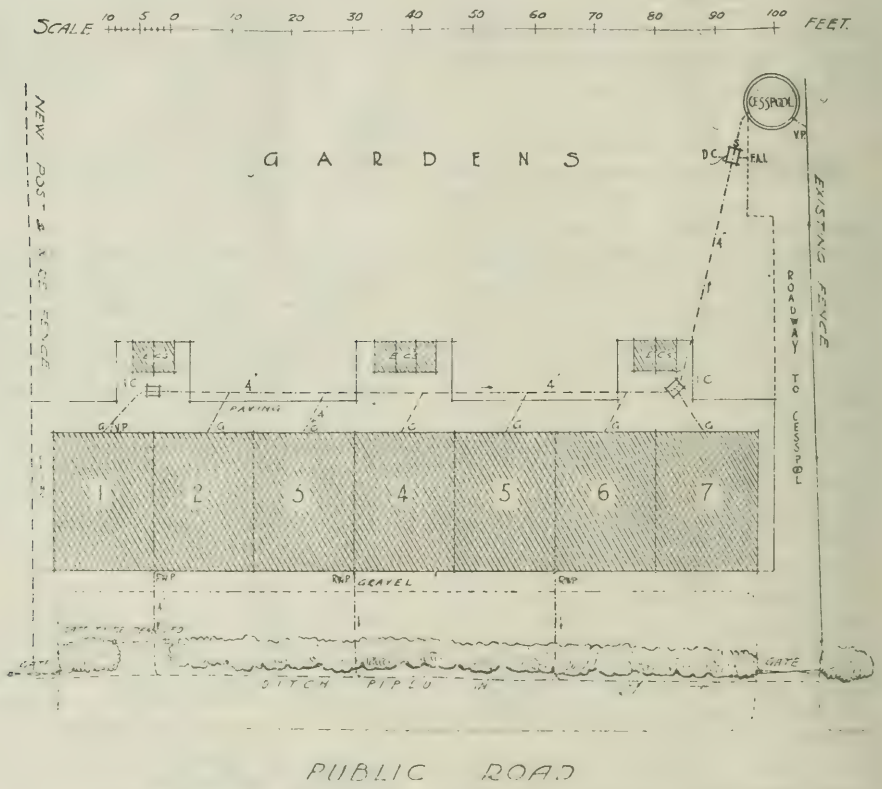
*Dampproof Course.*—Two courses of Staffordshire bridles in cement.

*Windowheads and Cills.*—Two courses of tiles bedded and pointed in cement.

*External Door Cills.*—Hard blue York stone, dowelled for frames.

*Floors* (Ground).—1-in. yellow deal, tarred on underside and spiked direct to tarred battens (2 in. by 2 in.), laid in and level with oversite concrete. First: 7-in. by 2-in. joists, 7-in. by 3-in. trimmers, 1-in. yellow boards.

*Windows.*—All solid frames, filled in with 2-in. casements.




Proposed Workmen's Cottages at Chipperfield, Hemel Hempstead: Block Plan.

*Partition Walls* (Ground).—4½-in. brickwork, except between stairway and living-room, which is matchboarded. Studded partitions first floor.

*Roofs.*—Covered with approved Penrhyn slates.

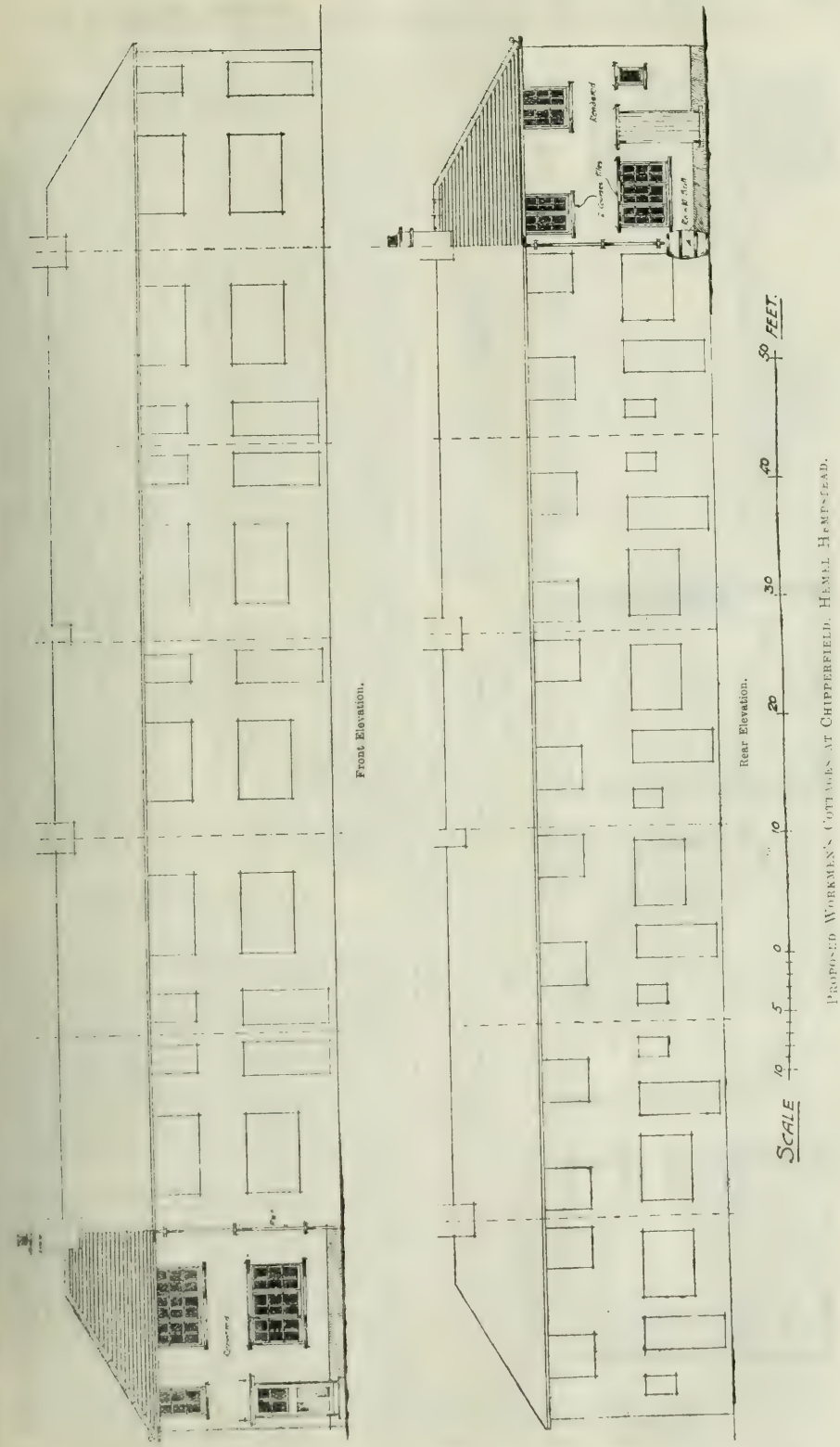
*Ventilation.*—Bedrooms Nos. 1 and 2 are provided with ceiling panels to ventilate the pocket above windows. Bedroom No. 3 has an airbrick, 6 in. by 9 in., inserted immediately under the eaves.

*Living Room.*—Fitted up with small dresser, good cupboard under stairs, and self-setting cooking stove.

*Scullery.*—Has iron copper with steam outlet into flue, stoneware sink, with lead waste and trap, and deal draining board.

*Water Supply.* The services will be taken from the company's main in the road, up cartway, and along the rear of the cottages to each sink.

*Fencing, &c.* The existing hedge will be trimmed back and restocked, a 9-ft. oak gate, 3 ft. of which will




PROPOSED WORKMEN'S COTTAGES AT CHIPPERFIELD, HEMEL HEMPSTEAD.

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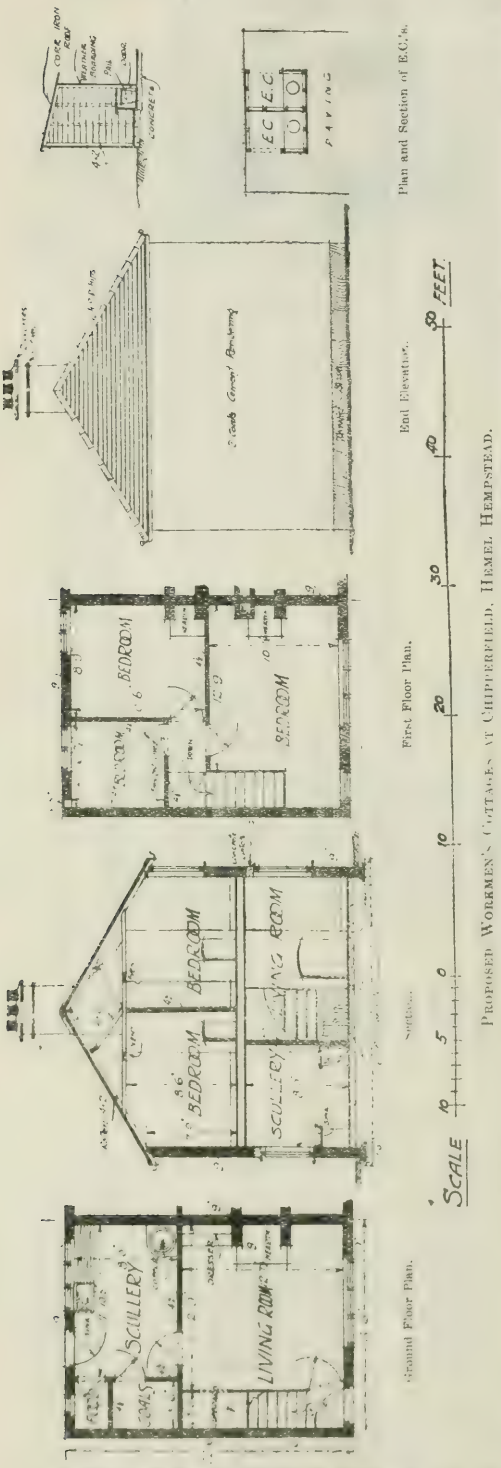
open as a wicket, will be fixed across the cartway, and a small oak wicket-gate will be provided at the other end of the plot. The gardens, which will each contain




about 150 poles, will be simply staked out, and not fenced off from each other.

It is estimated that the rent required will be 4s. 3d. per week per cottage.

## SURVEYORS' INSTITUTION.

### PRELIMINARY EXAMINATION, 1912.

The following candidates have satisfied the examiners in the above examination:—

Messrs. J. P. Addison, Meadowfield, near Durham; R. Addison, Appleby, Westmorland; F. H. H. Barber, West Ayton, Yorks; A. G. Bates, Paddington, W.; P. R. Bawden, Redruth, Cornwall; G. Berriman, Bournemouth; G. C. Biggs, Congleton; G. D. G. Bottomley, High Harrogate; C. L. Bulstrode, Bishop's Waltham, Hants; A. V. Cain, Milnthorpe, Westmorland; O. A. Chapman, Tramore, co. Waterford; F. E. Clarke, Twickenham; G. J. Clarke, Slough; R. K. Crouch, Kenilworth; D. L. Davies, Carnarvon; S. Davies, Lye, Worcestershire; J. H. Day, Maidstone; G. McTier Desprey, 116 Kensington High-street, W.; W. R. H. Downes, 7 Ebury-street, S.W.; W. E. Ellis, Newport, Mon.; E. R. Elwell, Leytonstone, N.E.; E. H. Esbester, Knowle, Bristol; A. Evershed, Stapenhill, Burton-on-Trent; C. W. S. Fifield, Chingford, Essex; H. G. S. Flower, Chewton Mendip, Bath; F. O. Forrester, Purley; F. C. Gibaud, Bristol; A. Gilbert, Enfield Highway, Middlesex; A. Glasse, Loughton, Essex; E. E. W. Granger, Symonstone, near Burnley; H. S. Graves, Willesborough, Ashford; S. L. T. Green, 5 Addison-road, W.; H. H. Haddelsey, Moseley, Birmingham; W. Harwood, Keyworth, Notts; G. S. Hebden, Rawcliffe Bridge, S.O., Yorks; M. T. Hedley, Dalston, Cumberland; T. A. Heywood, Darwen; G. S. Jennings, Moseley, Birmingham; R. G. Jukes, Tipton, Staffs; M. D. Kilford, Ilkeston; H. C. Killender, Liverpool; W. S. Knowles, Gloucester; D. Langlands, Sutton at Hone, Kent; R. C. Lewonski, Hove; H. C. Mason, Croydon; A. W. B. Medhurst, Wandsworth, S.W.; H. P. Mole,* Redhill, Surrey; C. Ody, Fallowfield, Manchester; T. B. Owen, Stroud; F. L. Pascoe, Stroud Green, N.; A. D. Paull, Wembley, Middlesex; R. R. B. Payne, Hitchin; G. B. Piggott, Barmouth; E. Purry, 51 Parliament-hill, N.W.; E. G. Richardson, Wood Green, N.; H. H. Roberts, Bettws-y-Coed; R. G. Roberts, Abergele; J. T. Robinson, Atherstone; R. A. Samuel, Swansea; E. Seabrooke, 113 Warwick-avenue, Maida Vale, W.; W. A. Shimmin, Douglas, Isle of Man; P. E. Simmons, Basingstoke; P. W. Soundy, Charlwood, Surrey; H. N. Surgey, Seaford; C. J. Thurgood, Ware, Herts; D. W. Turner, Mansfield; R. M. Vickery, Chard; S. Watts, 5 Bank Buildings, West Kensington, W.; T. G. White, Pontardulais, Carmarthen; C. I. Widcombe, Datchet; H. V. Willis, Southampton; C. H. F. Wollaston, St. Albans; H. C. Wolton, Lavenham Hall, Suffolk; C. J. Wolley, Stoke-on-Trent; E. H. Wootten, Ealing; and C. S. Wootton, Ealing.

SCOTTISH CANDIDATES.

Messrs. Thomas MacMillan, Glasgow, and J. C. Platt, junr., Barnes.

**Cutting of Hedges in Ireland.**—One of the grievances of road contractors in Ireland has reference to the order of the county councils with regard to the cutting of hedges. According to a letter read at the last meeting of the Wexford County Council this work is carried out against the will of the occupiers of the land bounded by the hedges. It was alleged that in some cases the cutting involved the contractor in serious litigation, and he was called upon to defend costly actions for damages. The writer added that so bitter was the opposition that the majority of contractors prefer being mulcted by the withholding of their salaries to encountering litigation and the enmity of the occupiers.

**Street Lighting in the City of London.**—Lamp-posts are to disappear from the streets of the City of London, and all lamps—except in open spaces—will be suspended over the centre of the road and provided with lowering gear. This is one of the principal features of a new lighting scheme adopted by the Court of Common Council. Experiments with the centrally-hung lamps have been carried out at the St. Paul's end of Cheapside and in King William-street and Cannon-street, and Mr. Joseph Gunton, chairman of the Streets Committee, stated that they had met with universal favour among the public. Under the new scheme the lighting of the City will be fairly equally divided between gas and electricity, and it is claimed that, while there will be a nett annual saving of £6,831 in the cost, the illumination will be increased from 668,405-candle power to 1,270,160-candle power.

* Head of list.

# An Evening in the Surveyors' Institution Library.*

By JULIAN C. ROGERS.

**[It is with much regret that we find ourselves unable to give the following paper in its entirety, a consideration due both to the Author and to the essay itself. We have, however, presented its leading points, and cordially welcome it as a stimulating plea for the widest culture on the part of "surveyors" in all the branches which that comprehensive term covers.—ED. THE SURVEYOR.]**

It is a testimony to the revivifying influence characteristic of the late secretary of the institution (1869-1905), as is recorded on the very microscopic nameplate on his portrait in the meeting-room) that his public return to Great George-street on the 22nd ult. should bring again from the shades the pseudonym hereto appended, a pen-name which has not worn the garb of type for many years. Nothing but physical disability would have prevented the Chiel from returning for the nonce to his old haunts, to honour both the man and the occasion. And, though disconcerted by the absence of his sheltering screen, he was well rewarded, for Mr. Rogers has a rare literary touch, perhaps inherited; a nice sense of humour which is never forced and never crude; and as wide and discriminating an experience of men and matters as of books. With sure instinct he "mixed reason with pleasure and wisdom with mirth"—was scholarly without being pedantic. It was a saying of Dr. Johnson that "a man will turn over half a library to make one book"; Mr. Rogers had turned over a whole library to make an essay. No wonder, therefore, his paper was mosaic work, and only discursively can the Chiel refer to it. Keenly was he in sympathy with the allusion to obsolete text-books, for often the Chiel has wondered how publishers can make it pay to issue such works, nowadays often out of date before advertisement can make their existence known. Glad, too, was he to meet the word "esurient," quite a good synonym for "hungry," and one to give dignity to current journalism. "Burin," again, bespoke the resources of the deft word-monger, albeit the casual may at first sight have counted it a misprint for "brain." The technical will know it for the chisel of the copper-engraver. "Classical quotation is the parole of literary men all over the world," said "the literary Titan of the eighteenth century" to Wilkes, and Mr. Rogers can resort to it without being pedantic. Moreover, his inclusion of a Greek axiom (to quote but one instance) enabled him to pay to his audience the delicate compliment of assuming that they all understood the reference in the original, which no doubt they did. But for the benefit of those who are not of the elect the Chiel proudly Englishes it as conveying that "a big book is a great evil"—which undoubtedly it is, seeing that it cannot be handled with comfort in bed.

> "All things are big with jest: nothing is plain
> But may be witty if thou hast the vein,"

sang old George Herbert. Mr. Rogers distinctly has the vein, and he is to be thanked for bringing to light so eloquent a denunciation as that of a leasehold being "an eviscerated freehold, stuffed with law." It is the better for being unconscious, and for coming from a serious pamphlet on leasehold enfranchisement. Another paragraph excited the Chiel's sympathy. One pictures Mr. Rogers handling with loving regard Barrett's "Bristol," and identifying therein the spurious imitations of "the marvellous boy." Suddenly the annotater finds missing the facsimile of the poem which should be on p. 637, and he mutters anathema on the pests that invade the sanctity of even the Surveyors' Institution library. "I mean," as quoth Charles Lamb, "your borrowers of books—those mutilators of collections, spoilers of the poetry of shelves and creators of odd volumes." "Fasting spittle" allured the Chiel, but he sought in vain, because in haste, for some explanation of it in Markham. Instead he found a precious specific which it would perhaps have been personal for Mr. Rogers to emphasise in the presence of venerable fathers of the profession: "To breed haire," it ran, "take Southern-wood and burn it to ashes and mixe it with common oyle, then annoint the bald place therewith morning and evening and it will breed hair exceedingly." Another reference the Chiel found time to make was to "Dr. Cowheel," and it led him to dissent somewhat from Mr. Rogers's conclusions that Carlyle's "improper females" had an unduly bad time of it in the Middle Ages. Under "Free-Bench" the Chiel found that in the manors of the county of Berks it is true that if such errant lady were guilty of incontinency she forfeited her estate, "yet if she will come back into the Court riding backward on a black ram, with his tail in her hand, and say certain words, the steward is bound by the custom to readmit her to her free bench." The cryptic "certain words" had to conclude as follows:—

> "And for my Cuncum Cruncum
> Have lost my Buncum Buncum,
> And for my Tail's Game
> Have done this wordly Shame,
> Therefore I pray you, Mr. Steward, let me have my land again."

Mr. Rogers rather suggested as a penalty something in the nature of white-hot pincers and boiling oil, but the reclamation rite seems to have had nothing Inquisitional about it, though perhaps lacking in dignity. Unanticipated animation was given to the discussion of the paper by two plotters, literary stars of the first magnitude, who, the Chiel imagines, had come together with mischievous intent—the scarifying of their good friend the essayist. One was Sir Ernest Clarke, the whilom secretary of the Royal Agricultural Society, who knows all that may be known of the bibliography of agriculture (*vide* his Cambridge lectures and other eloquent evidences). One gathered that, anent this subject, which he had made his own, he would have seen apt application to Mr. Rogers in the view of the fourteenth or fifteenth century Hoccleve, or Occleve:—

> "Some man for lakke of occupacioun
> Museth ferther than his witte may streeche,
> And all thurghe the fiende's instigacioun
> Damnable erroure hodethe."

The other was Mr. H. B. Wheatley, F.S.A.—"a dab at an index," as Goldsmith says in "The Bee." To Sir Ernest's criticisms Mr. Rogers replied in effect: "'Et tu, Brute!' brother ex-scrivener. I'll talk to you privately, Ernest, over coffee and a cigar. Meanwhile I don't accept a word of your corrections, and they don't induce me to hedge a letter of my essay." To the more gentle Wheatley he was his suave self, and he accepted the debater's plea for full credit to Captain John Graunt for the "Observations on the Bills of Mortality of the City of London." Pithily Dr. Johnson has indicated the value of a library when he pointed out that one half of knowledge is to know where to find information on a subject: Mr. Rogers concluded his delightful paper by suggesting an even finer mission when he expressed the hope that his essay had inspired the audience with some portion of the spirit of "divine contentment" its author had himself enjoyed in the company of books. Undoubtedly it did, and that its inspiration will similarly influence the wider circle who will read it here and elsewhere is the ardent hope and firm belief of

THE CHIEL BEHIND THE SCREEN.

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It must be at least seven or eight years ago that the council did me the honour to suggest the writing of this paper. Meanwhile, a good deal of water has run under the bridges, and I had begun to regard the whole matter as deferred to the Greek Kalends. In this, however, I was very much mistaken. What seemed so remote, and, indeed, improbable, suddenly became a stern reality, an official letter reminding me that promises, like maledictions, may "come home to roost."

I was not long in discovering that I had to deal, not with a single subject, but with scores of separate subjects, each clamouring for precedence, and without one single point in common. Where to commence and where to finish was the problem, and I felt inclined to exclaim with the opium eater, "End there is none; so likewise there is no beginning."

It will be seen, therefore, that no connected treatment is possible, and that I have no choice but to be as discursive as my subject is large, a liberty as one could desire. So much by way of preliminary.

In one of Emerson's well-known Essays is a passage which seems to fit the present case. He says, speaking of books and their inaccessibility: "The colleges, while they provide us with libraries, furnish no professors of books, and I think no chair is so much

* Paper read at a meeting of the Surveyors' Institution held on Monday, January 22nd.

wanted. In a library, men are surrounded by many hundreds of dear friends, but they are imprisoned by an enchanter in those paper and leathern boxes; and though they know us, and have been waiting two, ten, or twenty centuries for us—some of them—and are eager to give us a sign, and unbosom themselves, it is the law of their limbo that they must not speak until spoken to, and as their enchanter has dressed them, like battalions of infantry, in coat and jacket of one cut, by the thousand and ten thousand, your chance of hitting on the right one is to be computed by the arithmetical rule of permutation and combination—not a chance out of three caskets but out of half a million caskets, all alike. . . . It seems, then, that some charitable soul, after losing a great deal of time among the false books, and alighting among a few true ones which made him happy and wise, would do a right act in naming those which have been bridges or ships to him to carry him over dark morasses and barren oceans."

Though no professor of history, this is the duty imposed on me this evening, and which I will endeavour to perform to the best of my ability, in the conviction that all thinking men love books and that there are none here, like Lord Foppington in the play, who held that "to mind the inside of them is to entertain one's self with the forced product of another man's brains, whereas a man may be much amused with the natural sprouts of his own."

Neither will any here share the view of Lord Rosebery that a library is a mere "cemetery of books," which ought, for the most part, to be destroyed in the interest of literary elbow-room. . . .

There is, however, a class of book undeserving of the smallest mercy in a library like ours. I refer to the obsolete or even obsolescent text-book, which, next to a pet tiger, is the most dangerous of possessions, especially if it rests, as so many do, on the shifting sands of law.

Theoretically, a library like ours should, I suppose, be strictly limited to professional text-books. I am profoundly thankful that this narrow view has not been suffered to prevail. . . .

The influences that determine the character which a library shall take are difficult to trace, even with a first-hand knowledge of the various stages of its growth. Some present in this room may remember how scandalised was the scientific world in the fifties of the last century by the expression "a fortuitous concourse of atoms," applied to matter by that jaunty person Lord Palmerston. Without dread of similar consequences I venture to describe our library as a more or less fortuitous concourse of books, for it consists very largely of works contributed by private donors, each with his own notion of what would be acceptable and appropriate. This accounts, to some extent, for its rather miscellaneous character. Books so acquired are in a great numerical superiority, but I think I may say that, with a few notable exceptions, all the more valuable of our books have been acquired by purchase, and it is to those (though not wholly) that I propose to confine myself this evening.

The staple of our library is British topography, and our collection of these noble works would be hard to match elsewhere. Shall I be thought lacking in appreciation of them when I avow my inability to understand why topography should be regarded as of such surpassing and peculiar interest to surveyors; for I say it without hesitation after an experience of thirty-six years, there is no class of book in the library less frequently consulted by the members. . . .

Whatever might be the appropriateness of topography, there could be no manner of doubt as to the claims of agriculture, historical and technical, ancient and modern, to a place on our shelves, and it figures there to a satisfying extent.

Professional text-books also, as a matter of course. There is no lack of them. They are always ready, as Dr Johnson says in his celebrated metaphor, to "encumber one with help," and as a much older writer says of them, "they are like bishops—one edition of them is pawneth another." The most eminent can eat and be satisfied, even to repletion. I am sometimes tempted to wonder whether text-books share with bacteria the faculty of autogenesis, or self-multiplication, and there is a strange law of nature which seems to impel him who has been unsuccessful in life's battle to write a text book lest a malign misfortune should overtake his friends, which is the kindest construction one can put upon it.

Late many years in organised attempt was made to extend the library beyond the range of the three categories of "Topography," "Agriculture," and "Professional Text-Books," and it was only occasionally, and by chance, that the gloom which brooded over our shelves was lightened by the gift of a book less desperately practical, and one wondered, like King George III. at the apple in the dumpling, "how the deuce it got there." . . .

As I have said, British topography forms the staple of our collection—in value, not number. The earliest county history is Lambarde's "Kent," of which we possess an excellent reprint, . . . encouragement of Archbishop Parker the husband of the lady whose hospitality at Lambeth was acknowledged by Queen Elizabeth in such ambiguous terms—"Madam I would fain call you; Mistress I dare not call you; but, whether Mistress or Madam, I thank you." It will be remembered that Elizabeth never got over her Catholic repugnance to a married clergy.

We have also a copy of Kilburne's "Kent," published . . . after Lambarde's work, to which it is inferior in every way. . . .

Sir William Dugdale's masterpiece, "The History of Warwickshire," was published about one year before Lambarde's "Kent," but there is no comparison between the two authors. Lambarde was an ignorant amateur; Dugdale a professional antiquary and a literary craftsman of the first order of excellence. His work is the model on which all subsequent county histories have been fashioned. We possess a copy of the original edition of this famous book. It is enriched with many plates by the celebrated engraver Hollar, who also contributed many illustrations to the same author's *magnum opus*, "The Monasticon," of which we possess a fine, though not an original, copy. There could not be a better refutation than this splendid work of the Greek axiom, *μέγα βιβλίον μέγα κακὸν*. . . .

Another book which should by no means be overlooked is Parton's "History of the Parish of St. Giles." Apart from its literary merit, it is of interest from a plan showing in detail all the houses and the names of their occupants or owners in the year A.D. 1300. I believe this to be the earliest plan of the kind in existence.

The library has its humours, conscious and unconscious. There is among the tracts a pamphlet on "Leasehold Enfranchisement," the opening sentence of which is a masterpiece of verbal definition: "A leasehold is an eviscerated freehold, stuffed with law." It is much to be regretted that the rest of the treatise does not fulfil the promise of this hopeful beginning.

I have often wondered what sort of man he was who wrote a book which he entitled "Talks on Manures," which you will find in the library. The word "talks" is so friendly—so suggestive of a quiet colloquy by the fireside; but with manures for a subject the romance is gone. Indeed, I know of nothing to match it save a little book of erotic poems written by a footman, and sent to me by the author, dubbed "The Muse in Livery"—a delightful blend of Plush and Parnassus, or, perhaps worse than all, a work published many years ago by a writer on cutaneous diseases with the appallingly suggestive title, "Hunt on the Skin."

There is a book on the shelves with the highly deceptive title "Blount's Jocular Customs," a treatise of the most arid description on "Manorial Law." I have not been able to trace the origin of this particular use of the word "jocular." That it is utterly misleading I know for certain, for I have seen a student take it down with eager expectancy and hastily replace it with a look of deep disgust. . . .

One of the strangest topographical works ever produced is the "Polyolbion" of Michael Drayton, described on the title page as "A chorographical description of the tracts, rivers, mountains, forests, and other parts of Great Britain." It was published in 1613. Drayton is the "Tusser" of topography, except that his verses are of a higher order of poetical merit in which the personification of inanimate objects bears a conspicuous part, after the fashion of the period. There is nothing like it in the language. A lyrical Bradshaw or Euclid in hexameters would seem very little more strange to modern eyes. The book is annotated by John Selden, and has for frontispiece a portrait of the unfortunate Henry, Prince of Wales, who, had he lived, might have deprived us of the blessing of Charles II. It also includes some commendatory verses by that much-neglected poet of the Commonwealth, George Wither (beloved of Mr. Joseph Chamberlain), and some remarkable maps well worth examination as grotesque specimens of cartography. It would seem from them that the towns and watercourses in those days had each its

own female conservator, whose duty it was to look after things by sitting permanently in midstream. As an almost inevitable consequence showily dressed young men hovered about in a state of riparian rapture, intent on enticing them ashore. The various Conservancy Boards would add greatly to their popularity by reintroducing this charming arrangement, if the Lord Chamberlain would permit it, which I doubt.

Lastly, among our topographical books, let me call your attention to a work of very little intrinsic value, but curious and interesting as enshrining some of the earliest effusions of the inspired boy, Thomas Chatterton—I refer to Barrett's "Bristol." Barrett, who seems to have been the most credulous and unsuspecting of men, even for an amateur antiquary, fell greedily into the trap set for him by Chatterton, and solemnly printed the pseudo-poems of the imaginary monk Rowley with which his correspondent supplied him. Many years ago I marked these spurious poems in our copy of the book, to which they have lent such a dubious fame. The curious can read them on pages 600 to 609, and elsewhere in the volume. There should be a facsimile of one of the poems on page 637, but for some reason it is missing.

Those who care for early chronicles should look at our copy of the magnificent volumes of "Reports of the Record Commission," published under the title "Monumenta Historica Britannica." Here you will find the oft-quoted "Chronicle of Bede" (*circa* 673-735), "venerable," if anyone ever deserved the title, and the "Anglo-Saxon Chronicle," printed in English and Anglo-Saxon in parallel columns—most interesting for those who care to achieve some knowledge of the rudiments of our native tongue, and very useful for students of the much-neglected poet Gower in his last, or English, period. The volume also contains a most instructive map of Roman Britain.

Agriculture, as I have said, is very fully represented on our shelves—at any rate historically—but is deficient on the modern side. Here you may trace its evolution from (what shall I say?) Virgil to Voelcker. Perhaps the most instructive in the series, for the student, at any rate, is the monumental "History of Agriculture and Prices" by my late relative, Prof. Thorold Rogers, based on the records of Merton College, Oxford, the oldest landlords in the country, their ownership extending without a break from the thirteenth century to the present day.

Next let me call attention to Fitzherbert's "The Boke of Husbandry," a copy of which, in black letter, dated 1534, is in the library.

Thirty years after Fitzherbert came Thomas Tusser's rhymed jingle called "Five Hundred Points of Good Husbandry," which was, I presume, supposed to be got off by heart a sort of *memoria technica*. Tusser had a passion for doggerel verse, even committing his autobiography to that detestable medium. Strange to say, he is included by the large charity of Southey among the "Early British Poets." Our copy is only a reprint, dated 1812.

Next comes Gervase Markham, of whom it is sufficient to say that his industry was greatly in excess of his knowledge, while his principles were detestable. He thought nothing of republishing his old books under new titles, until the booksellers combined against him, making him sign a bond not to write any more works on agriculture if he wished for further employment. This excellent plan is well worth reviving in our times to check the fecundity of some authors I could mention.

Of Markham's thirty-two lucubrations we happily possess but eight; all, however, are gems of absurdity. A perusal of his "English Housewife's Household Physic" would cure the most confirmed hypochondriac. Among his sovereign remedies for human ills is what he calls "lasting spittle," which, whatever its therapeutic value, has the advantage of being cheap, and, under modern fiscal conditions, likely to be abundant.

Not to labour the list, Walter Blith's "English Improver Improved" is worthy of a passing glance, as well as Hartlib's "Legacy of Husbandry," published, like Blith's book, in the time of the Commonwealth. This Hartlib owes some of his fame, such as it is, to the fact that he was Milton's friend.

It was nearly a century later that Jethro Tull published his epochal treatise on "Horse-hoeing Husbandry," which marks the first real advance in British farming for some centuries. Tull, as everyone knows, was the inventor of the drill. There is an excellent copy of his work in the library. It is sufficient merely to mention his contemporary Maxwell of whose "Practical Husbandry" we possess an original copy, and we come to that prince of observers and most voluminous of writers, Arthur Young.

I believe that we own a complete set of Young's writings. They can still be read with profit, though he belonged to that curious class of men competent to advise others in a business in which they are themselves dismal failures. He was rather a fussy and pretentious person, but as a annalist of agriculture he remains quite unrivalled. There is no more interesting book in our library than his "Tour in France," written on the very eve of the French Revolution. His "Tour in Ireland" has been recently republished, and I had the happiness to discover that we possess Young's own copy of this work, copiously interleaved with his original sketches, which were supposed to have disappeared. Such was Young's enthusiasm that he recorded on his wife's tombstone that "she was the great-granddaughter of the first person who used marl in Norfolk"—a queer title to immortality. It reminds one of the ardent naturalist who botanised on his mother's grave. I do not think it is generally known that King George III., the dullest of his race, contributed to Young's "Annals of Agriculture" under the pseudonym of Ralph Robinson, who was his Windsor shepherd. It was agriculture that he understood so far as he understood anything.

Of the writings of William Cobbett, Young's successor as an annalist, we possess nothing but his immortal "Rural Rides," which is almost a classic in the language. There is an indefinable charm about the book. It seems to exhale the very air of the breezy downs and sequestered lanes he loved so well. No man is harder to place in the hierarchy of agricultural writers, but as a master of pellucid English he has few equals. His book is also an excellent school of vituperation for anyone that cares to graduate in that gentle art; but his provocations were great, and he lived and wrote in that most miserable period in all agricultural history—the first quarter of the nineteenth century. Cobbett might be described as a sort of bucolic Juvenal, who considered he had a mission to lash the sins of his age, as he conceived them, and it cannot be denied that he laid on the scourge pretty lustily. Still, the fact remains that he was a charming writer and as keen an observer as his prototype Arthur Young, on whose "Tours" his "Rural Rides" are obviously modelled. . . .

It is said that the first copies of his "Grammar" (an admirable work which should be in the library) contained definitions of the *definite and indefinite articles*, which he had the wisdom to suppress—*viz.*:—

"'The' is the definite, 'a' the indefinite article.

Examples—

*The* House of Commons

*A* Den of Thieves."

The principal charm of our library consists in a number of miscellaneous books which cannot be grouped under any general heading.

Probably few of the members have had the curiosity to take down a book with the forbidding title "A Law Dictionary," by Dr. John Cowel (the spiteful Coke always referred to him as Dr. Cowheel)—which is a perfect mine of information on feudal customs and manorial law. It illustrates, better than any other book with which I am acquainted, the monstrous edifice of legal chicanery which came in time to overlay the common law of the land. Persons delicately referred to by Carlyle as "improper females" had a bad time of it in the Middle Ages, as you will see in Cowel if you refer to the word "Free-bench." . . .

The very mention of dictionaries calls up the gigantic figure of Samuel Johnson—the literary Titan of the eighteenth century, on whose merits the opinions of his fellow countrymen are now so curiously divided to some a synonym for all that is boorish and disgusting, to others for all that is greatest in conduct and morals. It has been said that his name is a touchstone of ethical perception, and I am not concerned to deny it. What is certain is that no man before or since ever engaged, single-handed, on so gigantic a task as his dictionary or carried it through more successfully. The preface is a miracle of erudition, and should be read by anyone who values the genesis of our English tongue.

I am happy to say that we possess a copy of the original edition, and there is surely some pathos in the fact that here we can gaze upon the actual printed characters on which the great doctor's poor myopic eyes rested as he stooped over the proof-sheets in his dismal garret in Gough-square, the front of his old tow wig sizzling in the candle flame.

He employed five amanuenses, all Scotsmen, two

named Maclean, the others Maitland, Shiel, and Stewart, whose names thus live in history.

The work occupied him seven years, and he received for it a sum, per annum, which falls short of many a fee now paid to counsel for a couple of day's work in observing the facts in a single compensation case.

Johnson, of course, was no philologist and was quite unacquainted with German literature, and his definitions are not always unimpeachable. His selection of authorities was probably the best available at the time, and it is said that he was assisted in his choice by Pope.

His definition of "oats" is well known—better than that of "excise" as "a hateful impost levied on commodities and adjudged, not by the common judges of property, but by wretches hired by them to whom excise is paid," or of "lexicographer" as "a writer of dictionaries, a harmless drudge that busies himself in tracing the original and detailing the significance of words"; both highly characteristic specimens of playful bitterness.

We have another record of Johnson in the library. If you turn to page 360 of the volume of the "Gentleman's Magazine for 1736, you will find the following advertisement:—

> "At Edial near Lichfield, Staffordshire,
> Young gentlemen are boarded and taught
> The Latin and Greek languages.
> Samuel Johnson."

This venture followed immediately after his marriage to his unlovely wife, the widow Porter, and oddly enough the same volume contains an advertisement of a new general dictionary, by whom is not stated.

We are also the possessors of a good copy of Bayle's great historical and critical dictionary—a miracle of learning and research.

Let me commend to your notice the deeply interesting collection known as the Somers Tracts. Most of them are what remained of Lord Somers' library after a disastrous fire in 1752. How many of these papers (some of a highly confidential nature) came into his hands does not appear, but it is obvious that in his position as Lord Chancellor he would have access to many State documents which, with his keen love of literary pursuits, he probably copied, and perhaps in some cases appropriated.

There are in this vast collection of tracts documents of extraordinary interest for the student of history. That this is so is shown by the fact that it is edited by no less a person than Sir Walter Scott. Our copy belongs to the second edition, published in 1809, the year of the appearance of "Marmion," and five years before the first of the Waverley novels.

As a specimen of these tracts let me suggest the perusal of Sir Roger Williams's "Account of the Wars in the Low Countries," where centuries earlier the British Army, according to Froissart, "swore so terribly." On page 33 of the first volume you will find a report of the speeches of Henry VIII., Queen Catherine, and Cardinal Campeius in the divorce proceedings before that wily person and Wolsey. But I must not linger over these inviting volumes.

Almost equal in interest is the so-called "Harleian Miscellany," another enormous collection, selected by Oldys, the antiquary, from the library of Edward Harley, second Earl of Oxford. It comprises nearly 700 rare tracts. . . .

We have but two recognisable books from Beckford's celebrated library at Fonthill—one of them the "History of Framlingham," the other a small guide to the city of Hereford. Both derive interest from the fact that they are annotated on their fly-leaves in Beckford's own hand, showing that he was not a mere collector, but a diligent student of the books he acquired.

Among the many curiosities in the library is a little duodecimo volume, entitled "The Compleat Lawyer," by William Noy. The feat of compressing the whole body of law within 117 small pages strikes one as surprising. It is perhaps explained by the fact that the author was more skilled than most men in producing immense results by small means. For it was he who, as Attorney-General to Charles I., framed, and it is said suggested, the ordinance for the levying of ship money, which cost the King his head and the kingdom a sanguinary internecine war of nine years' duration. . . .

Noy's house at Brentford was pulled down within my own memory. I may mention here that the statutes at large are a blank for these nine years, the Acts passed in the time of the Commonwealth being treated as non-existent.

We have an excellent copy of the seventh edition of "Coke upon Littleton," printed partly in black letter, dated 1670. It is, perhaps, next to Justinian's "Institutes," the best-known law book in any language. It contains a quaint portrait of Sir Thomas Littleton himself (*temp.* Ed. IV.). We have also a fine black-letter copy, printed in 1583, of Littleton's original work, "The Tenures," on which Coke has imposed himself so enduringly.

Among our most valuable possessions is Bracton's great work, "De legibus et consuetudinibus Angliæ." It is remarkable not only for its vast learning, but as an early and splendid specimen of the printer's art. This great treatise was published in 1569. It is described by Sir William Jones as "the best of judicial classics." Ours is an original copy, and, though nearly 350 years old, might have issued yesterday from the press of Richard Tothill. I may mention that Tothill lived on the south side of Fleet-street, a few doors inside Temple Bar. He is well known to bibliophiles as the printer of the poems of the Earl of Surrey, splendidly reproduced in one of the volumes of "Arber Reprints," which I commend to all lovers of literature.

Our library is not very rich in what is rather loosely known as "sociology," but contains some notable books on the subject. One of the best (I say it without partiality), because drawn from unimpeachable sources, is Prof. Thorold Rogers' "Six Centuries of Work and Wages," which vividly depicts the condition of the common people from the thirteenth century to the present day.

Other works of the kind, though much inferior in point of accuracy, are Eden's "State of the Poor," published in 1797, and Porter's "Progress of the Nation," neither of which the student of social economics can afford to neglect. It is a satire on our boasted place in the universe that this man, who dealt with such portentous problems, died from the sting of a gnat.

We are also not very rich in books on architecture, perhaps rightly so, but I should like to direct your attention to two of them—Wren's "Parentalia," and Pugin's "Contrasts."

The "Parentalia" is a history of the family of Sir Christopher Wren, written by his son, the second Sir Christopher. Wren was not only a great architect (perhaps the greatest since Bramante), but a great scientist, for he was Savilian Professor of Astronomy in the University of Oxford, and a president of the Royal Society. On page 274 is a most interesting account of a survey of St. Paul's Cathedral, made by Wren a few months before the Great Fire in 1666. This should be read in connection with a report by him after the fire, which will be found on page 247 in Elmes' admirable biography of Wren, also in the library.

A. Welby Pugin's "Contrasts" strikes one at first as an ill-natured pictorial skit on contemporary architecture. It is not really so, being only an appeal to the eye, against the degradation of his beloved art. His plan is to place side by side modern and ancient examples of buildings for similar purposes, very much to the disadvantage of the former. I have heard it said by those who knew him that this great artist never used a T-square, and rarely supplied the builder with a working drawing, the poor man having to content himself with rough sketches in charcoal, on the nearest plane surface available.

Let me call your attention to a little "History of Newcastle-upon-Tyne," for the sake of its frontispiece, an undeniable product of the burin of Thomas Bewick, recognisable at once, by the instructed eye, by the masses of uncut wood left to form the deeper shadows.

Those who have a fancy for ancient itineraries should look at William Burton's "Commentary on the Itinerary (first published in 1658) of the Roman Emperor Antoninus Caracalla (186-217), not Antoninus Pius, as is generally supposed. It contains the whole story of the Roman government of Britain in the third century. It is a book much beloved of antiquaries—by the learned Selden most of all.

Or, coming later down in history, the curious itinerary through Wales, in 1188, of Baldwin, Archbishop of Canterbury (1184-90). It appears in the Library Catalogue under the name of De Barri, who accompanied Baldwin on his travels.

Later still, the travels in England and elsewhere of Cosmo III., Grand Duke of Tuscany, who visited this country in the reign of Charles II. The principal interest of the book consists in a large number of views of English towns and cities in the seventeenth century, and the record it contains of many quaint habits and customs of the time by a contemporary observer. The view of the Banqueting House,

Kingsgate, and the adjoining houses is particularly interesting.

We have a copy of the third edition of the admirable itinerary (1534-42) of the learned John Leland—that prince of antiquaries. . . . The book forms the foundation of nearly all subsequent writings on our national antiquities. . . .

Of road books we have some excellent examples. The Roman roads appear in detail in Reynold's "Iter Britanniarum," which is in point of fact a commentary on the itinerary of Antoninus already referred to. It contains an excellent map of the Roman roads in Britain.

We have also another road book (engraved text and illustrations on 100 copper plates, a most costly production) entitled Ogilby's "Britannia," which was the direct predecessor of Patterson's well-known book.

Patterson's "Roads of England and Wales," published in 1771, enjoyed an extraordinary popularity and passed through many editions. It was in immense demand in the pre-railway times. We have a copy, dated 1784, of the sixth edition, and another copy greatly enlarged by Mogg, which came out just before the disappearance of the mail coaches. The advent of the automobile has given the book a new lease of life, and it is again in great request.

I have referred in another paper to Captain John Graunt's "Observations on the Bills of Mortality of the City of London." The real author was Sir William Petty, whose name is so familiar to readers of "Pepys' Diary."

It is, so far as I know, the first attempt to establish a theory of vital statistics. The division of the population into "breeders" and "feeders," in other words, bread-winners and dependants, seems rather crude to the modern mind. One fact comes out with sufficient clearness—that in the seventeenth century the population of the City was kept up entirely by immigration from the country, which was also the case with all the large towns, noticeably so in Bristol and Winchester.

The author gives an amusing description of the way in which the Bills of Mortality were "made and composed." He says: "When anyone dies, then either by tolling or ringing of a bell, or by bespeaking of a grave of the sexton, the same is known to the searchers. The searchers thereupon (who are ancient matrons) repair to the place where the dead corps lies, and by view of the same, and by other inquiries, then examine by what disease or casualty the corps died." No wonder if, after such an inquest, so many were said to have died from "wolf," "rising of the lights," or were "planet struck" or "burst."

The subject of population leads one by an easy transition to the celebrated essay by the much-misunderstood and much-maligned Thomas Malthus, beloved of J. S. Mill and detested by Cobbett, and whose name has given an adjective to the language. His "Essay on Population," which is in the library, fell like a thunderbolt on a generation taught from pulpit and forum that fecundity and patriotism were interchangeable terms. . . .

There is a queer book in the library, published in 1653, entitled "Mattheus de Auctionibus," which, being interpreted, is "Matthew on Auctions." Latin was the language of the rostrum in ancient Rome, but I am not aware that biddings took place in that language in the time of Charles II. Its principal interest, apart from its antiquity, consists in a reference to auctions held *sub hasta* (literally under a spear planted in the ground) of the spoils taken in war.

In order that the fact may be on record I may here state that this very house in which we are assembled has a literary history of its own. Here it was, at No. 13 Great George-street, incorporated in our building, that John Wilkes, patriot, buffoon, and libertine, wrote the famous No. 45 of the "North Briton," and from which he was dragged to imprisonment in the Tower. What is now known as the "members'" room on the ground floor was his dining-room, and I have no doubt that its beautiful chimney-piece dates from his time.

I need not commend to your notice the "Annual Register" complete from 1758 to the present day. Also the "Gentleman's Magazine." For the first thirty years the Annual Summary in the former was written by Burke. The "Gentleman's Magazine" was started by Cave in 1731. He was the first to publish what purported to be reports of the Parliamentary Debates. As is well known, they were the work of Johnson, performed by means of the then undiscovered science of telepathy. This deception is the only blot on the fair fame of the moralist.

I imagine that few have ever seen, though everyone has heard of "Cocker's Arithmetic." "According to Cocker" is an accepted figure of speech. The work was first published in 1677. Our copy is dated 1695. Between the earlier date and 1720 it passed through thirty-seven editions. . . .

We have a complete set of the excellent photo-lithographic reproductions of "Domesday Book" (or "Inquest," as it is more properly called), published by the Ordnance Survey authorities. Its interest is greatly enhanced by a previous perusal of an excellent treatise on it by Mr. Adolphus Ballard, which is also in the library. This great survey of the whole kingdom took but nine months to execute. *Tempora mutantur.*

Francis Grose's "Antiquities of England and Wales" in eight folio volumes, is formidable reading, and more useful for reference than perusal. He was the convivial gentleman to whom Burns refers in his ode "Frae Maid-en-kirk to John o' Groats."

Few would care to turn over the pages of our fine copy of the "Statutes at Large," yet there is much instruction to be gleaned from them, reflecting as they do the passing passions of the day and the gropings of many generations of men towards the light which shines with such dazzling splendour in our incomparable age, when, if the auguries can be trusted, happiness and contentment is about to be the lot of all, without the necessity for any personal exertion worth mentioning.

It is, of course, impossible within the limits of the time at my disposal to pass in review more than a few of the books to which I should have been glad to refer, but I hope I have said enough to show how rich our library is in works which should appeal to every educated man. I can speak from experience for I am familiar with them all, except, perhaps, 5 per cent. with which I have merely a nodding acquaintance, which, if I can help it, shall never ripen into intimacy.

No reasonable person can expect our library to be used, say, like the library of the Athenæum Club—for very few of our members can be numbered (or, for that matter, would care to be numbered) among the leisured classes.

Practically there are but two periods in the life of an ordinary man when methodical reading is possible—the period of youth and the period of late middle life.

Needless to say, what is read in youth is of incalculably greater benefit than what is read in maturer years, if read properly and on a systematic plan; otherwise it is time absolutely wasted, for there is an art in reading as there is in writing or speaking. Mere browsing at large, like an ox in a fat pasture, may afford some passing pleasure and serve to beguile an idle hour, but is useless if you would make your knowledge a permanent possession. I speak to the younger men, and, in the hope of assisting them, venture to formulate a few simple rules for reading, which I have myself followed for more than fifty years: (1) Read with concentrated attention; (2) make what you read the subject of careful afterthought until it is clearly mirrored in the mind; lastly, having read your subject and pondered over it, *read round it*, which is most important of all, for it is only through links of association that the memory is able to summon what is wanted from the storehouse of the mind. These links of association stand in the same relation to the memory as an index to a book or a catalogue to a library. Without them all is chaos.

Reading round a subject, as I have called it, has the further advantage of forming a number of fixed nuclei, about which, in time, a vast amount of information insensibly gathers. It is the true way of reading, and nothing else takes its place, however good the memory for isolated facts. Personally, I have no liking for note-making, and never found any advantage in adventitious aids of this kind.

I hope this interlude will be pardoned and counted unto me for a sort of righteousness.

My function this evening is confined by the title of my paper to the library as it is. The temptation is strong to point out its deficiencies. A visit, note-book in hand, to the libraries of the Athenæum Club, the Royal Statistical Society, or the London Institution would show the directions in which our library could be usefully extended without departing from its present general character and scope.

The institution is still young, as institutions go. The composition of the membership has undergone great changes in the last forty years without losing its basal form in relation to the great landed interests. It has attracted to its ranks in large numbers the important class of building and quantity surveyors;

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valuers, as distinguished from the stewards of country estates, sanitary surveyors interested in ventilation, drainage and sewage disposal, municipal surveyors concerned with paving, sewerage, road making and water supply. The literary needs of all these classes of practitioners have had to be catered for, with the result that the library is what it is—a storehouse of information in which every reasonable practical want is, fairly if not fully, provided for.

But there is, beyond this, a larger question which, as it is treading on delicate ground, a former vice-president shall voice for me.

How many are there still living who remember, as I do most vividly, a paper read before this institution forty-one years ago by the late Mr. Jeremiah Mathews, entitled "A Plea for Culture in the Profession of a Surveyor." He pointed out (what is true) that at the beginning of his career (say about 1820) "the modern surveyor was unknown . . . occupying a simply subordinate position." He adds: "It is well to be reminded of this . . . in order that we may be impressed with the necessity for an expansion of our education and culture." Again he says: "I consider the best preparation for our profession to be a high general education . . . such as is generally thought necessary in the older established professions . . . and I certainly know of no place comparable to the universities for this purpose."

This is the road which the institution is now treading, but as it is open only to a few, might it not be well to place further self-educational facilities within the reach of our students by the inclusion of a considerable number of works of general literature in the lending library, and by encouraging the younger men to attend the classes in History and Literature held at King's College and in many of the provincial universities? But perhaps this is a counsel of perfection.

This we can place to our credit—that we were the very first of the modern professions to adopt the examination system, previously confined to the older so-called liberal professions. Our example has since been followed by the architects, the engineers, the accountants, and many other bodies, showing how correctly we interpreted the spirit of the age.

There are still some who remain unconvinced of the utility of examinations, but they are of the class described by Sydney Smith as "persons who, had they lived at the dawn of Creation, would have got up a cry of 'Give us back old chaos!'" They will die out, and their epitaphs will be written in water.

Let me, in conclusion, express an earnest hope that, in endeavouring to avoid dulness, I have not become chargeable with levity. A dry annotated catalogue would have been an intolerable strain on your patience, and a poor return for the honour done me in intrusting this subject to my hands.

My task is done. It has been a pleasant one, for it has afforded me an opportunity of renewing my acquaintance with many old literary friends.

I have spent many happy hours in our library—that calm, sequestered "Retreat of the Ten Thousand"—if I may so misapply a classical reference. If I have succeeded in inspiring my audience with any portion of the spirit of "divine contentment" I have myself enjoyed in the company of books I shall be well rewarded for my pains in writing this paper.

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**"The Surveyor" Special Annual Issue.**—A subscriber writes as follows: "I cannot let the occasion go by without writing to congratulate you upon the splendid annual number of The Surveyor. It is a triumph in the production of annual numbers so far as the technical press is concerned, and does you and all concerned infinite credit." We can assure our correspondent that his kindly appreciation is very welcome and encouraging.

## NEW FERRO-CONCRETE BRIDGE AT STAFFORD.

The accompanying illustration is from a photograph of a new bridge over the river Sowe at Stafford, and is reproduced by kind permission of the proprietors of *Ferro-Concrete*.

The arch of 56 ft. clear span has the rise of 6 ft., and consists of two curved ribs spaced 6 ft. 6 in. apart, and connected by decking 3 in. thick stiffened by projecting beams. The design is of very original character in the respect that the two ribs extend up from the intrados to the top of the parapets, and are most securely fixed at the ends by monolithic connection with the ferro-concrete abutments.

Although having the appearance of a true arched structure, the bridge would be more accurately described as a rigid arched girder bridge. The bottom part of each rib is reinforced by six steel bars, and the top part by four steel bars, both sets being connected by long stirrups passing through the concrete between the openings by which the parapet is pierced.

The bridge, which was opened in August last, was designed by Mr. W. Plant, Assoc.M.Inst.C.E., the borough engineer of Stafford, and the contractors were the Yorkshire Hennebique Contracting Company, Limited, of Viaduct Works, Leeds.

New Bridge at Stafford.

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**One of Many.** A Somerset reader writes: "Will you kindly withdraw my advertisement from your 'Ex-Pupils' and Assistants'' column, as by its means I have now secured an excellent appointment."

**Parkes Museum Exhibits.**—The President of the Local Government Board, Mr. John Burns, the medical officer, Dr. Newsholme, and Mr. Willis, assistant secretary, last week visited the Royal Sanitary Institute, 90 Buckingham Palace-road, S.W., where, in addition to the permanent exhibits in the Parkes Museum relating to hygiene and public health, a special exhibition has been arranged of plans and models of shelters for tuberculous patients.

**Central Committee on Roads and Road Traffic.**—A meeting of the Central Committee for Road Statistics was held at the offices of the County Councils Association on Wednesday, January 24th, Lord Belper being in the chair, and the gathering including representatives of the Road Board, the Urban and Rural District Councils' Associations, the County Surveyors' Society, the Royal Automobile Club, and the Society of Motor Manufacturers and Traders. It was decided that, as the Road Board would now deal with the greater part of the work of collecting statistics, and as this would no longer be, as was originally intended, the main work of the committee, it was desirable to change its name, which will accordingly be in future the Central Committee on Roads and Road Traffic. The committee have in hand the whole question of uniformity in the erection of danger signs and direction posts, but they are deferring action in the matter pending the submission of a report which is being prepared by the Roads Improvement Association.

# Lethbridge, Alberta, Sewage Disposal Works.

By T. AIRD MURRAY, M.CAN.SOC.C.E.

The following description of some of the main features of the Lethbridge sewage disposal works now under construction should be not only of Canadian but also of general interest. The design of the sedimentation tank is understood to be original, and possesses certain features which are intended to obviate the recognised objections to the ordinary septic tank form of construction.

Generally speaking, the works are designed in order to obtain a reduced character of sewage effluent amenable to disinfection at the lowest possible cost.

The city of Lethbridge is situated in Southern Alberta, on the banks of the Belly River, a stream of considerable volume which joins the South Saskatchewan River. The city obtains its water supply from the river, which also serves as a water supply for several large coal mining centres located below Lethbridge. The population is over 12,000, and the normal water consumption converted into sewage about 700,000 gallons per day. The city is sewered on the separate system, but a proportion of the rainfall enters the sewers from roofs, and a small amount of subsoil water also enters the sewers.

There is one main outfall sewer for the whole system, which up to the present has discharged raw sewage into the Belly River about a quarter of a mile below the city intake.

The demand for sewage purification is caused by the large number of typhoid cases in the mining centres depending upon the river as a source of water supply below the point of sewage discharge.

The discharge of sewage varies considerably at different periods of the day, and is only slightly affected by rainfall. Weir readings at the outfall sewer led to the conclusion that the proposed works should be constructed to deal with a maximum rate of discharge of 2,000,000 gallons per day, a normal rate discharge of 1,000,000 gallons between 6 a.m. and 9 p.m., with a minimum rate discharge of 400,000 gallons per day between 9 p.m. and 6 a.m. Several of the water mains are composed of wood stave pipes, and much of the night flow is considered to be due to direct leakage from the mains to the sewers.

A series of analyses of samples of the sewage show it to be comparatively fresh at the point of discharge, the gradients being excellent and the distance of flow short. The average strength of the sewage is comparable with the class described as weak in the Fifth Report of the Royal Commission on Sewage Disposal.

Fortunately, there is sufficient natural fall to allow of the sewage being treated before it enters the river without pumping.

Fig. 4 shows the general lay-out of the scheme, consisting of (1) detritus and screening tanks; (2) continuous flow sedimentation tanks; (3) percolating filters; (4) humus tanks; (5) chlorine mixing chamber.

The 1st, 2nd, 3rd and 4th stages of treatment may be said to be entirely subsidiary to the 5th stage—viz., that of disinfection. The preliminary methods are employed in order to ensure an effluent which can be disinfected at a high efficiency with a low annual cost. Experiments with reference to the disinfection of the sewage tended to show (1) the difficulty of obtaining satisfactory disinfection without the removal of a large proportion of the solids; (2) That in order to disinfect the settled sewage liquor after 70 per cent of the suspended solids were removed there was required approximately 10 parts of chlorine per 1,000,000 parts of the sewage liquor; (3) that in order to disinfect the sewage liquor after it had been well oxidised and rendered chemically stable, it required approximately 3 parts of chlorine per 1,000,000; (4) that, after the oxidised liquor had stood for one hour for further sedimentation, from 1½ to 2 parts of chlorine were required in order to obtain satisfactory disinfection. The above experiments were carried out with only small quantities of sewage, and under circumstances which only allowed of very general conclusions. The general conclusions were so far in agreement with other experimental work of Mr. E. B. Phelps and others that they reasonably appeared to justify as follows:—

Suppose 2,500,000 gallons of sewage per day. To disinfect the liquor, after 75 per cent of the solids have been removed, at 10 parts of chlorine per 1,000,000 of sewage liquor, with chloride of lime at 1.5 cents. per pound, the cost would be $4,000 per annum for lime only. To disinfect this sewage after thorough oxidation in filters and the removal of the filtrate humus, at 2 parts of chlorine to 1,000,000 of effluent, the cost would be $800 per annum. The difference in annual cost capitalised at 5 per cent represents $64,000. Filters for oxidising sewage at 2,500,000 gallons per acre at 6 ft. 4 in. in depth can be constructed in Canada at a cost of $30,000, or $3 per cubic yard of filter material. There is thus a capital saving of $34,000 by adopting oxidising filters rather than attempting to disinfect a putrescible effluent on a unit of 2,500,000 gallon sewage discharge.

The point where the capitalised cost would be warranted of disinfecting a putrescible sewage liquor rather than providing a non-putrescible liquor by filtration, followed by disinfection, appears to be when only about 4 parts of chlorine are required for disinfection. The writer is strongly convinced that, owing to the difficulty of penetrating even the finer solids and treating unstable sewage liquors with chlorine, it will generally be found expedient to adopt what may be termed the standard methods of sewage disposal in order to obtain non-putrescibility before disinfection is attempted.

Stress is laid upon the above point, for the reason that the proportion of dilution of volume of minimum flow in the Belly River to the sewage discharge is far beyond that which is considered necessary to ensure oxidation by dilution.

### DETRITUS TANKS.

These are built in duplicate, each 15 ft. by 8 ft., with a depth of 6 ft. 6 in., with a total capacity of 10,000 gallons, providing a normal velocity flow of 1·7 ft. per minute. Wrought-iron upright screens are fitted across the tanks with ½-in. openings between the bars.

### SEDIMENTATION TANKS.

These are in duplicate (see Figs. 1, 2 and 3). It will be noted that the sewage is delivered over a weir the full length of the longitudinal side of the tank. This is in order to obtain a low velocity of flow with as short a period of contact as is practicable, and is a departure from the ordinary custom in septic tanks of discharging the sewage over a weir the width of the cross-section only, and providing a considerable length of passage for the supernatent liquid over the settled matters. The settled sewage leaves the tanks by means of 3-in. pipes fixed below the sewage level, and set at equal distances apart along the whole longitudinal length of the outlet end wall, thus ensuring that no floating matters pass off with the settled liquor. The settled liquor passes up and through scrubbing chambers of clinker before it enters the main outlet channel to the filters.

Each tank is practically divided into two compartments, as is the case with the Emscher tank. A reinforced wired glass apron is made to project into the tank the whole longitudinal width. This apron covers what is called a sludge storage basin or area, and has a slope of about 1 in 5. The fore base of the tank is also lined with glass with a similar steep slope. The apron overlaps the fore base and rests upon piers which are set intermittently, allowing of openings between the sludge storage basin and the main body of the tank.

The working principle aimed at is that, by means of the low velocity of flow owing to the wide cross-sectional area of tank, precipitation of the solids will take place upon the apron and the fore base, and that, owing to the steep slopes and the minimum of friction presented by the glass surface, the precipitated solids will continually be delivered into the storage area or basin. In this basin putrefactive decomposition may be allowed to take place, with the result that such action will be entirely separate from the flowing supernatent fresh sewage. The gases arising from decomposition will rise and impinge upon the lower surface of the apron, and will be carried off by vent pipes to the outside of the tank, as shown. The many advantages of a decomposed sludge will thus be obtained without the admitted disadvantages resulting from sludge decomposition in contact with fresh flowing sewage.

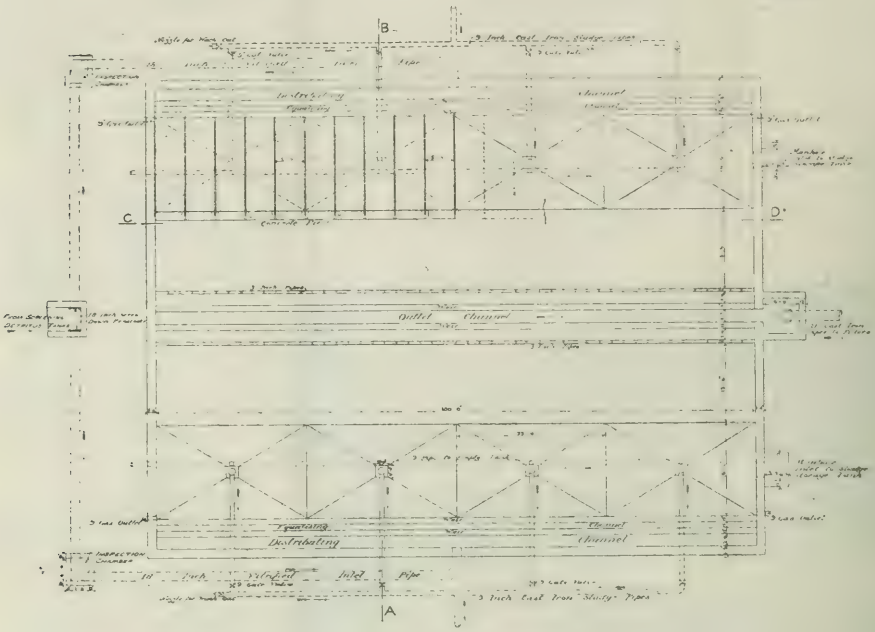
Several of the above types of tanks are being con-

structed under the writer's direction in Canada, and one installation has been in use for some time, and although apparently giving excellent results, has not yet been in operation long enough in order to provide opportunity to obtain official and reliable data. The type of tank, although similar to the Emscher as far as the objects aimed at are concerned, was designed before the Emscher was known of in Canada, and no data as to comparative efficiencies as yet exist. The is at a rate of ·0002 ft. per second at the normal rate of flow of 1,000,000 gallons per day, and twice that velocity at the maximum rate of flow.

FILTERS.

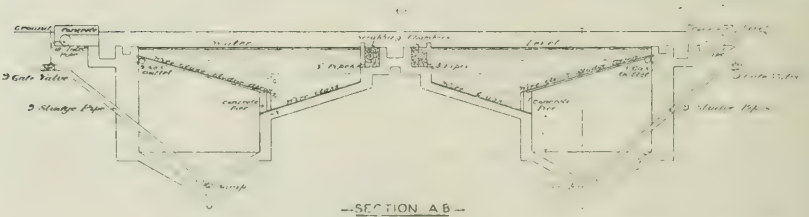
The settled liquor from the above tanks is distributed over circular percolating filter-beds, these being three in number, each 108 ft. diameter, with a depth of 7 ft. of clinker graded from 2 to 3 in. cubes.

FIG. 1.



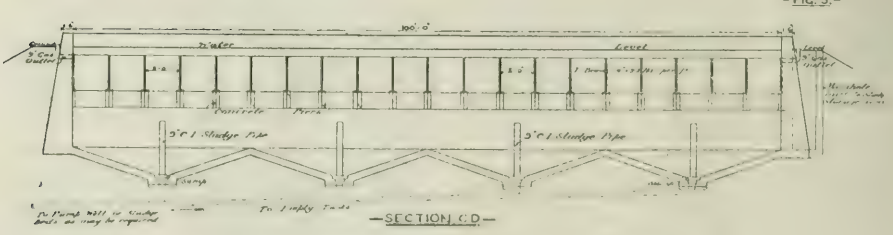

—PLAN—

FIG. 2.



—SECTION A B—

FIG. 3.



—SECTION C D—

LETHBRIDGE, ALBERTA, SEWAGE DISPOSAL WORKS.
(FIGS. 1—3.)

Lethbridge tank, however, is not costly as far as construction is concerned, and the principle of the glass apron appears eminently suited to a rectangular form of tank for covering a sludge storage basin separated from the main body of the tank.

The sludge storage capacity in each tank up to the level of the lip of the fore base is equal to 60,000 gallons, while the sedimentation capacity is equal to 100,000 gallons. The velocity of flow through the tank

The rate of filtration at the normal flow is 140 gallons of sewage per cubic yard of filter material.

The distributing apparatus consists of revolving distributors actuated by 2 ft. head difference between the level of the sewage in the tank and the level of the filter material in the beds. The distributing apparatus and other special mechanical appliances are designed and supplied by Messrs. Adams & Co., hydraulic engineers, of England. The sub-drainage of

the filters is conveyed to the centre of each bed, and from thence to humus sedimentation tanks.

HUMUS TANKS.

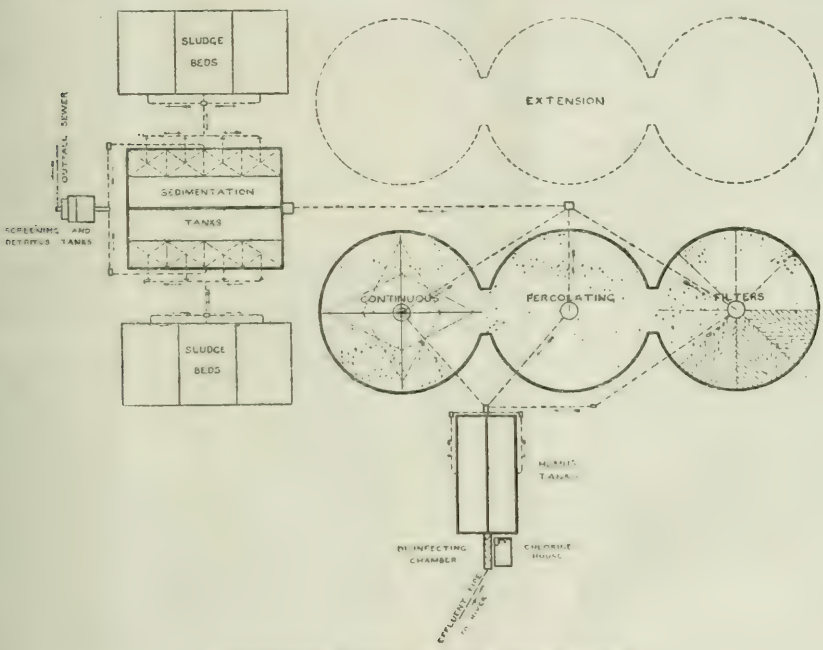
These are in duplicate, each 80 ft. by 15 ft., average depth of 4 ft., with a total capacity of 60,000 gallons, and a normal velocity of flow of ·005 ft. per second. As in the case of the sedimentation tanks, the influent is distributed over a weir the full length of the longitudinal section, but no sludge apron or sludge storage basin is provided.

DISINFECTING PLANT.

This consists of a brick-built house for lime storage, mixing tanks, and head orifice tank regulated to the volume of flowing sewage. The hypochlorite mixes with the sewage in a chamber of 26 ft. by 4 ft. wide, with baffles placed every 3 ft.

In laying out the plant one of the main considerations has been compactness, as all the tanks and filters are to be covered and rendered frost proof. Most of the work has been let by contract, the city supplying the clinker. The total cost is estimated at about $80,000.

The direct supervision of the work is under the control of Mr. A. C. D. Blanchard, the city engineer, while Mr. T. Aird Murray, of Toronto, as consulting engineer, is responsible for the design and lay-out of the scheme.




Lethbridge, Alberta, Sewage Disposal Works.
(Fig. 4.)

**Central Heating and Power Plant.** In a paper read before the Institution of Civil Engineers on Tuesday last, Mr. R. J. Dudley, M.Inst.C.E., described the arrangement and equipment of a central heating plant, combined with an electric light and power station, designed to serve the various buildings of McGill University, Montreal. Although only of moderate size, the installation is of interest on account of the somewhat severe climatic conditions and the unusual nature of the service. The station as at present working supplies current to eleven buildings, and heat to five, and the heating service will be extended to all the buildings as opportunity arises. The heat distribution being largely by means of forced circulation hot water, as well as by steam, the heaters and circulating pumps are installed in the engine-room, and are at present capable of supplying hot water to 60,000 sq. ft. of direct-radiation heating surface. The electric distribution is by underground cables throughout, the cables as well as the heat-distributing pipes being carried partly in tunnel and partly in conduit.

## CORRESPONDENCE.

*"All truth is precious, if not all divine."*—Cowper.

### PUBLIC OFFICIALS AS EXPERT WITNESSES.

*To the Editor of* The Surveyor.

Sir,—In your issue of the 19th inst. is a report of the Leeds Tramway Committee containing a resolution condemning the giving of evidence in the Courts by public officers in opposition to other authorities. Such a resolution has, of course, reference only to particular circumstances, but your editorial comments condemn without reservation the practice referred to, both in particular and in general.

Now, in my mind, there is much to be said in support of a view diametrically opposed to that enunciated, and it appears to me that so to order it that the evidence of those with intimate and special knowledge of municipal affairs can be given on one side only—*i.e.*, in support of the local authority—cannot be to the public weal.

I suggest, with all diffidence, that it is within the bounds of possibility for a local authority to be misguided in its actions, and that cases have even been known of individuals suffering wrong at their hands. To preclude public officers from giving evidence in such cases is not unlike loading the dice, and would produce a situation to the irony of which the pen only of a Dean Swift could do justice.

The primary object of all actions at law is to arrive at truth and justice, in which aim local authorities and individuals are equally interested. The corollary of such an axiom is that the best possible evidence, no matter on which side, should be obtained, and where the interpretation or application of any of the powers of a local authority is under review, surely the most informed and trustworthy evidence is that of a municipal officer?

In any case, the proviso that municipal officers shall take part in law cases in opposition to other authorities only with the consent of their councils would doubtless, suffice to prevent any officer, with a penchant for litigation, from acting as a free lance and offering his services as a witness anywhere and everywhere without regard to the merits of the causes involved.

I feel that the subject on which I have lightly touched is one calling for rather more consideration

than it has received before a decisive verdict is pronounced.—Yours, &c.,

"Brobdingnag."

January 26, 1912.

[We are inclined to think that there is more to be said against, than in favour of, local government officials giving evidence as experts in opposition to other local authorities. At the same time, we are not so dogmatic as to hold that there is not, as our correspondent contends, much to be urged in support of a view diametrically opposed to this, and we should welcome a free discussion of the matter.—Ed. Surveyor.]

## THE ROAD BOARD'S GENERAL DIRECTIONS AND SPECIFICATION (No. 7).

*To the Editor of* The Surveyor.

Sir,—While agreeing with some of Mr. Negus's criticisms [The Surveyor, January 19th], I should like to join issue with him on one point. He ridicules the provision that a certain amount of smaller stone should be included in the material used for coating. Personally, I have long contended that the practice of using stones graded to very nearly the same size is a mistake, and I am glad to see that the Road Board disapprove of it.

Whatever form of binding is used, the less the road can be made with the better. If no stone less than 1¼-in. gauge be used, then there must be large interspaces, unless some of the stones be crushed up—no infrequent occurrence under dry rolling, as Mr. Negus points out.

If a box be filled first with large and then with small material, evenly graded, then the weight will be approximately the same. But let them be mixed and the box refilled and a considerable increase of weight will be noted. Such material will therefore pack closer and be less liable to crush.

Most stone companies take pride in grading their material, and I know one which does so by quarters of an inch. I trust that the Road Board or some other authority will draw their attention to this specification, so that, at any rate, those surveyors who agree with it will be able to get material in accordance with it.

Possibly the reply may be made that there is a demand for smaller material for patching. This demand cannot be as great as it used to be. By adjusting the length of the screens it should not be difficult to remove a portion of the 1¼-in. material without taking away all of it.

As an alternative suggestion, and in order to meet the views of those who regard the presence of small stones with suspicion, the material might be broken into three gauges—namely:—

2½-in. to 1¼-in. for rolling.

1¼-in. to ¾-in. for patching.

¾-in. to dust, top dressing for roads and footways.—Yours, &c.,

R. Oakden.

Newark.
January 29, 1912.

## THE BURNING OF SEWAGE SLUDGE.

*To the Editor of* The Surveyor.

Sir,—In my paper on "Market Harborough Sewage Disposal Works," reproduced in The Surveyor of February 17th last, I described the system of sludge disposal adopted, and briefly touched upon the burning of sewage sludge.

It may perhaps interest your readers to know that during the past summer the greater part of the air dried sludge from the sludge lagoons at Market Harborough was wheeled into heaps and burned without the addition of coal or wood.

The resultant is an inoffensive fine red ash, easy to handle and to spread upon the land. The cost, consisting of labour only, was quite small, and should be so even in a summer not so abnormally favourable as the last.

Though for large towns accumulations of sludge would be quite inadmissible, burning seems well worthy of consideration by small towns where the cost of filter presses is prohibitive, or where the demand from farmers for the sludge is small. Moreover, the ash tends to lighten clay land.—Yours, &c.,

H. W. Coales.

Council Offices,
Skegness.
January 26, 1912.

## PIPE SOCKETS.

*To the Editor of* The Surveyor.

Sir,—On reading your worthy issue of to-day I noticed on p. 174 the proposed improved form of socket.

The idea for another form of socket occurred to me, and I forward a sketch of it.—Yours, &c.,

Novo.

January 26, 1912

## MACHINE BROOMING OF COUNTRY ROADS.

*To the Editor of* The Surveyor.

Sir,—I have read your article in The Surveyor of the 26th inst. *re* the "Machine Brooming of Country Roads," and would like to say that the rural authorities of Hampshire are not behind the times in this respect.

The above council, acting on my advice, purchased a rotary sweeper some two years ago, and the rural districts on each side of us—*i.e.*, Winchester and South Stoneham—also machine broom their roads.—Yours, &c.,

H. C. Phillips,
District Surveyor, Hursley.

Chandler's Ford,
Hants.
January 31, 1912.

**Standardisation of Vitrified Ware Pipes.**—The Standardisation Committee of the Institution of Municipal and County Engineers tender sincere thanks to all those members who have replied to the recent queries as to form of pipe sockets.

**Cumberland Appointments: Committee's Recommendations.**—The Highways Committee of the Cumberland County Council have framed a scheme for the reorganisation of their road and bridge department, which will be submitted to the council's quarterly meeting next week for adoption. The late county surveyor and bridgemaster (Mr G. J. Bell), who had 453 miles of roads and 500 bridges to look after, had a salary of £750 a year, inclusive of travelling expenses. He had under him at the head office an assistant, Mr. W. Finch, whose salary was £200 a year and travelling expenses in addition. Roughly the cost of the head office was £1,000 a year. The Highways Committee now propose to appoint a county surveyor and bridgemaster at a salary of £350, rising by annual increments of £25 to a maximum of £500. They also propose to appoint a draughtsman at £150, rising by annual increments of £20 to £250. Further assistance will be provided by the appointment of clerks. The new county surveyor will be allowed travelling expenses in addition to his salary.

**Width of Roads in Scotland.**—Lord Pentland, the Secretary for Scotland, received a deputation in Edinburgh last week from the Scottish County Councils Association on the subject of the width of roads. The object of the deputation was to bring under the notice of Lord Pentland the decision of the Second Division of the Court of Sessions in a case where a district committee was sued in consequence of an accident to a dogcart, the contention being that owing to the accumulation of road metal and heaps of road scrapings the road had been narrowed down to 11 ft. 6 in. The district committee was held liable. It was stated that the matter would have been submitted to the House of Lords to test whether district committees were required to have labour statute roads 20 ft. wide, as provided for under an enactment of 1771, but for the fact that in the special circumstances of this case it was improbable that they would get a clear decision on the point. In the course of the discussion before Lord Pentland, in which all the members of the deputation took part, the desirableness of legislation repealing that old Act was urged, but nothing definite was agreed upon beyond the statement that the legal question would in all probability be raised by some district committee in order to get a definite judgment from the House of Lords.

# The Decay and Preservation of Timber.

By WILLIAM RANSOM, Assoc.M.Inst.C.E.

(*Conclusion.*)

In last week's article on this subject we have seen how timber is likely to decay and liable to attack, and we must now ascertain the best methods for its seasoning and preservation so that it may withstand decay, disease and attack. The success of any method will depend upon effecting a change in the sap so as to prevent decomposition, and by imparting any property to the wood which will be unfavourable to the spread of fungoid growth and the absorption of moisture.

The sap left in the wood is the primary cause of decomposition, and the process of seasoning consists in drying up or expelling the sap. This causes shrinkage to take place, and therefore is an important reason why the seasoning should be well done, otherwise when placed in buildings injury would be done by the shrinkage as the timber gradually dried out. Even in timber that has been well seasoned shrinkage will occur upon any fresh face being exposed by the saw or even by the plane. For this reason joinery work should never be wedged up immediately it is put together, but enough time should elapse to enable the wood to undergo as much shrinkage as possible before being placed in position.

Seasoning will not convert sapwood to heartwood, but while decreasing the weight will increase the strength of the timber. The best method of seasoning is by the natural process, although it takes the longest time to accomplish—from three months to three years, according to the size and quality of the timber. The timber is stacked in sheds in such a manner as to allow free circulation of the air all round the timber. It should not be exposed to draughts, and should be protected from the sun and rain. The timber must be placed perfectly level to avoid bursts during the shrinkage process. Every endeavour should be made by frequent turning to ensure regular drying to avoid large snakes. Converted timber is frequently seasoned by being stacked on end. It has been found by experience that long exposure to air will harden such woods as larch, oak and spruce, while baywood and sequora are rendered brittle and tender.

Water seasoning consists in submerging timber in a running stream so that the sap may be washed out by the action of the water. The butt end of the balk should face the current. The timber should be entirely submerged, otherwise it is injured along the water line. After this process has gone on for about a fortnight the timber is stacked and dried by the natural method in a very much shorter time than if it had received no preliminary treatment. Timber that has been water-seasoned is less liable to warp, or is rendered more durable. Seasoning is sometimes done by boiling the water or exposing the timber to the action of steam, but such processes are too expensive, and also reduce the strength of the timber.

Long immersion in water will harden elms, greenheart and teak, while fir and oak are softened. Pine and mahogany are destroyed by long immersion.

Hot-air seasoning or desiccation consists in exposing the timber for a few weeks to the action of hot air. The wood is stacked in kilns or ovens which are heated to about 100 deg. Fahr. The timber is seasoned in about one-tenth the time occupied by the natural process, but it is said that it is liable to reabsorb moisture from the atmosphere and return to a partially unseasoned condition. This process is very much in vogue in the Southern States of America, where pitch-pine is stored to prevent the discoloration of the sapwood.

A modification of this method is known as McNealis's process, and consists of exposing the timber to moderate and moist heat, which is charged with various gases. The quality of the timber is not affected by this method.

Timber is rendered harder and more durable by being smoke-dried, scorched or charred. The heat must be gradually applied to avoid splitting the wood and to make sure that the interior moisture has been removed. Worms will not readily attack wood that has thus been treated. Wood smoke contains a proportion of creosote, which, being antiseptic, imparts its preservative properties to the wood with which it comes in contact.

In the process of seasoning timber loses a great deal of weight, and it is generally considered that timber is fit for the carpenter when it has lost one-fifth, but for joinery purposes one-third of its weight should be lost.

The action of light upon timber is very marked. Chestnut, teak and Spanish mahogany are darkened, but bays, oak and walnut are bleached.

Beyond the ordinary processes of seasoning several other methods have been adopted for the preservation of timber—that is to say, it is sought to delay or retard natural decay, and the methods chiefly consist in hermetically sealing the pores of the wood by filling them with some insoluble compound that will resist decomposition, or by making the juices insoluble and incapable of fermentation. To preserve wood it must primarily be well seasoned, and not placed in unventilated positions. For all ordinary purposes painting is the only other process adopted for its preservation. The paint will close the pores and prevent the atmospheric oxygen acting upon the wood. All moisture should, of course, have been first extracted in the seasoning process, or the paint will only imprison the moisture and cause decomposition. French polish preserves most woods, but it is injurious to pitch pine, because it prevents evaporation of the turpentine.

For wood posts placed in the ground charring is a good preservative, especially if the wood be fixed opposite to its natural position, so that moisture may have difficulty in travelling up the reversed cells of the wood.

There have been many experiments for the preservation of wood. Emerson (in 1737), Kyan (in 1832), Burnett (in 1838), and others, all tried various means, by the use of various chemicals, &c., to increase the life of timber.

The most important and practical method is that of creosoting by means of Bethel's process. Wood that is subjected to this process is first thoroughly dried and then placed in an air-tight cylinder. Steam is admitted, and then an exhaust pump produces a vacuum of 25 in. The creosote is then admitted at a temperature of 120 deg. Fahr., and forced into the pores at a pressure of from 150 lb. to 170 lb. per square inch for from six to ten hours. One gallon is usually allowed for every cubic foot of timber. For ordinary work the creosote does not penetrate the wood to a greater depth than from 1 in. to 4 in., although it is possible to penetrate to a depth of 12 in. The creosote increases the weight of timber by about 10 lb. per cubic foot. This process is the most effective of all the preservative processes, and renders timber practically secure from the attacks of insects. The creosote has not only antiseptic properties, but it coagulates the albumen of the sap and impregnates the wood with an imperishable substance.

Creosote is a tar liquor known also as a dead or heavy oil, obtained by the distillation of coal tar between the temperatures of 370 deg. Fahr. and 600 deg. Fahr. It will sink in water, and is very variable in composition. Carbolic acid imparts its chief antiseptic properties.

All the processes for the preservation of timber are influenced by the porosity of the wood. Hard woods are therefore more difficult to treat and require longer treatment for the preserving liquor to penetrate the pores.

In recent years experiments have been directed to the preservation of timber from fire by making the wood non-flammable. The methods suggested have chiefly consisted of giving the wood a coating of cyanite-asbestos paint, or tungstate of soda. The chemicals which have been used by certain patentees are kept secret, but they are said not only to render the wood fire-resisting, but are able to season the wood within a month of felling. The process is chiefly applicable to open-grained, non-resinous woods. In America several fire-retardent treatments have been adopted. The two principal processes are the Bacher and Ferrel, but the chemicals used are not made public.

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**Roadite, Limited.** The address of this firm is 9 Great Georgestreet, Westminster, S.W.

# Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

## THE MONTHLY PREMIUM.

The premium for January has been awarded to

Mr. W. H Price.
Urban District Council Offices.
Lytham.

whose contributions have, in the opinion of the adjudicators, been the best received during the month.

## QUESTIONS.

This week answers are invited to the following questions:—

**223. Reinforced Concrete Bridge.**—Design a reinforced concrete bridge to carry a 36-ft. main road over a river (at right angles), single span 60 ft. between abutments, 36 ft. wide, 20 ft. from mean surface of water to the crown of arch. Banks 5 ft. above mean water level; foundations 15 ft. clay, then hard red sandstone. Allow for usual main road traffic, and show calculations. (A. P., *Liverpool.*)

**224. Town Planning.**—What are the chief points to be considered in laying out a new town?

**226. Sewage Pumping.**—Show calculations arriving at the diameter of a sewage pumping main sufficiently large to meet the requirements of the Local Government Board for a population of 4,500 upon the partially separate system, the velocity through the main being at the rate of 4 ft. per second, the water supply of the district being at the rate of 16 gallons per head, the population being distributed in 1,000 houses scattered over about 4 miles of roads, the pump well being so situated that an overflow, if allowed by the Local Government Board, could be arranged so as to discharge into a brook near to. ("Student.")

**227. Refuse Disposal.**—Describe, with illustrations, the most efficient and economical form of refuse destructor for a village of 500 inhabitants. (M.Inst.Mun. and C.E., *November.*)

**228. Cost of Roads.**—What is the cost per square yard, complete, of constructing roads in (*a*) asphalte, (*b*) wood-block, (*c*) granite-pitching, (*d*) macadam, (*e*) cobblestone, (*f*) tar-macadam? ("Brazilian.")

**229. Swimming Bath.**—Give sketches showing plan and cross-section of a covered swimming bath, say 70 ft. by 30 ft., with a detail of the roof. What method would you adopt for heating the bath? (M. and C.E.)

## REPLIES TO QUESTIONS.

**219. Tram Rails.**—Describe an accurate, practical method of measuring the wear of a steel-girder tram rail. (T. R.)

It is presumed the question refers to the periodical measurements of the wear of a tram rail during its life in a permanent way.

It is a generally accepted fact in practice that a tram rail, laid in a straight or fairly straight line, becomes worn out and unfit for further use in the tram track when the crown of its groove comes into contact by wear with the outer circumference of the flange of the car wheels—that is to say, when the head of the rail is so much worn down that the flanges of the car wheels commence to run deep and bear upon the bottom of the groove of the rail.

In the case of a tram rail laid in a curved line of road particularly where the radius of the curve is small, the life of the rail will depend upon additional conditions such as the excessive wear on the check side, consequent upon the grinding action of the car wheels running over it.

Assuming, therefore, that the life of a tram rail is expected to be thus taken up in the wearing away of the head to the extent of depth A—B, Fig. No. 2, then the periodical measurements of wear during the life may be readily and reliably ascertained and recorded by means of the simple and inexpensive instrument shown in Fig. No. 1.

The instrument could be supplied and operated profitably and to the advantage of many a tramways assistant who may read these notes to amend the same and protect his perfect instrument, unless, indeed, such an instrument already exists.

It will be seen that the instrument consists of a brass template, cut to register with the rail head when new, together with a row of movable pins, so arranged as to drop vertically into any of the positions the wear on the rail head may determine.

The method of using the instrument will be apparent—suffice it to say that the pins are secured in the positions they assume by means of a rubber-faced strip adjusted by two set screws.

The space between the outline of the brass template and the outline assumed by the extreme points of the pins represents the extent of wear of the

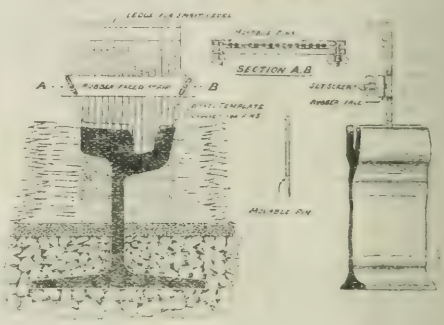


Fig. 1.

rail head, and this information may be readily transferred to a full-size paper section if the template be laid flat upon it in proper register and the positions of the points of the pins carefully pricked off.

As the bottom of the groove of rail forms the datum line for the measurements of wear by this method, it follows that the groove of the rail must be thoroughly cleaned out at the point, and at the time of measurement, so as to insure the template of the instrument exactly fitting the rail groove: indeed, the accuracy of the information gained depends entirely upon the observance of this precaution, together with the exact adjustment of the template by spirit-level.

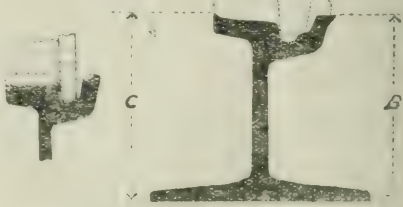


Fig. 2. Fig. 3.

When the rail is so much worn that the wheel flanges come into contact with and bear upon the bottom of rail groove, then the foregoing method of measurement of wear obviously becomes useless—and probably the rail too—but should the use of the rail be continued beyond this point, the only practical and safe method of periodical measurement available is by means of a plaster cast impression of the head of rail taken when in the worn state, the depth of wear being fixed by carefully taking dimensions B and C from the underside of flange to the surface of both the check and tread of rail head (see Fig. No. 3.)

Mathematical precision cannot, however, be claimed by the process of this latter method. Plaster

The Surveyor
And Municipal and County Engineer.

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casts of a rail head are not easily made, and are not altogether reliable when made. The fixing of the datum line, from which to plot the outline of the plaster cast upon the paper section, is also certain to be but a more or less approximate process, and it need scarcely be added that, for the purpose of measuring the dimensions B and C (Fig. No. 3), the removal and renewal of setts and concrete are necessitated.

In connection with both the measurements of the wear of a steel-girder tram rail and the estimating of the duration of its life it is well to have in mind that the extent of wear during the first six months of its life cannot be taken as a safe basis for *pro-rata* calculations. The distribution and arrangement of the component parts of either acid or basic steel rails are such that a constant rate of wear throughout the length of any one rail—or, for that matter, throughout the depth of the wearing part of a rail at any one cross-section—is not maintained.

Presumably the value of recording the periodical measurements of the wear of a tram rail lies chiefly in two directions, namely:—

(1) The information thus gained in directing and suggesting the adoption of the best standard of chemical composition to insure a maximum resistance to wear and tear.

(2) The facilities gained in calculating, approximately, the time when it will be necessary to execute renewals.

In connection with the latter, local conditions must be considered, else the prophecy will surely be a false one. The varying conditions of rail wear (assuming the tracks have been well and truly laid) will comprise, chiefly, the following: Radii of rails; gradient of rails; position of rails relative to up or down hill runs; position of rails relative to fixed stopping places or junctions; chemical composition of rails; type of rail joints in use; type of brakes on cars; type and condition of flanges of car wheels and condition of rolling stock generally; use of sand on rails by car drivers; watering of tracks by traffic management; constant or mean steel gauge of car wheels; frequency of vehicular traffic over tracks; and last, but obviously most important, the frequency of car journeys over rails.

J. R. is referred to valuable notes on "Tramway Wear and Maintenance," by Mr. Charles F. Wike, M.INST.C.E., the city engineer of Sheffield, published in the "Proceedings" of the Institution of Municipal and County Engineers, vol. xxxiii., pages 385 to 397. (S. J. H. *Mansley*.)

### NOTES.

W. H. P. (*Lytham*) writes in regard to his recently published answer to Question (212):—

I think your correspondent F. P. D. is somewhat hypercritical in his criticism of my reply to the question on outfall sewer extension.

First, as to his opinion that "it might be impossible to get flanges to fit so as to bolt home twelve bolts in each flange." There was nothing in the question to lead one to assume that the surface of the bottom of the sea was so irregular that it would not be possible to get a fairly regular gradient, and if the gradient is fairly even, as shown in the sketch submitted in answer to the question, I can see no difficulty in getting flanges to fit. If the bed of the sea was unequal, I suggested roughly levelling by laying concrete in bags, a method which would be equally necessary for the ordinary spigot and lead wool joint suggested by F. P. D. Flange pipes can be given a little play by adjusting the packing to the joint, and there can be no question that the flange joint is stronger and more likely to keep a proper alignment than a socketed lead wool joint.

With regard to the twelve bolts shown, this is the usual number for an 18-in. British standard flanged cast-iron pipe, though the bolts should have been $\frac{7}{8}$ in. instead of $\frac{3}{4}$ in., as shown in sketch. The 1¼-in. and 2-in. bolts advocated by F. P. D. are unnecessarily strong, and would necessitate special castings, paid for at "special" rates.

An 18-in. pipe is $\frac{3}{4}$ in. to $1\frac{3}{8}$ in. thick, and the outside diameter of the British standard flange is 25¼ in. 25¼ in. − 19½ in. $= \frac{5\frac{3}{4}\text{ in.}}{2} = 2\frac{7}{8}$ in., the width available for hole of bolt. The hole of the bolt should be $\frac{1}{8}$ in. larger than the bolt, and this makes the space $= 2\frac{7}{8}$ in. $- 2\frac{1}{8}$ in. $= \frac{3}{4}$ in. for a 2-in. bolt, and if the bolt is fixed in the centre of the flange, this leaves $\frac{3}{8}$ in. width of flange on each side of the bolt, which is manifestly weak. Moreover, the diameter from corner to corner of a 2-in. hexagonal bolt or nut is 3·636 in., and therefore the bolt would come outside the flange altogether, or require a very wide flange, which would have to be specially made and prove very costly.

The force of the current on the bed of the sea is not so great to call for any specially strong flanges, and as a matter of fact two-thirds of the number of $\frac{7}{8}$-in. bolts for which there are holes would probably be quite sufficient to keep the pipe in position in most places on the English coast. If pipes with three lugs instead of flanges were preferred, then 1¼-in. bolts should be used.

With regard to the materials to be used, I think we are agreed, for every engineer living on the sea coast knows that cast-iron does not rust so quickly in sea water as wrought iron or steel. At the same time, if the bed of the sea is very unequal, the greater elasticity of the steel pipe will prevent it fracturing so quickly as a cast-iron pipe, though its lightness is a drawback so far as movement is concerned, compared with the greater weight and stability of the cast-iron pipe.

**Water Supply in Rural Districts.**—At a conference at Cambridge on Saturday last, presided over by Sir George Fordham, chairman of the Cambs County Council, a paper dealing with the subject of village water supplies was read by Prof. Kenwood, medical officer of health, Bedfordshire. The author insisted that, quite apart from the legal obligation, it should be the chief concern of the sanitary authority to provide and maintain a suitable water supply, and yet, up and down the country, there were very many rural authorities who were in default in that respect. He said deliberately that public health in its fullest sense was sometimes at the lowest level in villages where the so-called vital statistics might seem by superficial thinkers to justify the crude and hasty deduction that all was well. It was comparatively seldom that village wells furnished all the year round a water supply which would be considered suitable in quality and quantity for an urban community, and it was usually polluted by sewage impurities. The remedy was a difficult problem, and its difficulty was almost entirely one of finding the necessary money in districts where that commodity was scarce. He suggested co-operation between villages and the storage of rain water in storage reservoirs. Prof. Sims Woodhead, in the course of the discussion, said he looked forward to a time when, if they were not very careful, their sewage disposal would be so bad that a very great number of their water supplies would be impracticable.

# Institute of Sanitary Engineers.

## MR. A. J. MARTIN'S PRESIDENTIAL ADDRESS.*

My first duty to-night is to thank you for the honour which you have done me by electing me, for the second time, as your president. I am grateful for this fresh mark of your confidence, and I will endeavour to merit it by promoting the interests of the institute to the best of my ability.

The compliment which you have paid me is a high one, but the situation is not without its embarrassments. I began my year of office by giving you an address, for the purpose of which I diligently ransacked a field which a long succession of presidents had already left woefully bare. Little did I think, as I joyfully appropriated the few grains of wheat which they had left me, that a short twelve months later I should again have to search through that same barren stubble for material for another address. You will not be surprised to hear that the quest has been a fruitless one.

At the last annual meeting of the Coal Smoke Abatement Society one of the speakers, pleading total ignorance of coal smoke, delighted his audience with a dissertation on genius. I feel strongly tempted to follow his example, and, forsaking for once the well-worn professional groove, to lead you through fresh woods and pastures new. My conscience, however, reminds me that you will expect my remarks to have some connection, more or less distinct, with sanitary engineering. I propose, therefore, to invite your attention to the question of standards.

### STANDARDS OF MEASUREMENT.

The first standards with which an engineer is concerned are those of weight and measurement. The historian of the next generation will have some things to tell which will greatly astonish his readers. They will learn how the greatest commercial nation in the world, fighting for dear life against a swarm of keen competitors, persisted in handicapping itself with an antiquated and cumbrous system of weights and measures, totally different from those employed by the rest of the world, and containing such gems as that 30¼ sq. yds. make 1 rod, pole or perch. The expression "one pound" has no less than four distinct meanings. We have adopted a most ingenious plan for increasing work, and multiplying the chances of error, consisting in measuring all our lengths and heights in one unit (feet) and converting them into another (yards) as soon as we come to deal with the contractor. The chemist and the physicist have long since shaken off the trammels of our archaic weights and measures, and fallen into line with the rest of the world. We engineers have not so free a hand. We have to consider the convenience and the prejudices of those for whom we have to work, and so we remain tied to the old system.

### THE PRE-STANDARD ERA.

In the palmy days of engineering every engineer was a law unto himself. He drew up his own specifications on his own lines, and his clients had the benefit of his experience, and the privilege of paying for his fads. The manufacturer who had to cater for the varying requirements of a number of engineers had by no means an easy time of it. In the course of the recent discussion on the standardisation of vitrified ware pipes a manufacturer mentioned that he had received in one morning as many as four or five specifications, each differing from the others, as well as from anything which he had in stock, as regards the thickness of the pipes, or the depth or width of the sockets. It would be easy to multiply instances of the confusion, delay and expense which have resulted from the absence of any general agreement as to the dimensions and quality of articles in common use. Even in this year of grace 1912 the motorist or bicyclist who has to replace a missing nut has no security that the one which he buys will fit the bolt!

The most striking case, probably of expense and inconvenience caused by the absence of a recognised standard have occurred in connection with railway gauges. The engineers who built our first railways regarded each group of lines as a separate system. They could not be expected to foresee the extent to which intercommunication has developed within the last few years, or that passengers would travel without a change from Bradford to Dover, or from Sheffield to Swansea, and goods from one corner of the kingdom to another. They could not realise, therefore, the inconvenience which would result from a break of gauge; and so it came to pass that the railways of this country were laid out of two distinct widths—the broad gauge of 7 ft., adopted by Brunel on the Great Western, and the narrow gauge of 4 ft. 8½ in., which was used on the other lines. The "Battle of the Gauges" was short and sharp. The narrow gauge won the day, and has been adopted throughout the country as the "standard gauge." But it is no small matter to alter the width of 1,375 miles of track, and it was not till 1892 that the Great Western finally fell into line with the other railways, and the broad gauge became a thing of the past. Undeterred by our experience, India, Ceylon, and Australia have committed themselves to a policy of mixed gauges, and will, sooner or later, have to rectify their mistake.

### ENGINEERING STANDARDS COMMITTEE.

In 1901, on the motion of Sir John Wolfe Barry, the council of the Institution of Civil Engineers appointed a committee to consider the advisability of standardising various kinds of iron and steel sections. The reference has since been greatly extended, and there are now no less than thirteen sectional committees, and twenty-seven sub-committees, each having charge of a particular class of engineering materials. Other professional societies, including the Institute of Sanitary Engineers, are taking part in the work, and the Government have signified their approval of it in a practical manner by making a substantial annual contribution towards the committee's expenses.

The subjects which have already been under consideration include the composition of iron and steel, the form and size of a large number of articles made from them, and the standardisation of electrical plant. Matters of more immediate interest to the sanitary engineer are Portland cement, steel and iron pipes, and vitrified ware pipes. Standard specifications for the two former have already been issued, and the latter are still under consideration.

The employment of standards involves the application of systematic tests, which have given rise to a new profession, that of the testing engineer. The rigorous tests which are now applied to all kinds of engineering materials not only ensure a uniformity and reliability which would otherwise have been unattainable, but have led to a vast improvement in their quality. Thus the only material available forty years ago for the construction of long-span bridges was wrought-iron, with a limiting stress of 5 tons per square inch. The engineer of the present day can command steel capable of withstanding over 7 tons per square inch, which not only admits of an important economy, but enables him to bridge spans on which the dead weight of the older material would have been prohibitive.

Another material which has undergone a great improvement in the past generation is Portland cement. The specifications of the seventies called for a tensile strength at seven days of 178 lb. per square inch, and even the best-ground cements left a large percentage of residuum on a sieve of 1,600 meshes to the square inch. Nowadays briquettes break at anything up to 850 lb. per square inch, and no cement is accepted which leaves more than 3 per cent on a sieve of 5,776 meshes per square inch. Not only so, but rigid tests are applied for expansion, a factor of which, until recently, comparatively little account has been taken. The quality of stoneware pipes has also been greatly improved. In the matter of workmanship, too, the advances have been scarcely less notable. It is on record that Matthew Boulton, when building steam engines for Watt at his Soho works, wrote to the latter as follows: "My dear friend, congratulate me. I have just succeeded in making a cylinder nowhere more than a ¼ out of truth." Now we can bore a cylinder, if we want to, to the nearest thousandth of an inch. Special tools and appliances of all descriptions have been evolved to meet special needs, with the result that metal objects of the most varied forms can be shaped with wonderful rapidity and certainty. It is impossible to compare the materials, machinery and methods which we have at our disposal to-day with those which the early engineers had to put up with without experiencing a profound sense of admiration for the results which they achieved with such inadequate means.

* Delivered on Wednesday evening, Sir John McCall, Agent General for Tasmania, in the chair.

It is worth while to contrast the steady improvement which has taken place in engineering materials with the deterioration which has occurred in many articles of ordinary consumption, and the precautions which we adopt to ensure the quality of the former with the absence of such precautions in relation to our food and clothing. The householder may buy chicory at the price of coffee; his bread may be bleached with chemicals and robbed of its most nutritive constituents; his digestion may be ruined by the preservatives in his meat and milk; he may have to put up with wool-stuffs of shoddy and brown paper soles to his boots; his child may be burnt to death through wearing a flannelette, warranted "uninflammable;" but he has the satisfaction of knowing that the tar for painting his roads is carefully tested, and that the cement with which his sewers are jointed conforms to a rigid specification. Why should we cheerfully go on swallowing camels in our food, when we insist on straining out the last gnat from our building materials? Is the medical officer's sense of duty less keen than that of the engineer? No one who is acquainted with our public health service would entertain the thought for a moment. Our disinclination to protect the consumer is traditional. It dates back to that old legal maxim *caveat emptor*—let the purchaser look out for himself—a maxim sound enough no doubt in the days before housecraft became a lost art, and before all the resources of chemistry had come to the aid of the fraudulent trader, but singularly inappropriate to-day. There is moreover a well-grounded sense of the ineffectiveness of the law as a check on adulteration and similar frauds. In dealing with offences of this kind, the law is necessarily more or less out of date. It is like a slow and bungling marksman firing at a fast-moving target. Before the cumbrous machinery of the law can be brought into action, the offender has escaped on to safer ground, and found new ways of effecting his nefarious purpose, which he can practise with impunity.

VOLUNTARY AGREEMENT *v.* LEGISLATION.

It is instructive to note that the standardisation of engineering materials, and the consequent improvement in their quality, have been brought about without the assistance of the law by the co-operation of the parties concerned. The engineer has not treated the manufacturer as a criminal, to be threatened and coerced, but has met him on equal terms as a man and a brother; and the manufacturer has loyally done his best to improve the quality of his wares. Is not the example worthy of imitation in relation to the commodities of daily life? Is it not possible to form standardisation committees, comprising manufacturers, dealers, doctors, chemists, and members of local authorities, to formulate standards for foodstuffs, textiles, and the like? There is a good deal of human nature in most of us, and I am convinced that more can be accomplished for the protection of the public with the goodwill of the trades concerned than by any system of penal repression. It is true that the position of the ordinary consumer is not nearly so strong as that of the engineer, but the risk of being struck off from the list of fair-dealing firms would be a powerful deterrent against fraud.

An important advantage of voluntary standardisation as compared with legal enactments is the ease with which the former can be kept up to date. The Engineering Standards Committee is fully live to the danger of checking progress by the stereotyping of present practice, and provides that each sectional committee shall meet at least once a year to consider whether any revisions of their specifications are desirable. The law, on the other hand, is rigid. The safeguards which it provides remain in force long after they have ceased to be useful, and even after they have come to operate to the detriment of the consumer in whose interest they were framed. A notorious example of this occurs in the case of the illuminating standards for gas, which the incandescent mantle has long since rendered obsolete, but which, nevertheless, remain in force, with the result that the price of gas is enhanced without any benefit to the companies, the use of gas for cooking and heating purposes is checked, and smoky fogs are perpetuated.

Another instance of an undesigned and mischievous effect of well-meant legislation is afforded by our building by-laws. Framed with the object of securing better homes for the people, they have, in some districts at least, actually impeded the provision of such homes, by prescribing standards of accommodation or construction to which it has been economically impossible to conform. In like manner the indiscriminate enforcement of standards regulating the width and construction of roads in cases to which they were never intended to apply, and the consequent heavy cost of developing building estates, have been largely responsible for the erection of those long and unlovely rows of narrow-fronted houses with which we are so painfully familiar, while the wise relaxation of these standards has been an important factor in the success of recent town planning schemes.

An essential weakness of by-laws is the hindrance which they oppose to the introduction of improved materials and new modes of construction, as when the builder of a house of reinforced concrete finds himself compelled to make his walls just as thick as if he were building them in brickwork.

The Local Government Board have been somewhat severely criticised for their conservative attitude towards certain new materials, more particularly reinforced concrete and steel pipes, for which they have insisted on shorter periods of repayment than they are accustomed to allow in the case of better-known materials. That it is not always wise to take the durability of a new material for granted is shown by the history of the 30-in. steel main, 350 miles in length, which was laid down at a cost of £2,140,000 to convey water for the supply of Coolgardie. Completed in 1902, it showed signs of serious corrosion as early as 1905, and it is at the present moment a source of very grave anxiety to the Government

STANDARDS IN SANITARY ENGINEERING.

The sanitary engineer nowadays has to comply with many standards which were either unknown to the engineer of the last generation, or which, if recognised at all, were far less severe than those in force to-day. Whether engaged in water supply, sewerage, sewage disposal or ventilation, he is confronted by requirements with some of which it is no easy matter to conform.

Forty years ago clay was a recognised jointing material for sewers. It was not considered essential that a sewer should be watertight; in fact, in many cases the upper halves of the joints were purposely left open, in order that the pipe might serve the double purpose of a subsoil drain and a sewer. All that has long since been changed, and it is agreed on all hands that sewers and drains must be watertight. There is not the same unanimity as regards the tests by which their watertightness shall be ascertained. For new work the water test, or, as it has been recently called in some quarters, the "hydraulic" test, is almost universally used. One wonders, by the way, how many contractors would be willing to subject their work to a real hydraulic test, or, for that matter, how many sewers would stand it. The indiscriminate application of the water test to old work is, however, a practice of questionable propriety. There is little doubt that property owners have been put to a great and unnecessary expense by the testing to destruction of drains which for all practical purposes were perfectly satisfactory.

Local authorities have not been victimised in this way to nearly as great an extent, but a great deal of public money has been wasted through the false standards which are current in the matter of sewer gradients, and which are based, partly on experiments carried on under conditions differing widely from those met with in practice, and partly on unfortunate experiences with badly-laid sewers, for which the gradients have had to bear the blame. These standards are variously expressed, but for small sewers it is not infrequently stated that the minimum velocity should be 2 ft., or even 2½ ft., per second. This sounds very reasonable, but when we come to apply it in practice, we get some rather startling results. Thus, if we regard 2 ft. per second as the least permissible velocity, we find that gradients flatter than 1 in 100 can only be used with flows of 33,000 gallons per day and over, while with less than 5,000 gallons per day a gradient of 1 in 20 is the flattest that can be used. Needless to say, these limits are not observed; but it is only the wide divergence which exists between profession and practice which prevents a greater waste of money than actually takes place. The superstition which prevails in the matter of sewer gradients sometimes manifests itself in a very strange way. If an intended sewer is particularly flat, and the velocity consequently poor, money is deliberately spent in making it worse. On a gradient of 1 in 600, for instance, a 9-in. sewer is not considered respectable, so a 12-in. pipe, or even a 15-in., is laid in its place (the gradient remaining unchanged), although every engineer knows that the larger pipe will give a lower velocity, and be more liable to silt up, than the smaller one.

*(To be concluded.)*

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Bath T.C.** January 24th. Mr. W. O. E. Meade-King.—£1,450 for the improvements to the Bath Cattle Market, Walcot-street. The Local Government Board's sanction was withheld pending the submission of a scheme for the provision of accommodation in the Corporation Yard, Dorchester-street, for the cattle at present penned in the Cattle Market. The Board's inspector stated that the scheme submitted would provide accommodation for more cattle than were ever likely to be there. The Corporation proposed to utilise certain structures which were on the premises, and were let to existing tenants, who had, however, been given notice to quit. These were now in the occupation of the council, so that those buildings would be converted into pens for the accommodation of the cattle.

**Cheltenham T.C.** (January 23rd. Mr. W. O. E. Meade-King).—£1,750 for additional sand filter construction at the pumping station at Tewkesbury. It was stated that the corporation had powers to draw 3,000,000 gallons a day, but only had capacity for filtering 600,000 gallons. They were providing for Paterson's roughing filters out of revenue, but the loan was for ordinary cement construction or alternately ferro-concrete construction.—No opposition was raised.

**Derby T.C.** (January 24th. Major J. Stewart).—£1,913 for the purchase of certain land near the Navigation Bridge, London-road, for use as a recreation ground.—It was stated by the town clerk that the land occupied an area of 25½ acres, and was immediately adjoining 30 acres previously purchased by the corporation for a similar purpose. Indeed it was really an extension of the first scheme. The price worked out at £75 an acre, which was considered extremely cheap. This fresh land bordered the canal for a considerable distance. It was rather low-lying, but could be advantageously raised by tipping. Although the land was intended for a recreation ground, the corporation wished to have as free a hand as possible to use part of it for a tip. When it was explained that there was a brook running through the land Major Stewart suggested that after the land had been raised and planned out this stream might be utilised for ornamental waters.

**Ebbw Vale U.D.C.** (January 23rd. Mr. P. M. Crosthwaite).—£33,658. A further loan for the Ebbw Vale waterworks and the Cwm Carno adit. Mr. T. Hughes stated, in reply to the inspector, that the outstanding loans under the Public Health Act amounted to £51,662, although sanction to the borrowing of £53,185 for a sewerage scheme had been received during the past few days. The amount outstanding under the Water Act was £100,124. Mr. Alex. Binnie remarked that the increased water from the adit was 60,000 gallons per day. The new lower reservoir yielded about 918,000 gallons per day, the normal yield of 450 acres with an extended rainfall of 56 inches, while the available capacity of the Carno reservoir was 180,000,000 gallons, and that of the Llwyn-ridd reservoir 72,000,000 gallons. Mr. S. R. Bates stated that the total length of the adit at the present time was 3,058 yards. There was no opposition.

**Lichfield T.C.** (January 25th. Major J. Stewart). £2,000 for the provision of a refuse destructor and tar macadam plant, for which a site has been provisionally purchased for £125 in Curborough-lane.—The town clerk (Mr. Herbert Bassett) said that at present the refuse was tipped in a disused gravel pit known as Fernley Pit adjoining the Birmingham Road, one and a half miles from the centre of the city. Although there was still ample room at the pit for refuse, many complaints had been, and were still being, received in reference to it, particularly in connection with the increase of rats, which were only kept in check by frequently laying down poison. Mr. W. B. Chancellor, city surveyor, and W. Mansergh, of the firm of Messrs. Beeman and Froude (Limited), Manchester, who are to erect the destructor, explained the plans and estimates, and in the course of their evidence it was elicited that the destructor would be sufficient for the refuse to be made by a population of 60,000 persons.

### APPLICATIONS FOR LOANS.

**Batley T.C.**—£1,000 for the extension of an elementary school.

**Bedwellty U.D.C.**—£13,650 for the erection of sixty houses in the garden village at Penyrheol.

**Brumby and Frodingham U.D.C.**—£4,000 for a new reservoir.

**Dunstable T.C.**—£450 for storm-water works.

**Finchley U.D.C.**—£17,000 for a new council school.

**Kettering U.D.C.**—£2,600 for the erection of the East Memorial Art Gallery.

**Maghull U.D.C.**—£5,000 for the erection of twenty-five workmen's dwellings.

**Peterborough T.C.**—£2,000 for the purchase of fencing.

**Plymouth T.C.**—£1,000 for public conveniences, and £980 for laying out Mutley Park estate.

**St. Austell U.D.C.**—£385 for road works.

**Todmorden T.C.**—£381 for paving playgrounds.

**Totnes T.C.**—£800 for laying out the cemetery extension.

### LOANS SANCTIONED.

**Bexhill T.C.**—£3,000 for the purchase of land west of the park.

**Cambridge T.C.**—£11,636 for a new elementary school.

**Denbighshire C.C.**—£4,300 for an elementary school at Pentre.

**Plymouth T.C.**—£3,152 for private street works.

### FORTHCOMING INQUIRIES.

FEBRUARY.

| | | £ |
|---|---|---|
| 5. | **Walton-on-the-Naze.** For laying out gardens and extension of public conveniences (Mr. M. K. North) ... ... | 740 |
| 5. | **Weston-super-Mare.** For wood paving and street widening works (Mr. W. O. E. Meade-King) ... ... ... ... | 1,324 |
| 6. | **Bristol.** For street improvement purposes (Mr. W. O. E. Meade-King) ... ... | 2,020 |
| 6. | **Darwen.** For the extension of gas mains (Mr. R. H. Bicknell) ... ... ... | 3,660 |
| 6. | **East Ashford.** For sewage disposal purposes (Major C. E. Norton) ... ... | 2,500 |
| 6. | **Milton Regis.** For works of sewerage (Mr. A. A. G. Malet) ... ... ... ... | 1,200 |
| 6. | **Pontefract.** For depot and mortuary purposes (Major J. Stewart) ... ... ... | 1,080 |
| 6. | **Ruislip-Northwood.** For works of sewerage (Mr. R. G. Hetherington) ... ... ... | 1,615 |
| 6. | **Shoeburyness.** For water supply purposes (Mr. P. M. Crosthwaite) ... ... ... | 2,300 |
| 6. | **Southampton.** For electricity, asphalte paving and street works (Mr. T. C. Ekin) | 24,740 |
| 6. | **Wellington.** For street widening purposes (Mr. Edgar Dudley) ... ... ... | 675 |
| 7. | **Batley.** For the purposes of a park (Major J. Stewart) ... ... ... ... ... | 5,138 |
| 7. | **Margate.** For the provision of lavatories (Mr. A. A. G. Malet) ... ... ... | 2,029 |
| 7. | **Oswaldtwisle.** For water supply and town hall purposes (Mr. R. H. Bicknell) ... | 5,250 |
| 7. | **Southend.** For tramway and public baths purposes (Mr. P. M. Crosthwaite) ... | 8,800 |
| 7. | **Widnes.** For road widening purposes (Mr. Edgar Dudley) ... ... ... ... | 1,150 |
| 7. | **Worthing.** For the provision of an underground convenience (Mr. F. O. Stanford) | 360 |
| 8. | **Aldershot.** For surface drainage purposes (Mr. F. O. Stanford) ... ... ... | 1,600 |
| 8. | **Bradford.** For the provision of a refuse tip (Mr. R. H. Bicknell) ... ... ... | 5,570 |
| 8. | **Huddersfield.** For the erection of artisans' dwellings (Mr. William Henry Collins) ... | 8,771 |
| 8. | **Sheffield.** For street widening purposes (Major J. Stewart) ... ... ... ... | 5,850 |
| 8. | **Warrington.** For the provision of a recreation ground (Mr. Edgar Dudley) ... | 6,000 |
| 8. | **Worcester.** For street improvement purposes (Mr. W. O. E. Meade-King) ... | 6,000 |
| 9. | **Ashton-upon-Mersey.** For the provision of a recreation ground (Mr. Edgar Dudley) | 1,060 |
| 9. | **Beaconsfield.** For street and sewerage purposes (Mr. W. O. E. Meade-King) ... | 1,135 |
| 9. | **East Grinstead.** For sewage disposal purposes (Mr. F. O. Stanford) ... ... | 3,122 |
| 9. | **Hinckley.** For water supply purposes (Major J. Stewart) ... ... ... ... | 2,000 |

# Municipal Work in Progress and Projected.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Bakewell, Coventry, Mexborough £1,500; housing and town planning Stafford; refuse collection and disposal—Swanage; road and materials—Bexhill £2,653, Castleford £4,386, Haslington £5,250; sewerage and sewage disposal—Bleau, Church Stretton, Dewsbury, Lymm £9,465, Montreal £10,000, Upton-on-Severn; water, gas and electricity—Chester £13,000, Coventry £16,514, Lostwithiel, Ludlow; miscellaneous—Birmingham £70,000.—Particulars of other works projected will be found on our "Local Government Board Inquiries" page.

## ADMINISTRATION.

**East Riding C.C.**—Replying to a protest made at the meeting on Monday against the payment of roadmen at the rate of 3½d. per hour, Colonel Stracey-Clitherow said the workmen were paid according to what was the custom in the particular locality, and some of them were very old men who were able to do the work in a leisurely way. He promised that the matter should be considered.

**Rutland C.C.**—The following resolution, passed by the Warwickshire County Council, has been carried by this council, on the recommendation of the Finance Committee: "That the Local Government Board be urged to take such steps as they deem best with a view to the alteration of the law to enable county councils to defray the reasonable expenses of their officials in attending conferences held for the purpose of discussing matters connected with their duties," with the addition of the words "when authorised by the county council, or a committee thereof, so to do."

**Staffs, C.C.**—The council have approved the recommendation of the Main Roads and Bridges Committee that an increase of 1s. per week should be given to every roadman between the ages of twenty-one and sixty-five inclusive, who, working whole time on the main roads, did not receive an average wage of 24s. a week, provided that in no case should the increase make the average wage of the persons to whom such addition was granted exceed 24s. per week, and to grant an additional 1s. per week to certain individual men in the several districts on the basis of rent.

## BUILDINGS.

**Bakewell U.D.C.**—It is stated that a building scheme for the provision of baths is being considered. Plans are already in existence, and, should the scheme go forward, it will render the construction of an open-air swimming-bath unnecessary.

**Cardiff T.C.**—Plans for the erection of a pavilion for the use of patrons of the tennis courts and bowling green at Roath Park, at a cost of £150, have been approved.

**Coventry T.C.**—Plans have been approved for branch public libraries at Earlsdon, Foleshill, and Stoke, to which scheme Mr. Carnegie has promised to contribute £10,000.

**Leeds T.C.**—In addition to the preparation and submission of a scheme for an estimate of the cost of adapting the old dispensary buildings for office accommodation for the tramways department, the city engineer, Mr. W. T. Lancashire, has been instructed to prepare a small block plan showing the empty accommodation in the market buildings, with a view to the council taking into consideration the question of the accommodation which can be provided at the Market Hall for the housing of the tramways, gas, sanitary, and parks departments.

**Mexborough U.D.C.**—It has been agreed to adopt the Baths and Washhouses Act, and that baths and washhouses be provided at a cost not exceeding £1,500.

**Newcastle-upon-Tyne T.C.**—The New Town Hall Committee recommend the council to erect a new concert-hall on the site of Northumberland Baths, Northumberland-road, with reception-rooms for the Lord Mayor and Lady Mayoress. A proposal to erect a new Mansion House has been rejected.

**Southwark B.C.**—The council have caused a scheme to be prepared for the erection of a mortuary and a coroner's court on a site adjacent to the present mortuary, and are now in communication with the London County Council on the subject.

## HOUSING AND TOWN PLANNING.

**Branston (Lincs) R.D.C.**—In a letter to the council the Local Government Board state with regard to the erection of working-class dwellings at Potterhanworth that they approved of the amended plans, subject to the drainage being altered as suggested by the Board. At the same time they pointed out the need for additional housing accommodation in the parish, and expressed regret that the council had determined to erect only eight instead of ten cottages. They suggested that if the extra cottages were not built immediately the land should be let, and the housing scheme credited with the rent. The Board were prepared to sanction a loan of £1,174, which from the revised balance-sheet they saw would be required for the purposes of the scheme, and their formal consent would be sent later.

**Erpingham R.D.C.**—The Local Government Board have written stating they were satisfied that a need for additional houses exists at Briston, and approved the site which the council had selected for the purpose. They suggested a number of small alterations in the plans of the proposed cottages, and notified that they would give their sanction to the scheme on receipt of the amended plans. With regard to the cost of the scheme, they had decided that any loss on the cottages should be made a charge upon the parish of Briston and not upon the district. The Board considered there was a need for houses at a lower rental, and more suited to agricultural labourers, than those proposed, and they hoped the council would consider the advisability of building such houses when the present scheme had been carried out.

**Stafford T.C.**—The Housing Committee have been instructed to prepare plans and estimates for the erection of twenty cottages in two sizes, to be let to persons removed from houses under a closing order of the council, and to no person who is in receipt of more than £1 a week.

## PARKS AND OPEN SPACES.

**Cheshunt U.D.C.**—A scheme, estimated at £800, has been prepared for laying out the recreation ground at Elm Arches.

**Prestatyn U.D.C.**—It has been decided to spend a further sum of £400 on laying out the Coronation Gardens.

## REFUSE COLLECTION AND DISPOSAL.

**Middlesbrough T.C.**—The borough engineer (Mr. S. E. Burgess) has presented a report dealing with refuse disposal. The corporation, he states, send away about 45,000 tons of refuse per year. The cost of disposal by destructor is 1s. 8d. or 1s. 9d. per ton, and there is a residue of one-third as clinker. The cost of disposal by barging to sea on the existing arrangement is 1s. 4d. per ton, or from a properly constructed dock, 1s. 6d. per ton. The cost of sending it away to farmers by railway truck, including all charges, is 7½d. There is not another town in the country, he adds, that could dispose of its refuse at 7½d. per ton, and the more they got rid of by that means the better it was for the corporation.

**Penrith U.D.C.**—It has been decided to purchase a steam motor-waggon for the removal of house refuse.

**Swanage U.D.C.**—The surveyor, Mr. J. Sidney Senior, has laid before the Works Committee a plan for a refuse-destructor, together with an estimate of the cost

## ROADS AND MATERIALS.

**Bedale R.D.C.**—It has been agreed not to apply to the Road Board for any grant in respect to tar spraying, several farming members of the council criticising adversely the effect tar had on the roads.

**Bedwellty (Mon.) U.D.C.**—The surveyor, Mr. J. H. Lewis has received instructions to prepare a plan for a new road from Fairview to St David's Church. The cost of the scheme is estimated at £900

**Bexhill T.C.**—The council have approved of the plan and estimate for the construction of the new road to Sidley from North-street to Alexandra-road, and have

decided to apply to the Local Government Board for sanction to borrow £2,653.

**Brentford U.D.C.**—The Road Board have written to the council stating, with reference to the proposal for the construction of a new approach road to London *viâ* Brentford and Hammersmith, that, according to their present view, assistance to this project would be the best application in the public interest of the funds available for the improvement of road communications in London. In the event, therefore, of the local authorities deciding to take up the proposed scheme and to make applications for contributions towards its cost under the Development and Road Improvements Fund Act, 1909, the Board were prepared to give favourable consideration to such applications. According to the wish of the Board, the council have appointed delegates to discuss the matter at a conference to be convened, the delegates being authorised only to support a scheme for the widening of the High-street.

**Castleford U.D.C.**—Carlton-street is to be widened and the road improved at a cost of £4,386.

**Clitheroe R.D.C.**—With reference to the tar-spraying of roads, concerning which a letter has been received from the county surveyor asking the council's opinion on the subject, the surveyor (Mr. T. Rawcliffe) at the recent meeting stated that tar-sprayed roads were bad for horses, and Mr. T. Robinson said roads that had been sprayed with tar were not safe at all for horses. The clerk was instructed to write to the county surveyor stating that while the council had no wish to return to the old dusty roads, they thought tar-spraying ought to be modified in some way, so as to minimise the danger to horses.

**Cornwall C.C.**—The Highways, Bridges, and Main Roads Committee have instructed the county surveyor (Mr. A. E. Brookes) to take an early opportunity of preparing a comprehensive scheme with reference to the maining and dismaining of the main roads throughout the county, and communicate his intentions to the local surveyors and members of the county council residing in the districts affected.—The county surveyor has also received general instructions for special works of improvement to be carried out under grants from the Road Board.

**Haslingden T.C.**—Road improvement works estimated to cost £5,250 are to be carried out

**Hinckley R.D.C.**—The surveyor, Mr. F. Tuckey, has prepared specifications and estimates for road works in King-street and George-street.

**Islington B.C.**—The council are being advised by the Works Committee to put down new wood blocks in Hornsey-road at an estimated cost of £600, and to renew the asphalte in part of Thornhill-road at an estimated cost of £1,200.

**Littleborough (Lancs) U.D.C.**—Improvements are to be carried out at Hare Hill-park at an estimated cost of £370.

**Llandudno U.D.C.**—A scheme has been completed for the repair of Mostyn-street at an estimated cost of £707.

**Middlesbrough T.C.**—During a discussion at the Middlesbrough Streets Committee last week, it was mentioned that the paving of Head-street and Marsh-road, despite Local Government Board sanction, was to be left over until distress labour was procurable, and there was none at present. After discussion, however, it was agreed to proceed with Head-street. It was stated that the work by distress labour would cost £1,127, and by departmental labour £1,005, and in the end it was agreed to pave both thoroughfares.

**Plymouth T.C.**—The Local Government Board has made a grant of £250 to the Distress Committee in connection with the scheme for the widening of Old Laira-road by the unemployed men registered with the committee. The work will be under the direction of the borough surveyor, Mr. J Paton.

**Portsmouth T.C.**—The Drainage Committee are recommending for adoption a scheme prepared by the borough engineer, Mr. A. W. Ward, for watering the roads in the northern portion of the town. The scheme provides for the construction of a tower adjoining the swimming pond at Stamshaw, from which water will be carried through mains and distributed throughout the district. The cost of the scheme is placed at £7,500. It is estimated that the amount of £330 now paid annually for water for watering the roads will be saved. The tower would hold, it is estimated, about 30,000 gallons. The water would be drawn from the swimming-pond at Stamshaw. It is hoped to obtain a loan from the Local Government Board to cover the necessary cost, repayment to be spread over a long period.

**Stoke Newington B.C.**—It has been agreed to repave Blackstock-road carriage way, Finsbury-park, from a point near Seven Sisters'-road to Ambler-road Council School, with macadam, at an estimated cost for materials of £290.

**Stonehaven T.C.**—There is every prospect of a new promenade being provided to take the place of the one swept away by the recent heavy storms. Negotiations have been going on between committees of the council and the Recreation-ground Trustees, and the latter body have given their consent to the laying-out of the embankment within their ground as a promenade, the council to sink piles and protect it from the sea. This arrangement will save the council the expense and trouble of making up the promenade every year before the arrival of the summer visitors.

**Tewkesbury T.C.**—The tender of Mr. H. Morgan, of Birmingham, at £281, for widening Providence-place, has been accepted.—The improvement of the Rope-walk is to be carried out at a cost of £180.

**Thetford T.C.**—It has been decided to purchase a horse sweeping machine, and place an additional 500 tons of granite on the main road.

**Warwickshire C.C.**—Captain Oliver-Bellasis, at the meeting of the council on Tuesday, moved that for the future the inspector of the No. 1 main road district be paid a salary commencing at £200 and rising by annual increments of £10 to a maximum of £250; and that he be paid in addition his reasonable travelling expenses as sanctioned by the county surveyor. Councillor Slack moved as an amendment that the sum be reduced to £175, rising by increments of £10 to £215. Councillor Blackham seconded the amendment. Colonel Dibley said it was the height of absurdity to say that county officials should not receive adequate remuneration. It was a very responsible post, and they had just lost a first-rate man because of the low salary. He was leaving to take a post in Hampshire at £260, rising to £300. The amendment was rejected. Mr. W. Johnson, M.P., moved that the provision as to allowing travelling expenses be omitted, and this was carried. The report, with this exception, was then adopted.

## SEWERAGE AND SEWAGE DISPOSAL.

**Barnard Castle U.D.C.**—The council have approved plans prepared by Mr. Harry W. Taylor, A.M INST.C.E (Messrs. Taylor and Wallin), of Newcastle-upon-Tyne and Birmingham, for intercepting sewers along the side of the river Tees, and a long retaining wall in Galgate. The scheme was approved at the last meeting, and instructions given for an application to be made to the Local Government Board to borrow the necessary amount for executing the works.

**Blean R.D.C.**—The Local Government Board has given sanction to a scheme of sewerage and sewage disposal for Herne and Reculvers, prepared by Mr. F. A. Ward, surveyor to the Blean Rural Council. The scheme included slate beds for primary treatment and clinker contact beds for secondary treatment. Except for one small detail the scheme was approved by the Local Government Board exactly as submitted.

**Church Stretton R.D.C.**—The council have instructed Messrs Willcox and Raikes, of Westminster and Birmingham, to report on a scheme of sewerage and sewage disposal for the district of All Stretton.

**Dewsbury T.C.**—The plans, specifications, quantities, &c., for the construction of the new sewage works will be prepared by the borough surveyor, Mr. H. Dearden. Messrs. James Diggle and Sons, Manchester and Westminster, will act as expert advisers in connection with the scheme.

**Kinross-shire C.C.**—The new sewage disposal works at Milnathort were formally last week. The engineer of the scheme was Mr. T. O. Niven, Glasgow, and the contractors were Messrs. John A. Paton and Sons, Alexandria.

**Lymm U.D.C.**—In the amended plans the cost of the sewerage scheme is set down at £9,465.

**Montreal T.C.**—Mr. G. Janin, city engineer, has prepared plans for additions to the sewage farm to cost £10,000.

**Shifnal R.D.C.**—Messrs. Wilcox, Raikes and Reed have written stating that they have completed their draft estimates for the Albrighton sewerage, and find that after making due allowance for the alterations necessary in consequence of the amended requirements of the Local Government Board that their total estimate now comes to £4,250, whereas the original estimate was £4,000. The seal has been fixed to the agreement with Messrs. Willcox, Raikes and Reed, subject to sanction of the Local Government Board being obtained to the purchase of the necessary land.

**Upton-on-Severn R.D.C.**—At a meeting of the council held on the 11th ult. Mr. Willcox, of Willcox and Raikes, of Westminster and Birmingham, attended and submitted a scheme for the sewerage and sewage disposal of the districts of Madresfield, Newlands, and Guarlford. The scheme was approved, and it was resolved to apply to the Local Government Board for sanction to a loan of £5,000 to carry out the first instalment of the scheme, including the drainage of Madresfield and Lower Guarlford.

## WATER, GAS, AND ELECTRICITY.

**Alloa T.C.**—An electricity station has recently been erected and equipped in connection with the corporation gasworks for the generation and supply of electric light to consumers. The current had previously been supplied in bulk to the council by the British Electric Plant Company, but the experiment was not regarded as satisfactory or economical. The station consists of a large open-roofed building, 120ft. long by 29ft. broad, and contains three powerful gas-engines of the most improved types and design.

**Brighton T.C.**—The Lighting Committee have resolved that four new oil coolers be installed at the Southwick Electricity Works in place of the old surface condensers which had been utilised for the purpose and which had now developed leakages, the cost of the new coolers being £750.

**Chester T.C.**—The council last week adopted a scheme for the erection, on the site of the old Dee Mills, of hydro-electricity works, and to apply to the Local Government Board for sanction to borrow £13,000 for the work.

**Coventry T.C.**—A scheme of electric lighting extensions to cost £16,514 has been adopted.

**Kingsbridge (Devon) R.D.C.**—The surveyor, Mr. W. H. Whittaker, has been instructed to prepare plans for placing the reservoir further up in the Rectory Field, so as to get 5 or 6 feet more head. He estimates the cost of the scheme at £196.

**Kington (Hereford) U.D.C.**—Writing with respect to the proposal of the council to purchase the undertaking of the local water company for £5 500, the Local Government Board state that, apart from the question of price, there appeared to be reason to doubt whether the purchase of the undertaking was the best solution of the difficulty which the council experienced, and in all the circumstances it would probably be well for the council to take advice as to whether a more efficient water supply could not be obtained from another source at a cost not exceeding that which would be incurred if the council purchased the company's undertaking. A letter has been written to the Local Government Board in reply, pointing out that there was absolutely no other source of supply to be obtained, and requesting the Board to receive a deputation from the council.

**Lostwithiel T.C.**—Messrs. Jenkins, of Liskeard, the engineers acting for the council in connection with the new waterworks, have presented plans and specifications, and it has been decided to invite tenders forthwith.

**Ludlow R.D.C.**—The council have accepted a scheme prepared by Messrs. Willcox and Raikes, of Westminster and Birmingham, for improving the water supply in the Craven Arms district by the provision of an additional borehole and new pumping plant.

**Tipton (Staffs) U.D.C.**—Arrangements are being made to borrow £10,000 for the extension of the gas plant, and £500 for new meters.

**Upton-on-Severn R.D.C.**—Mr. Willcox (of Messrs Willcox and Raikes, Westminster and Birmingham) has reported that the borehole in connection with the proposed water supply has now been completed, the boring having reached a depth of 1,640 ft., and a quantity of water is overflowing at the surface. Instructions were given to the contractors, Messrs. E. Timmins and Sons, of Runcorn, to carry out a test of continuous pumping for fourteen days and nights.

## MISCELLANEOUS.

**Birmingham T.C.**—The increased tramway traffic in Greater Birmingham has necessitated the provision of more rolling stock, and the Tramways Committee propose to ask the council for authority to obtain one hundred new cars of the latest pattern. At present the department have upwards of four hundred cars. Each car costs about £700, so that the new order will mean an expenditure of about £70,000.

**Bradford T.C.**—The sewage committee intend to proceed with the construction of a new road from Thackley to a point at Strangford, in connection with the Esholt sewage disposal scheme. The road is to be 60 ft. wide, and planted with trees and laid out with side grass plots. Already the Sewage Committee have carried out extensive tree-planting at Esholt, and recently they have purchased 25,000 more young trees, which will be taken gradually from the nursery garden to various parts of the estate.

## PERSONAL.

Mr. J. H. Walters, highway surveyor, has been appointed borough surveyor of Congleton in succession to Mr. R. Burslem, resigned.

Mr. J. H. Row, surveyor of highways to the St. Austell (Cornwall) Rural District Council, has been granted a month's leave of absence in order to recuperate his health.

Mr. G. E. Ashworth, assistant to the county surveyor of the West Riding of Yorkshire, has been appointed chief engineering assistant to the Durham county surveyor at a salary of £200 a year, rising to £250.

Mr. C. A. Lake, highway surveyor to the Thirsk Rural District Council, has been appointed building inspector without salary, and Mr. Hudson, the road foreman, has been appointed assistant surveyor to the same at a salary of £100.

Mr. H. Percy Boulnois, M.INST.C.E., of 7 Victoria-street, Westminster, has, we are informed, been appointed external examiner in sanitary engineering for the Faculty of Technology at the Victoria University of Manchester. The appointment is for a period of three years.

Mr. J. Vail, surveyor of highways and sanitary inspector to the East Preston (Sussex) Rural District Council, died, we regret to state, last week. The council have decided to make the office a dual one, as before—*viz.*, surveyor and sanitary inspector—at a salary of £130 per annum.

Mr. J. W. Pearce, who for many years was engaged with the Acme Flooring and Paving Company, Limited, and has since started business on his own account as a tramway contractor, &c., has, we note, successfully carried out tramway contracts lately at Barow-in-Furness, Morecambe, Heysham, and elsewhere, and has now obtained another contract at West Hartlepool.

Mr. G. E. Ford, deputy city engineer of Bristol, has had his salary raised from £300 to £350 a year, and the following increments have also been voted: Mr. F. Wilson, district surveyor, £250 to £262 10s.; Mr. J. A. Henderson, district surveyor, £256 to £262 10s.; Mr. F. J. Williams, building surveyor, £200 to £250. Mr. R. H. Webb, chief clerk in the city engineer's department, has had his salary increased from £200 to £250.

Mr. E. G. Mawbey, M.INST.C.E., borough engineer of Leicester, gave an address last week before the Leicester and District Workers' Educational Association on "Twenty-two Years' Work in the Borough Surveyor's Department." He stated that the total capital outlay on various kinds of works which had been carried out by his department during the past twenty-two years, including the tramway scheme, had amounted to over £2,000,000.

Mr. A. E. Jackson, ASSOC.M.INST.C.E., assistant engineer to the Manchester Corporation, has been appointed borough surveyor and engineer of Southport. He served his articles with Messrs. G. & G. H. Crowther, water and sewerage engineers, of Huddersfield. He was afterwards assistant borough surveyor of Wakefield for two years, and was under the Hull Corporation as engineer assistant for seven years. He has filled his Manchester position for seven years. Of town planning he has made a special study, and

he has prepared plans of such schemes. The post carries with it a commencing salary of £600, rising by annual increments of £50 to a maximum of £800.

Mr. George Palmer, of the department of Mr. H. T. Wakelam, M.INST.C.E., F.G.S., the county engineer and surveyor of Middlesex, has been appointed assistant county surveyor by the county council of Cornwall. It is certainly worthy of record that during the last eight or nine years the following have secured appointments from Mr. Wakelam's department—*viz.*: Mr. T. L. Perkins, executive engineer to the Municipality of Hong Kong; Mr. W. T. Fletcher, county surveyor, Dorsetshire; Mr. Lionel Jenkins, county surveyor, West Suffolk; Mr. A. Fortune, Argentine Government Railways; Mr. S. H. Harpur, engineer and surveyor, Maesteg Urban District Council; Mr. M. A. Piercy, deputy engineer and surveyor, Federated Boroughs, North Staffordshire; Mr. Harold Collins, deputy city engineer, Norwich; Mr. J. H. Hammond, Public Works Department, India; Mr. St. John Perfect, Public Works Department, India; Mr. C. Bayley Mason, chief assistant valuer, Somerset House, W.C.; Mr. Saunders, New River Estates; Mr. C. Eachus, Valuation Department, Somerset House; Mr. A. H. Bushnell, Public Works Department, India; Mr. E. H. Bond, assistant county engineer and surveyor's department, Durham; and Mr. J. Apted, Public Works Department, Khargi, Egypt. Mr. Fortune, Mr. Palmer, Mr. Hammond, Mr. Bond, and Mr. St. John Perfect served articles at different periods with Mr. Wakelam.

## FOR OTHER ADVERTISEMENTS

See End of Paper.

## DERBYSHIRE COUNTY COUNCIL.

### APPOINTMENT OF DISTRICT MAIN ROAD SURVEYOR.

Applications are invited for the post of District Surveyor for the Derby Main Road District. Candidates must be between 25 and 45 years of age, and must have had experience in the direct maintenance of a considerable mileage of macadamised roads.

Salary (which is inclusive of travelling expenses) at the rate of £200 per annum, rising by increments of £10 per annum (subject to the recommendation of the County Surveyor) to £250 per annum. A further allowance of £10 per annum will be made in respect of office. Stationery, books, postages, &c., will be provided by the County Council.

Forms of application, and particulars of duties and terms of engagement, may be obtained from the County Surveyor, at the County Offices, and will be forwarded through the post on receipt of a stamped addressed foolscap envelope.

Applications, endorsed "District Surveyor," must be upon the Form provided, and must reach me not later than 10 a.m. on Friday, the 16th day of February next.

Canvassing in any form will be a disqualification.

Dated this 31st day of January, 1912.

N. J. HUGHES-HALLETT,
Clerk of the Derbyshire County Council.

County Offices, Derby.

## RURAL DISTRICT COUNCIL OF LONG CRENDON.

### BRILL DRAINAGE.

The Long Crendon Rural District Council are prepared to receive Tenders for the Construction of 9-in. Stoneware-pipe Sewers, for interception of the Sewage of Brill, together with the necessary Manholes, Inspection Shafts, Flushing Tanks, Outfall and other contingent Works. The Works are to be in accordance with the Plans and Specifications prepared by Mr. Arthur J. Webb, Engineer and Surveyor to the Council, at whose Office at Long Crendon, Thame, the Plans and Conditions of Contract may be inspected, and copies of the Specification and Bill of Quantities obtained, upon depositing £5 (cheque only), which will be returned on receipt of a *bonâ-fide* Tender.

Sealed Tenders, endorsed "Brill Drainage," and addressed to Mr. Edward N. Purcell, 2 High-street, Thame, are to be delivered before noon on Wednesday, February 21st next.

The District Council do not bind themselves to accept the lowest or any Tender.

(By order of the Council)

EDWARD N. PURCELL,
Clerk.

2 High-street, Thame.
January 31, 1912.

## CITY OF WESTMINSTER.

### ANNUAL SUPPLIES AND SERVICES.

The Westminster City Council invite Tenders from persons willing to contract for the Execution of the under-mentioned Works and the Supply of the under-mentioned Materials, Articles, &c., for the twelve months ending the 31st March, 1913:—

1. Ballast and Sand.
2. ————
3. Boots, &c. (New and Repairs), (One Year or Three Years).
4. Bricks.
5. Brooms and Brushes.
6. Carriageway and Footway Repairs (Asphalte).
7. Carriageway Repairs (Macadam).
8. Carriageway Repairs (Granite-Sett Pavement).
9. Carriageway Repairs (Wood Pavement).
10. Cement and Lime.
11. Christ Church Yard Garden Maintenance.
12. Coal and Coke.
13. Disinfectants.
14. Drysaltery, Soaps and Sundries.
15. Dust Baskets (New and Repairs).
16. Flags (Sandstone and Artificial).
17. Footway and Channel (Mason's Work).
18. Gas and Hot-Water Fittings.
19. Granite (Broken).
20. Granite Setts, Kerb and Channels.
21. Gullies (Brick and Stoneware Construction).
22. Harness (New and Repairs).
23. Hats, Caps, &c.
24. ————
25. Horse Hire and Cartage Work.
26. Hose Pipe (New and Repairs), Leather.
27. Iron Castings.
28. Petroleum Spirit.
29. Painters' Materials and Miscellaneous Oils.
30. Pitch and Creosote Oil.
31. Plates, Sheets, Bolts, &c., Tree Guards and Sundries.
32. Retyring Wheels, Repairing Springs, &c.
33. Rubber and Waterproof Goods.
34. Sewerage and Drainage (Minor Works).
35. Shovels, Picks, Sewer Implements and Edge Tools.
36. Steam Road-Roller and Scarifier (Hire).
37. Stoneware Goods.
38. Street Name-Plates (Supply and Fixing).
39. Tarpaulin.
40. Timber.
41. Tool Handles.
42. Towels.
43. Uniform Clothing (One Year or Three Years).
44. Wood-Paving Blocks.
45. Washing Towels.

Specifications and Forms of Tender may be obtained on application at the Town Clerk's Office, Westminster City Hall, Charing Cross-road, W.C., on and after Wednesday, the 7th February, 1912, between the hours of 10 a.m. and 4 p.m. (Saturdays 10 a.m. and 12 noon).

Each Tender, on the official form supplied, is to be delivered at the City Hall, in a sealed cover, addressed to the Town Clerk, Westminster City Hall, Charing Cross-road, W.C., and marked with the name of the Tender. Tenders may be placed by or on behalf of tenderers in a locked box at the City Hall, provided for the purpose. No Tender will be received after 9.30 a.m. on Monday, the 26th February, 1912.

The Contractors will be bound by the contract, in the case of all workmen employed by them, to pay wages at rates not less, and to observe hours of labour not greater, than the rates and hours recognised by the Associations of Employers and Employees, and in practice obtained in the district where the work is to be executed.

Tenderers are prohibited from directly or indirectly canvassing Members or Officials of the Council in reference to any Tender, and the Tender of any person who does so canvass will be rejected.

The Council do not bind themselves to accept the lowest or any Tender.

JOHN HUNT,
Town Clerk.

Westminster City Hall,
Charing Cross-road, London, W.C.
January 31, 1912.

## ASSOCIATION OF SOMERSET SURVEYORS.

### FIRST ANNUAL MEETING.

The first annual meeting of the above-named association was held on Saturday last at the Town Hall, Bridgwater, the president, Mr. H. T. Chapman, county surveyor, occupying the chair.

The business consisted of electing the committee and officials for the ensuing year.

Mr. H. T. Chapman was re-elected president, and Mr. F. Parr (Bridgwater Urban) and Mr. W. A. Collins (Bridgwater Rural) were elected vice-presidents, Mr. Parr being re-elected.

Mr. F. W. Jones (Frome Urban) was elected hon. secretary and treasurer.

The balance-sheet for the past year was presented, and showed a credit of £5 19s.

Votes of thanks were passed to the officials for their work on behalf of the association during the past year, and the president, in responding, pointed out what a real help the association had been generally to the members.

The whole of the routine business being concluded, a paper by Mr. W. A. Collins on "Highway Administration in the Bridgwater Rural District, with Special Notes relating to Steam Hauling," which had been previously circulated, and which was taken as read, was considered and discussed.

Great interest was shown in the paper, as evinced by the number of members taking part in the discussion, and the questions, more especially those with regard to steam hauling, put to the author.

In the paper a tabulated statement showing the working expenses for the past two years was given. Some 12,130 tons of stone had been hauled, at a cost of £509 less than it would have cost the council had the lowest tenders been accepted for horse haulage, after allowing for every expense.

At the close Mr. Collins was heartily thanked for the paper.

The association was honoured by the presence of the Mayor of Bridgwater (Alderman W. Thompson), who addressed the members during the proceedings.

## UNSATISFACTORY TAR-TREATED ROADS.

### FAULTY PROCESSES AND MATERIALS.

The question of the alleged slipperiness of tar-treated roads was again discussed at the recent meeting of the council of the Roads Improvement Association, and a number of letters from various quarters with reference to the matter were considered.

The council were unable, from the information before them, to formulate replies which would give useful information and prevent recurrence of the difficulties, as it was evident that the causes of the alleged slipperiness were many, and that most cases required to be dealt with individually and separately. The information before the council, however, indicated that much of the slipperiness complained of was due to faults in the tarring process, and particularly to the tar, or tar preparations, being applied when the road was not in a fit condition to receive it, the tar consequently never becoming properly incorporated with the road surface; also, especially in the North of England, the abuse of the use of calkins on horses' shoes had aggravated the trouble by piercing the tar coating and allowing water to get underneath it.

The council resolved to endeavour to arrange for certain stretches of road to be specially inspected.

## APPROACH ROADS TO LONDON.

### AN UNFOUNDED STATEMENT.

We are authorised to say that the statement recently made in an evening newspaper in London that the Road Board have under consideration proposals for the expenditure of £30,000,000 on new roads of approach to London is entirely without foundation.

**Royal Institute of British Architects.**—The revised programme of the Examination of Licentiates desiring to qualify for candidature as Fellows is now ready, and may be obtained on application to the secretary. The first examination will take place towards the end of June or the beginning of July next.

## SOME RECENT PUBLICATIONS.*

ROCKS FOR ROAD BUILDING. By Edwin C. E. Lord, Petrographer, United States Office of Public Roads (Bulletin No. 37).

This useful pamphlet of twenty-eight pages and ten plates is the revised edition of Bulletin No. 31, which it supersedes. Under the head "Classification of Material," the rocks used in road making are arranged in a table of three main groups (igneous, sedimentary and metamorphic). Igneous rocks are sub-divided into intrusive (plutonic) rocks, such as granite and syenite, and extrusive (volcanic) rocks, such as rhyolite and basalt. The sedimentary group is sub-divided into calcareous and siliceous rocks, and the metamorphic group into foliated, such as gneiss and schist, and non-foliated, such as quartzite and marble. In a table of thirty-six mineral constituents, and fine physical properties, the constitution and properties (average) of thirty-four kinds of rock are given. The parts played by some of the more important minerals are explained, with reference to the probable behaviour of rocks used as road material. Under the heading "Correlation of Physical Properties with Mineral Composition," some of the main results of Mr. Lovegrove's experiments are discussed, the reference being to THE SURVEYOR, 1905, vol. xxviii., pp. 721 and 773. With respect to terminology and classification, there is a reference to Mr. Ryves' article in THE SURVEYOR, 1907, vol. xxxi., p. 406.

The twenty-two reproductions of micro-photographs of rocks are of unusual merit, the different minerals being much more readily distinguished than in the case in most of such reproductions.

PRACTICAL SEWERAGE AND SEWAGE DISPOSAL. By H. C. H. Shenton, F.S.E., M.I.MUN.E., M.R.SAN.I. Price 3s. 6d. nett. London: S. Edgecumbe Rogers.

In spite of the large number of books which have been written and papers which have been read upon this subject, this little book—brief mention of which was made in our special article on "Sewerage and Sewage Disposal" last week—will doubtless find a large circle of readers, as it deals with the matter from a purely practical point of view, instead of discussing at length and *ad nauseam* the various theories and doctrines which have been put forward by purely scientific men, and the author confines himself to the giving of definite advice based upon his own personal experience, and designed specially for those who have actually to carry out work. Descriptions of unsatisfactory methods are omitted, and the theoretical side of the question is left severely alone. The work is arranged in a very useful manner by division into numbered paragraphs, each of which is indexed alphabetically, so that the reader may readily refer to any matter dealt with in the book, and it will doubtless have a rapid sale among those for whom it is specially intended.

THE LOCAL GOVERNMENT ANNUAL AND OFFICIAL DIRECTORY FOR 1912. Price 1s. 6d. London: The *Local Government Journal* Office.

The twenty-first annual issue of this compact but copious compilation is just published. No pains have been spared to obtain correct information and to bring it up to the latest date before going to press. The main portion of the book is devoted to the directory, which gives the names and addresses of the chief officials of all corporations, London boroughs councils, county councils, boards of guardians, urban and rural district councils, county and borough asylums, &c., throughout the kingdom, as well as a list of the city companies of London. A feature which will be found useful is the insertion of the names of the chairmen of committees in the metropolitan boroughs, also the chairmen of the London County Council committees. In addition to the directory, there is a large quantity of useful information relating to baths and wash-houses, and electric light undertakings in the boroughs of London, and the abstract of the local government legislation of 1908 cannot fail to be of the greatest service.

THE ENGLISHWOMAN'S YEAR-BOOK AND DIRECTORY. 1912. Edited by G. E. Mitton. Price 2s. 6d. nett. London: A. & C. Black.

At the present time, when women are entering more keenly than ever before into competition with men in various walks of life, such a book as this should

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

have a very wide public indeed. This is the thirty-first year of issue, and the old standard of excellence is fully maintained. The book is divided into two parts, the first dealing with Education, Professions, and Social Life, and the second with Philanthropic and Social Work. The contents comprise full information in regard to every department of the life of the modern woman; but perhaps we may draw special attention to the section dealing with employments and professions, which is of particular merit. The "Woman's Whitaker," as the volume has been called, is indispensable to all who are interested in the modern feminist movement.

Hazell's Annual, 1912. Edited by Hammond Hall. Price 3s. 6d. nett. London: Hazell, Watson & Viney, Limited.

Hazell's Annual amply justifies its sub-title of "A Record of the Men and Movements of the Time." It deals with the events of the past year, both at home and abroad, in a concise yet surprisingly exhaustive way. It has an excellent index, moreover, which renders reference to any desired subject a matter of ease. The range of topics varies from "Aërial Navigation" to the "Zionist Movement," and from "Amateur Athletics" to "Zululand." In addition to being historical in character, the work is a helpful guide to the great political questions of the year, and will be found of the greatest interest and usefulness to every intelligent citizen.

The Writers' and Artists' Year-Book. Price 1s. nett. London: A. & C. Black.

The object of this useful annual is to help the author or illustrator to "place" his work to the best advantage. It contains a full directory of journals, magazines, and so forth, together with full information as to publishers, literary agencies, and many other matters of interest to those for whom it has been compiled. A new table of considerable interest included in the present issue is that of provincial papers whose editors consider outside contributions. The book is not only useful to the professional journalist, but also to the literary tyro seeking for a likely quarter in which to dispose of his work.

Handbuch der Hygiene. By Professors Rubner, Gruber and Ficker. Price (in paper covers) 27 marks. Leipzig: S. Hirzel.

This is a highly scientific, but, at the same time, extremely interesting and valuable work. It consists of various sections by different authors, dealing with the history of hygiene, the changes of chemical substances and nourishment, the atmosphere, the hygiene of the soil, warmth, clothing, physical exercises and climate. In addition to an excellent subject index, innumerable references to the bibliography of the subjects dealt with are given, and the volume should be on the book-shelf of every sanitarian.

Whitaker's Almanack for 1912. Price 1s. paper, 2s. 6d. half-bound.

The forty-fourth annual issue of this indispensable book of reference contains, in addition to the old features, several new articles, the most topical of which perhaps are those on Labour Unrest and Aviation. It is really surprising how each edition of "Whitaker" seems to contain even more information than its predecessor. The present volume has an index of over 7,000 references, and is larger than that of last year by sixty-six pages. As a handy and accurate work of reference it easily maintains its unique position.

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**Blackfriars Bridge.**—A report has been published by the City of London Corporation on the recent widening of Blackfriars Bridge, which is the second bridge at that spot. The first was begun in 1760, opened for foot passengers in 1766, and finally completed in 1769. The present bridge was begun in 1865 and opened by Queen Victoria in 1869. For the widening of the bridge the tender of Sir William Arrol & Co., Limited (£263,005) was accepted. This included £3,228, being the estimated cost of the Embankment subway. The actual cost of the widening and the subway proved to be £267,079, to which was added £3,469, being the agreed premium for early completion (175 days at £20 per day), making a total of £270,549. In addition to the cost of widening there were other expenses to the amount of over £31,000, including the tramways, or in all, £232,362. Before the widening the total width of the bridge between the parapets was 75 ft.; the present width is 105 ft.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President*—Mr. Albert D. Greatorex, M.Inst.C.E., Borough Engineer and Surveyor of West Bromwich.

### WHITSUNTIDE VISIT TO PARIS: PRELIMINARY NOTICE.

A preliminary notice with regard to the arrangements that are being made for the visit of the Institution of Municipal and County Engineers to Paris at Whitsuntide has, by direction of the council, been issued to members by the secretary, Mr. Thos. Cole.

Ladies are especially invited to attend this meeting. It is proposed to leave London (Victoria) at 10 a.m. on Thursday, May 23rd. On Friday, May 24th, the party will meet at the rooms of the Société des Ingénieurs Civils, 19 Rue Blanche, where it is intended to read a short paper descriptive of the works to be visited.

Visits will be paid to various municipal works of Paris, including the reservoirs at Montmartre and Montsouris, waterworks at Ivry and St. Maeur with filter-beds and ozonisation plant. An inspection will be made of the sewers and irrigation farm at Gennevilliers, and a visit paid to the destructor works and workshops.

With regard to the cost of the trip, Messrs. Cook & Son have offered the following itinerary and tariff:—

Thursday, May 23rd.—Leave London by day service *viâ* Newhaven and Dieppe for Paris; arrive Paris 6.43 p.m. Transfer to the hotels. Dinner and bed.

Friday, May 24th.—Plain breakfast. Lunch, dinner and bed. Horse-brake drive through the city for the visit to the different places.

Saturday, May 25th.—Plain breakfast. Lunch, dinner and bed. Second horse-brake drive in the city.

Sunday, May 26th.—Plain breakfast. Lunch, dinner and bed. No carriage drive.

Monday, May 27th.—Plain breakfast. Lunch, dinner and bed. Third horse-brake drive in the city.

Tuesday, May 28th.—Plain breakfast. Lunch, dinner and bed. Fourth horse-brake drive in the city.

Wednesday, May 29th.—Plain breakfast. Transport to the station, and leave by day service, *viâ* Dieppe and Newhaven, for London.

The price per person for the services mentioned above and in the hotels given below, also including the first class return railway ticket from London to Paris, *viâ* Newhaven and Dieppe, and four days' carriage drives with interpreter in horse-brakes through the city will be: Hotel Terminus, 195 frs.; Hotel St. Petersburg et St. Anne, 177 frs.; Hotel Dijon, 153 frs. (25 frs. = 20s.).

It is hoped for the success of the meeting that a goodly number will attend the visit. As it is essential in making the necessary arrangements to get approximately the number of those likely to attend, members are requested to make known their intentions not later than February 8th.

Further information will be issued in due course.

### NOTICES.

Home Examinations, at Examination Hall, Victoria Embankment, March 28th, 29th and 30th.

Cape Town (South Africa) and Bombay (India) Examinations, probably on the same dates.

Candidates for these examinations must have received the council's permission to sit. Early application should be made by candidates for the Home examination, as accommodation is limited, and applications will be accepted in order of priority.

The testamur of this institution is accepted by the Local Government Board of Ireland as exempting from their examinations for assistant county surveyorships, and by the Colonial Office as exempting from their practical examination for candidates for Colonial survey probationerships in the use and adjustment of surveying instruments.

The following meetings are reported as fixtures: June 7th and 8th, Scottish meeting at Stirling; Eastern District June 15th, at East Ham; Eastern District meeting on June 22nd, at Lowestoft.

A West Midland District meeting will be held at Stourbridge, April 13th, the Paris meeting at Whitsun, and the annual meeting will probably be held July 11th, 12th and 13th.

Members desirous of submitting a paper at the forthcoming annual meeting are requested to give early information of their desire.

Premiums not exceeding 30 guineas are awarded by the council for the best papers read by members and associate members during the year, and the attention of students is particularly called to the president's prize, referred to in last week's issue (p. 139).

### METROPOLITAN DISTRICT MEETING.

The following is the programme of the Metropolitan District meeting of the institution which will be held at Caxton Hall, Westminster (Room 13), on Friday, February 9th:—

7.30 p.m.—Discussion on the following paper, which will be taken as read:—
"The Relation of Modern Road Surfacings to Fish Life," by Mr. W. J. A. Butterfield.

8 p.m.—Adjourn to hold special general meeting [see separate agenda published in THE SURVEYOR of January 12th.]

8.15 p.m.—Tea and coffee will be served.

8.30 p.m.—Resume discussion on paper.

NORMAN SCORGIE.
Borough Surveyor, *Hon. District Secretary,*
Hackney, N.E.

THOMAS COLE,
11 Victoria-street, *Secretary.*
London, S.W.

## INSTITUTION OF MUNICIPAL ENGINEERS.

*President*—Mr. E. A. STICKLAND, ASSOC.M.INST.C.E., Borough Surveyor, Windsor.

### COUNCIL MEETING.

At a meeting of the council held on January 24th the following applicants were recommended for admission:—

(*a*) To Membership: Mr. J. A. Green, surveyor, Cheltenham Rural District Council.

(*b*) To Associate Membership: Messrs. B. L. Suharwal, Northgate Mansions, Gloucester; R. Forster, divisional main road and bridge surveyor, Cumberland County Council; A. C. Brown, borough surveyor's office, Chatham; and C. H. Blakeway, surveyor's office, Heaton Norris Urban District Council.

(Under the new by-laws these elections will be ratified at the next council meeting if no written objections are lodged within fourteen days.)

NEW MEMBERS, &c. From the applicants recommended for admission at the last meeting one member and four associate members were elected. One transfer was made to the membership class.

EXAMINATION CERTIFICATES.—The final drafts of certificates and diploma were approved, and instructions given to the engraver.

GENERAL MEETING.—It was decided that a General meeting should be held on February 24th, when Mr. A. Winter Gray would present a paper dealing with superannuation.

NON-FERROUS METALS EXHIBITION.—Mr. Henry J. Farmer, chairman of the council, was delegated to represent the institution on the council of the International Exhibition of Non-Ferrous Metals.

PROPOSED MUNICIPAL HOUSE.—The president and the secretary of the institution were appointed delegates to represent the institution in this matter.

SECURITY FOR OFFICIALS.—Certain correspondence between a member of the institution and one of the societies giving bonds on behalf of municipal officials was considered, and the secretary was instructed to interview the secretary of the society in question and to report at the next council meeting.

COUNCIL MEETING.—The next meeting will be held on Saturday, February 24th, at 3 o'clock.

### EXAMINATIONS.

The next examination will be held in May, 1912, at centres to be arranged. The papers set at the November examinations may be obtained in book form, price 1s., post free.

A general meeting will be held in the Committee-room No. 4 Southampton-row, London W.C., on Saturday, February 24th, at 6 o'clock, when a paper, "Superannuation and Security of Tenure: the National Association of Local Government Officers and its Bill," by A. Winter Gray, member of council of the institution, will be read.

Mr. L. Hill, secretary of the association, and, it is hoped, some of its prominent members, will be present and take part in the discussion, which will be an open one.

The building No. 4 Southampton-row is situated opposite the Holborn Station of the Great Northern and Piccadilly Tube, and within a minute of the British Museum Station of the Central London Railway.

B. WYAND,
39 Victoria-street, S.W. *Secretary.*

## ROYAL SANITARY INSTITUTE.

### MEETING AT MANCHESTER.

At a meeting of the Royal Sanitary Institute, to be held at Manchester, on Friday, March 8th, discussions will be opened on "The Application of the Housing and Town Planning, &c., Act, to the Development of Suburban Areas now in Process of Transition," by Mr. F. W. Platt, building surveyor, Salford, and on "The Quantity of Water available from Upland Drainage Areas," by Prof. J. Radcliffe, M.SC. On the following day visits will be made to places of local interest.

A meeting of the Royal Sanitary Institute will be held at the Poor-Law Offices, Shakespeare-street, Nottingham, on Saturday, February 10th, at 11 a.m., when a discussion will take place on "Local Public Health Administration and the Insurance Act."

Dr. Louis C. Parkes, deputy chairman of the council of the institute, will occupy the chair.

## INSTITUTE OF SANITARY ENGINEERS.

### FORTHCOMING MEETINGS.

A sessional meeting will be held at the Royal United Service Institution, Whitehall, on Monday, February 12th, when a paper on "Hospitals and Sanatoria" will be read by Messrs. A. Alban H. Scott (Fellow) and F. C. Davies (medical officer, Battersea Tuberculosis Dispensary). Mr. Edward White, J.P., chairman, London County Council, will take the chair at 8 p.m.

A sessional meeting will be held at Caxton Hall, Westminster, on Monday, February 26th, when a lecture on "Sanitary Building Construction" will be given by Prof. Henry Adams, M.INST.C.E., M.I.MECH.E. Mr. Edwin T. Hall, F.R.I.B.A., F.R.SAN.I., will take the chair at 8 p.m.

A sessional meeting will be held at Caxton Hall, Westminster, on Monday, March 11th, when a paper on "The Modern Home" will be read by Mr. Percival M. Fraser, A.R.I.B.A. The chair will be taken at 8 p.m.

**Pudsey's New Town Hall.**—The new town hall at Pudsey was formally opened last week. It was formerly the Mechanics' Institute, but has been remodelled to accommodate all the municipal departments, while also providing a suitable council chamber. The cost of purchasing the property and converting it has been between £15,000 and £16,000.

**Rival Town Planning Schemes in Fife.**—Rival town planning schemes are being promoted for the area between Inverkeithing burgh boundary and the extended boundary of Dunfermline. At the December meeting of Fife County Council there was submitted a notice of application by the town council of Dunfermline to the Local Government Board for authority to prepare a town planning scheme for (*inter alia*) an area comprising part of that administered by Dunfermline District Committee. At the recent meeting of the council at Cupar a similar notice was given by Inverkeithing. Both schemes cover the area between the two burgh-

**Manchester Main Drainage.**—Mr. T. de Courcy Meade, M.INST.C.E., city surveyor of Manchester, gave a lecture recently at the Municipal School of Technology on "The Main Drainage of Manchester." The lecture was designed principally for students in the sanitary engineering department of the school, and was illustrated by a large number of lantern slides. Mr. Meade began with a reference to the condition of Manchester at the close of the eighteenth century, and traced the city growth from that period to the present. Proceeding, Mr. de Courcy Meade stated that the Mersey and Irwell Joint Committee was constituted in 1891 for the purpose of enforcing the provision of the Rivers Pollution Prevention Act, 1876, in relation to so much of the rivers Mersey and Irwell and their tributaries as are above the southern boundary of the borough of Warrington. The total area under the jurisdiction of the Joint Committee is 776½ square miles. The amount spent on main drainage and sewage disposal by the public authorities within the area under the jurisdiction of the Joint Committee is about £6,070,000, and the population in the area is 2,782,215.

## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned* (*No.* 1359 *Holborn*), *subject to later confirmation by letter.*

SURVEYOR'S TEMPORARY ASSISTANT.—February 2nd.—Watford Urban District Council. £3 3s. a week.—Mr. W. Hudson, clerk and solicitor.

ARCHITECTURAL ASSISTANT.—February 3rd.—Midland borough engineer and surveyor's office. £150 per annum.—Box 1,121, office of THE SURVEYOR, 24 Bridelane, Fleet-street, E.C.

ENGINEER'S TEMPORARY ASSISTANT.—February 3rd.—Corporation of Plymouth. £3 3s. per week.—Mr. James Paton, borough engineer and surveyor.

DRAUGHTSMAN.—February 3rd.—Derbyshire Education Committee. £100 per annum.—Mr. G. H. Widdows, County Education Office, St. Mary's-gate, Derby.

CLERK OF WORKS.—February 3rd.—Clevedon Urban District Council.—Mr. H. C. Fry, clerk.

SURVEYOR.—February 5th.—Glanford Brigg Rural District Council. £110 per annum.—Mr. F. C. Hett, clerk, Brigg.

SURVEYOR'S ASSISTANT.—February 6th.—Herne Bay Urban District Council. 25s.—30s. per week.—Mr. G. H. Beetenson, clerk.

INSPECTOR OF NUISANCES.—February 8th.—Gwyrfai Rural District Council. £130 per annum.—Mr. J. Henry Thomas, clerk, 14 Market-street, Carnarvon.

INSPECTORS OF NUISANCES (2).—February 8th.—Basford Rural District Council. £120—£130.—Mr. Henry Stone, clerk.

INSPECTOR OF NUISANCES.—February 12th.—Darlaston Urban District Council. £105 per anuum.—Mr. J. Corbett, town clerk.

SURVEYOR.—February 13th.—South Stoneham Rural District Council. £100—£120.—Mr. E. T. Westlake, clerk.

ASSISTANT SANITARY SURVEYOR.—February 14th.—Easington Rural District Council. £130 per annum.—Mr. J. M. Longden, clerk.

CLERK OF WORKS.—February 22nd.—Oakwell Joint Hospital Board. 50s. per week.—Mr. W. Middlebrook, clerk, Council Offices, Birstall.

ASSISTANT ENGINEERS.—May 1st.—Indian Public Works and State Railway Departments.—Secretary, Judicial and Public Department, India Office, London, S.W.

## MUNICIPAL COMPETITIONS OPEN.

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LONDON.—February 17th.—Sketch designs for new head offices, for the Port of London Authority.—The Clerk.

YORK.—February 17th.—Designs are invited for a public elementary school by the Education Committee.—Mr. J. H. Mason, secretary, Education Offices, Clifford-street, York.

HARROW-ON-THE-HILL.—March 15th.—Enlargement of public offices, for the urban district council. Cost not to exceed £4,000. Premiums of £30, £20 and £15 guineas are offered.—Mr. J. P. Bennetts, engineer and surveyor.

## MUNICIPAL CONTRACTS OPEN.

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### Buildings.

BARROW.—February 3rd.—For the erection of twenty-two labourers' cottages, for the rural district council.—Mr. A. Haynes, clerk.

PEMBROKE.—February 3rd.—For the erection of stabling, for the county council.—Mr. A. H. Thomas, county surveyor.

ST. ANDREWS.—February 5th.—For the building of a retaining wall, for the corporation.—Mr. W. Watson, borough surveyor.

MARGATE.—February 5th.—Erection of new lavatories and extension of existing lavatories, for the corporation.—Mr. E. A. Borg, borough surveyor.

TIPTON.—February 5th.—For the erection of public conveniences, for the urban district council.—Mr. W. H. Jukes, surveyor.

HUDDERSFIELD.—February 6th.—For alterations to the cemetery lodges, for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor.

KINGSTON-UPON-THAMES.—February 6th.—For the erection of a landing stage, for the Property Committee.—Mr. R. Hampton Clucas, borough surveyor.

MELFORD.—February 7th.—For the erection of workmen's cottages, for the rural district council.—Mr. J. O. Steed, clerk, Sudbury.

SOUTHEND.—February 7th.—For the erection of a timber covering over south station of pier tramways, for the town council.—Mr. E. J. Elford, borough engineer and surveyor.

PEMBROKE.—February 7th.—For the erection of a school, for the Education Committee.—Mr. H. E. H. James, clerk, County Education Office, Haverfordwest.

GRAVESEND.—February 8th.—For the erection of a concert stand and refreshment kiosk, for the corporation.—Mr. H. H. Brown, town clerk.

WEST RIDING.—February 9th.—For the erection of a school, for the Education Committee.—Education Architect, County Hall, Wakefield.

LANCASTER.—February 9th.—For the erection of a grammar school for girls, for the Education Committee.—Mr. G. H. Mitchell, secretary, Town Hall.

LANCASHIRE.—February 12th.—For the completion of the Whalley Asylum, for the Committee of Visitors.—Mr. H. E. Clare, clerk, County Offices, Preston.

WHALLEY.—February 12th.—For the completion of an asylum, for the Committee of Visitors.—Mr. H. E. Clare, clerk, County Offices, Preston.

RISCA.—February 12th.—For the erection of fifteen houses, for the urban district council.—Mr. A. J. Dardis, surveyor.

WEST HAM.—February 12th—19th.—For the erection of a caretaker's residence, and other works, for the corporation.—Mr. W. Jacques, 2 Fen-court, Fenchurch-street, E.C.

WANDSWORTH.—February 13th.—For the erection of a public convenience, for the borough council.—Borough Engineer and Surveyor.

MERTHYR.—February 13th.—For the erection of three schools, for the Education Committee.—Mr. E. Stephens, clerk.

BIRKENHEAD.—February 15th.—For the erection of a brick gasholder tank and steel internal framing, boundary wall, weigh-house, entrance gates, two cottages, governor-house, and boiler-house, for the corporation.—Mr. J. Fearnley, town clerk.

HACKNEY.—February 15th.—For the erection of a branch library, for the borough council.—Mr. R. Cooper, architect, 12 Gray's Inn-square, London, W.C.

GILLINGHAM.—February 16th.—For rebuilding offices at the electricity station, for the corporation.—Mr. F. C. Boucher, town clerk.

LANCASHIRE.—February 16th.—For the erection of an elementary school, for the Education Committee.—Mr. Harcourt E. Clare, clerk, County Offices, Preston.

LYMM.—February 20th.—For building stable and cart shed, for the urban district council.—Mr. David Mort, surveyor.

DURHAM.—February 20th.—For the erection of a school at Easington Colliery, for the county council.—Mr. A. J. Dawson, clerk, Shire Hall, Durham.

NEWBURY.—February 23rd.—For the erection of twelve cottages, for the corporation.—Mr. S. J. L. Vincent, borough surveyor.

NORTHUMBERLAND.—February 26th.—For the erection of an infant's school, for the county council.—Mr. C. Williams, secretary, The Manors, Newcastle-upon-Tyne.

DARTFORD.—February 27th.—For the extension of the electricity works, for the urban district council.—Mr. W. Kay, clerk.

BLACKBURN.—February 27th.—For extensions to the town hall, for the corporation.—Mr. I. Beard, town clerk.

BANGKOK.—March 15th.—For the erection of an electric power station, for the municipality.—Mr. F. B. Shaw, engineer-in-charge, Municipal Electric Power Station, Local Sanitary Department, Bangkok.

## Iron and Steel.

ST. ANDREWS.—February 5th.—For laying two miles of water pipes, and other works, for the corporation.—Mr. Hugh Thomson, town clerk.

MARGATE.—February 6th.—For the supply of wrought-iron bow-topped fencing, for the corporation.—Mr. E. A. Borg, borough engineer and surveyor.

TUNBRIDGE WELLS.—February 10th.—For the supply of switch gear, for the corporation.—Mr. W. C. Cripps, town clerk.

BURNLEY.—February 10th.—For the supply of cast-iron water pipes, for the rural district council.—Mr. J. S. Horn, clerk.

WARBLINGTON.—February 12th.—For the erection of iron fencing and entrance gates, for the urban district council.—Mr. H. W. Stringfellow, surveyor, Emsworth.

## Roads.

DUNDALK.—February 3rd.—For the execution of road works, for the rural district council.—Mr. P. R Finigan, clerk.

RENFREW.—February 3rd.—For the supply of road materials, for the county council.—Mr. W. H. Hill, 15 West George-street, Glasgow.

FORFAR.—February 3rd—7th.—For the supply of road materials, in the Forfar district of the county.—Mr. Donald Ross, surveyor, Brechin-road, Kirrimuir.

CANTERBURY.—February 3rd.—For the supply of road materials.—Mr. A. C. Turley, city surveyor.

BUCKINGHAM.—February 3rd.—For the supply of granite and slag, for the rural district council.—Mr. R. C. Gordon, surveyor.

THORNABY-ON-TEES.—February 5th.—For works of forming, sewering, paving, kerbing, flagging, and channelling in several streets, for the corporation.—Mr. Charles T. Johnson, borough engineer.

NORWICH.—February 5th.—For the supply of a road-roller, for the corporation.—Mr. Arthur E. Collins, city engineer.

ALDERSHOT.—February 5th.—For the supply of flints, for the urban district council.—Mr. W. E. Foster, clerk.

CAMBERWELL.—February 5th.—For kerbing, channelling, &c., in Dovercourt-road, for the borough council.—Mr. C. William Tagg, town clerk.

SKIPTON.—February 5th.—For the supply of granite, for the urban district council.—Mr. A. E. W. Aldridge, surveyor.

HOLLAND (Lincs).—February 5th.—For the supply of broken granite, broken slag, slag rejections, unbroken slag, &c., for the county council.—Mr. H. Chaderton Johnson, clerk, Sessions House, Boston.

SUTTON-IN-ASHFIELD.—February 5th.—For the supply of tar-macadam and broken slag, for the urban district council.—Mr. W. Burn, surveyor.

GLASGOW.—February 5th.—For paving a street at Hillhead, for the corporation.—Mr. A. W. Myles, town clerk.

HERTS.—February 5th.—For the supply of granite and slag, for the county council.—Mr. Urban A. Smith, county surveyor.

MIDDLESBROUGH.—February 6th.—For the supply of whinstone, limestone and tarred slag, for the rural district council.—Mr. W. H. Dixon, district surveyor, Kirkby-in-Cleveland, near Stokesley, Yorks.

THORNE.—February 6th.—For the supply of dross, screenings, granite and tar, for the rural district council.—Mr. Geo. Kenyon, clerk.

WEALDSTONE.—February 6th.—For making-up work, for the urban district council.—Mr. H. Walker, surveyor.

LARNE.—February 6th.—For hill-cutting and other works, for the rural district council.—Mr. S. M. Wallace, clerk.

NORTHAMPTON.—February 6th.—For the supply of granite, slag and gravel, for the rural district council.—Mr. W. Fawkes, clerk.

LOFTUS.—February 6th.—For making up a certain street, for the urban district council.—Mr. Henry Hoggett, clerk.

PORTADOWN.—February 6th.—For the supply of a tar-macadam mixer, for the urban district council.—Mr. William Wilson, town surveyor.

GELLYGAER.—February 6th.—For the carrying out of street works, for the urban district council.—Mr. H. P. Jones, engineer and surveyor, Council Offices, Hengoed, near Cardiff.

ESCRICK.—February 6th.—For the supply of road materials, for the rural district council.—Mr. F. C. Camidge, clerk.

WHITEHAVEN.—February 6th.—For excavation and road forming, for the rural district council.—Mr. E. B. Croasdell, clerk.

CHINGFORD.—February 6th.—For the supply of granites, stone ballast, hoggin, and boiler clinker, for the urban district council.—Mr. L. C. Bowen, clerk.

BIRMINGHAM.—February 7th.—For the reconstruction of Sandwell-road, Handsworth, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

WORKSOP.—February 7th.—For the supply of granite and slag, for the urban district council.—Mr. G. H. Featherstone, clerk.

LYNN.—February 7th.—For making up a certain road, for the corporation.—Mr. A. J. Smith, borough surveyor.

GREENWICH.—February 7th.—For the supply of York stone, for the borough council.—Borough engineer.

GRANTHAM.—February 7th.—For the supply of granite and slag, for the rural district council.—Mr. Aubrey H. Malvin, clerk.

DEWSBURY.—February 8th.—For works of paving and flagging, for the corporation.—Borough Surveyor.

STOCKPORT.—February 8th.—For the supply of manual and team labour, paving, &c., for the corporation.—Mr. J. Atkinson, borough surveyor.

HEYWOOD.—February 8th.—For asphalting work, for the corporation.—Mr. Geo. G. Bouchier, town clerk.

PAIGNTON.—February 8th.—For work of making up, for the urban district council.—Mr. J. R. Hill, clerk.

OGMORE AND GARW.—February 8th.—For work of embanking and building proposed bridges, for the urban district council.—Mr. S. H. Stockwood, solicitor, Bridgend.

ISLE OF ELY.—February 8th.—For the supply of road materials, for the county council.—Mr. H. F. Simpson, county surveyor, Northern Division, Wisbech.

STOKESLEY.—February 8th.—For the supply of whinstone, limestone, tarred slag, &c., for the rural district council.—Mr. W. H. Dixon, district surveyor, Kirkby-in-Cleveland, near Stokesley.

HAMILTON.—February 9th.—For the supply of road metal, for the Middle Ward.—Mr. W. E. Whyte, district clerk, Hamilton.

WELLINGBOROUGH.—February 9th.—For the supply of Hartshill, Mountsorrel and other granite, for the rural district council.—Mr. W. Jackson, clerk.

MANCHESTER.—February 9th.—For draining, kerbing, and flagging, for the corporation.—Surveyor's Department.

GRIMSBY.—February 10th.—For road improvement work, for the rural district council.—Mr. J. F. Wintringham, clerk.

GLAMORGAN.—February 10th.—For the supply of material and haulage, for the county council.—Mr. G. A. Phillips, county surveyor, Bridgend.

BANBURY.—February 10th.—For the supply of hand-picked and broken granite and gravel, for the rural district council.—Mr. E. L. Fisher, clerk.

YARMOUTH.—February 10th.—For paving certain thoroughfares, for the Port Commissioners.—Mr. J. Tolver Waters, clerk.

HUNSLET.—February 10th.—For making up part of a street, for the rural district council.—Mr. W. B. Pindar, clerk.

DEVONPORT.—February 10th.—For carting and team labour, for the gas department.—Mr. W. P. Tervet, engineer and manager.

CRICK.—February 10th.—For the supply of Hartshill granite, Mancetter, or Mountsorrel stones, for the rural district council.—Mr. W. W. Band, surveyor, Newnham, Daventry.

HORNCASTLE.—February 10th.—For the supply of granite, for the rural district council.—Mr. J. E. Chatterton, clerk.

WANDSWORTH.—February 12th.—For executing repairs in two roads, for the borough council.—Mr. Henry George Hills, town clerk.

Beverley.—February 12th.—For the supply of stone for macadamising, for the rural district council.—Mr. E. Picker, surveyor.

Leigh.—February 12th.—For the supply of grit setts, flags, kerbstones, macadam, sewerage pipes, castings, pitch, and creosote oil, for the corporation.—Mr. W. H. Cowburn, town clerk.

Southampton.—February 12th.—For the hire of steam rollers, for the county council.—Mr. H. Barber, clerk.

Ilford.—February 12th.—For making up part of a street, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

Salop.—February 12th.—For the haulage of stone or tarred macadam, for the county council.—Mr. A. T. Davis, county surveyor.

Southampton.—February 12th.—For the hire of surface-tarring machines, for the county council.—Mr. H. Barber, clerk.

Selby.—February 12th.—For the supply of whinstone, for the urban district council.—Mr. Bruce McG. Gray, engineer and surveyor.

Reigate.—February 12th.—For the supply of granite flints, Kentish ragstone, tar-macadam, gravel, haulage, team labour, tools, and tar-washing surfaces of roads, for the rural district council.—Mr. Arthur J. Head, surveyor.

Carne.—February 12th.—For the supply of manual and team labour, and materials, for the rural district council.—Mr. Alfred A. Cole, clerk.

Mountain Ash.—February 13th.—For street works in Station-road, for the urban district council.—The Surveyor.

Long Sutton.—February 13th.—For the supply of granite, tar-macadam, and slag screenings, for the urban district council.—Mr. S. S. Mossop, clerk.

Morley.—February 13th.—For the supply of road materials, for the corporation.—Mr. W. E. Putman, borough engineer and surveyor.

Blaydon.—February 13th.—For paving certain streets, for the urban district council.—Mr. G. Symon, surveyor.

Enfield.—February 14th.—For making up three streets, for the urban district council.—Mr. T. W. Scott, clerk.

New Sarum.—February 14th.—For the supply of work and materials, for the corporation.—Mr. Francis Hodding, town clerk.

Louth.—February 14th.—For the supply of granite and slag, for the rural district council.—Mr. F. C. Chard, clerk.

Easingwold.—February 14th.—For the supply of whinstone and slag, for the rural district council.—Mr. F. J. H. Robinson, clerk.

Isle of Thanet.—February 15th.—For the supply of broken flints and broken granite, for the rural district council.—Mr. Charles Taylor, clerk.

Banbury.—February 15th.—For the supply of Hartshill stone, for the corporation.—Mr. N. H. Dawson, borough surveyor.

Preston.—February 16th.—For levelling and paving works, for the corporation.—Borough Surveyor.

Kingsbury.—February 16th.—For the supply of road materials, for the urban district council.—Mr. R. C. N. Newport, surveyor.

Beds.—February 17th.—For the supply of broken granite, slag, tar-macadam, flints, gravel, and cartage, for the county council.—Mr. W. W. Marks, clerk.

Rotherham.—February 17th.—For making up part of May-street, for the corporation.—Mr. E. B. Martin, borough engineer.

Goole.—February 21st.—For the supply of road material, for the urban district council.—Mr. C. G. Bradley, engineer and surveyor.

Brierley.—March 1st.—For paving two streets, for the urban district council.—Mr. B. Halstead, surveyor.

Chertsey.—March 4th.—For the supply of highway materials, for the rural district council.—Mr. H. Beeney, surveyor, High-street, Chobham.

## Sanitary.

Manchester.—February 5th.—For the supply of ventilating grids and other castings, for the corporation.—Mr. Thomas Hudson, town clerk.

Tipton.—February 5th.—For the erection of sanitary conveniences, drains, and paving of playgrounds, for the Education Committee.—Mr. E. Richards, secretary.

Evesham.—February 7th.—For the construction of additional sewage disposal works, for the corporation.—Mr. Thos. A. Cox, town clerk.

Southend-on-Sea.—February 8th.—For the sewering of certain streets, for the corporation.—Mr. H. J. Worwood, town clerk.

Lancaster.—February 9th.—For emptying cesspools, &c., for the rural district council.—Mr. G. Littlefair, sanitary inspector.

Luton.—February 12th.—For scavenging work, for the rural district council.—Mr. W. Austin, clerk.

Halesowen.—February 12th.—For laying sewer and surface-water drain, for the rural district council.—Mr. George H. Dallow, engineer and surveyor.

Wandsworth.—February 13th.—For the erection of sanitary convenience, for the borough council.—Mr. H. G. Hills, town clerk.

Houghton-le-Spring.—February 14th.—For work of scavenging, for the rural district council.—Mr. Robert B. Marley, clerk.

Northwich.—February 16th.—For alterations to sewage outfall works, for the urban district council.—Mr. W. M. Beckett, 53 Brazenose-street, Manchester.

Windsor.—February 19th.—For the construction of a main sewer, for the rural district council.—Mr. J. E. Gale, clerk, 3 Sheet-street, Windsor.

Leeds.—February 19th.—For the supply of earthenware drain pipes, sewer ironwork, galvanised dirt boxes, and cement, for the corporation.—Mr. W. T. Lancashire, city engineer.

Castletown.—February 20th.—For the construction of new sewerage, for the Town Commissioners.—Messrs. G. Kay & Co., 22 Athol-place, Douglas, Isle of Man.

Tangier.—March 4th.—For the construction of a drain, for the Special Committee of Public Works.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

## Stores.

Blackburn.—February 3rd.—For the supply of road materials, sewer pipes, iron castings, brooms, and other stores, for the corporation.—Mr. W. Stubbs, borough and water engineer.

Blackpool.—February 3rd.—For the supply of paving setts, kerbs, rubble, flags, broken limestone and granite, stoneware pipes, bricks, ironmongery, iron castings, brooms, coal, &c., for the corporation.—Mr. John S. Brodie, borough engineer and surveyor.

Hendon.—February 5th.—For the supply of road materials, horses and carts, disinfectants, ironmongery, &c., for the urban district council.—Mr. S. S. Grimley, engineer and surveyor.

Bermondsey.—February 5th.—For the supply of materials and work, for the borough council.—Town Clerk.

Cheshunt.—February 6th.—For the supply of coal and coke, granite macadam, flints, gravel, sand, Portland cement, stoneware pipes, &c., for the urban district council.—Mr. J. E. Sharpe, engineer and surveyor.

Gillingham.—February 6th.—For the supply of road materials, Portland cement, requisites for precipitation works, stoneware pipes, timber, sewer ironwork, coal, bricks, paints, general stores, disinfectants and forage, for the corporation.—Mr. F. C. Boucher, town clerk.

Woolwich.—February 7th.—For the supply of road material, forage, and general stores, for the borough council.—Mr. J. Rush Dixon, borough engineer.

Kensington.—February 7th.—For the supply of work and materials for the borough council.—Mr. W. Chambers Leete, town clerk.

Woolwich.—February 7th.—For the supply of ballast, sand, brooms, cement, chandlery, drain pipes, forage, harness, ironmongery, road material, sewer ironwork and timber, for the borough council.—Mr. Arthur B. Bryceson, town clerk.

Huddersfield.—February 7th.—For the supply of granite setts, macadam, furnace slag, granite, flags, pitch and creosote oil, cast-iron materials, bricks, hay, straw, coal, &c., for the corporation.—Mr. J. Henry Field, town clerk.

Halesowen.—February 9th.—For the supply of materials for six months, for the rural district council.—Mr. George H. Dallow, engineer and surveyor.

Ossett.—February 9th.—For the supply of materials, stores and workmen's tools, for the corporation. —Mr. T. W. Wilson, town clerk.

Penge.—February 10th.—For the supply of granite macadam, brooms, Kentish flints, Portland cement, disinfectants, drysaltery, artificial stone, tar-paving, and clock winding, for the urban district council.—Mr. Arthur E. Eves, clerk.

Stepney.—February 10th.—For the supply of bricks, brooms, cast-iron work, colours, oilman's goods, timber, tools, ballast, wheelwright's materials, uniform clothing, disinfectants, &c.—Mr. Geo. W. Clarke, town clerk.

Epsom.—February 13th.—For the supply of sewerage ironwork, gulley gratings, shovels, disinfectants, cement, stoneware pipes, kerbing and channelling, setts, broken granite, tar paving and tarred macadam, Thames ballast, &c., for the urban district council.

Battersea.—February 14th.—For the supply of brooms, materials for van covers, harness fittings, paints, tools, ironmongery, granite macadam and chippings, tarred slag macadam, York paving, Thames ballast, iron castings, &c., for the borough council.—Mr. W. Marcus Wilkins, town clerk.

York.—February 19th.—For the supply of Portland cement, stoneware pipes, sludge-press cloth, building and sewage lime, pitch and creosote oil, Yorkshire stone, kerbing, setts, whinstone, and limestone chippings, for the corporation.—Mr. F. W. Spurr, city engineer.

Eccles.—February 20th. For the supply of granite setts, flags, kerbs, channel stones, broken rubble, granite macadam, prepared tarred limestone, gravel, castings, pitch, gullies, stoneware pipes, &c., for the corporation. Mr. Thomas S. Picton, borough engineer.

Shoreditch.—February 20th. For the supply of paving repairs, asphalting, broken granite, plumbers' work, smiths' work, drain pipes, drain rods, timber, sewer ironwork lime, cement, cartage, ballast, scavenging, paints, gas mantles, printing, &c., for the borough council.—Mr. J. A. D. Milne, town clerk.

Goole.—February 21st. For the supply of road materials, stoneware pipes, Portland cement, tar-macadam, brough gravel, coal, paints, bricks, and disinfectants, for the urban district council.—Mr. C. G. Bradley, engineer and surveyor.

Finsbury.—February 26th.—For the supply of fodder, blacksmiths' work, castings, granite patent stone, cement, stoneware goods, wood-paving blocks, leather hose, brushes, brooms, tools, &c., for the borough council.—Mr. George Whitehead Preston, town clerk.

South Shields.—March 2nd.—For the supply of Northumberland whinstone, Fifeshire whinstone, Aberdeen and Norwegian granite, slag, Portland cement, flags, disinfectants, sewer boots, sanitary pipes, timber, iron, &c., for the corporation.—Mr. Leslie Roseveare, borough engineer.

## Miscellaneous.

Manchester.—February 5th.—For the execution of general contractors' and plumbers' work for the corporation.—Mr. Thomas Hudson, town clerk.

Cheshunt.—February 6th.—For the supply of materials and labour, for the urban district council.—Mr. J. E. Sharpe, engineer and surveyor.

Cardiff.—February 6th.—For public street works, supply of stone, cement, harness, paints, ironmongery, &c., for the corporation.—City Engineer.

Gillingham.—February 6th.—For the supply of road materials, cement, requisites for precipitation works, stoneware pipes, sewer iron work, &c., for the corporation.—Mr. F. C. Boucher, town clerk.

Lewisham.—February 6th.—For the supply of works, paving materials, disinfectants, &c., for the borough council.—Borough surveyor.

Erith.—February 7th.—For the supply of tar, for the urban council.—Mr. J. Kennedy Allerton, clerk.

Devonport.—February 10th.—For the supply of sulphuric acid, for the corporation.—Town Clerk.

Sevenoaks.—February 12th.—For the supply of tar for roads, for the urban district council.—Mr. S. Towlson, surveyor.

Darlington.—February 12th.—For the supply of sanitary pipes, gully grates, cement, brooms, shovels, road material and steam labour, whinstone, slag, &c., for the rural district council.—Mr. C. H. Leach, clerk.

Bradford.—February 14th.—For the supply of road metal, pitch and oil, gullies, earthenware pipes, timber, cartage, &c., for the corporation.—Mr. W. H. S. Dawson, city engineer.

Colchester.—February 17th.—For the cleansing of the cattle market, for the corporation.—Mr. H. Goodyear, borough engineer and surveyor.

Malvern.—Offers wanted for fire appliances, including two-horse tender, with 50-ft. escape, small manual engine and fire-escape.—Mr. W. Osborne Thorpe, surveyor and chief officer.

**Flooding the Wey Valley.**—Owners and occupiers of land in the Wey Valley held a meeting at Woking last week, and resolved to form a permanent association for the purpose of preventing the serious flooding which occurs periodically in the district. It was decided to invite the co-operation of the various local authorities in the district, and to ask the Surrey County Council, the Guildford Corporation and Rural District Council, the Weybridge and Woking Urban Councils, and the Chertsey Urban and Rural District Councils to appoint representatives on the committee, on the understanding that representation would mean some financial contribution.

# TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

ARMAGH.—Accepted for the supply of road tools, &c., for the rural district council.—Mr. W. Calvert, clerk:—
R. Turner & Co., Armagh.

BOSCASTLE.—For the construction of new reservoir, laying pipes, and fencing three reservoirs, in connection with the water scheme, for the parochial Sanitary Committee.—Mr. Harris, engineer:—

| | |
|---|---|
| C. L. Duke, Plymouth | £312 |
| W. B. Gard & Son, Boscastle † | 246 |
| J. Donovan, Widnes, Lancashire | 237 |

BRENTFORD.—For the supply of one gross of bass broomheads, for the urban district council:—
A. V. Box & Co., 30s. and 26s. per dozen.
Howard & Sons, 28s.
W. & F. Archer, 27s.*
W. H. Twinn, 26s and 25s.
F. Young & Sons, 24s.
Knights' Stores, 23s.
F. Smith & Co., 21s. 6d and 18s.
F. W. Smith, 21s
Yates & Co., 18s. 6d. and 15s. 9d.
R. Richmond & Sons, 12s.

CONGLETON.—For hooping steam roller wheels, for the corporation.—Mr. J. H. Walters, surveyor.—

| | |
|---|---|
| T. Wood & Sons | £75 |
| Aveling & Porter | 52 |
| T. Green & Sons | 49 |
| Oxford Steam Plough Company * | 49 |

DUBLIN.—For the supply of centrifugal pumps for main drainage purposes, for the corporation.—
Worthington Pump Company, London, £1,945.

FINCHLEY.—For carrying out private street work, for the urban district council.—Mr. C. J. Jenkin, engineer:—

Briarfield-avenue.

| | |
|---|---|
| W. Griffiths & Co. | £1,766 |
| E. Free & Sons | 1,702 |
| H. Elliott & Co. | 1,694 |
| J. Mowlem & Co. | 1,645 |
| T. Adams | 1,638 |
| W. Iles | 1,610 |
| G. E. Cloke | 1,513 |

Argyle-road (Second portion).

| | |
|---|---|
| W. Griffiths & Co. | £242 |
| J. Mowlem & Co. | 227 |
| H. Elliott & Co. | 226 |
| W. Iles | 220 |
| T. Adams | 219 |
| E. Free & Sons | 212 |
| G. E. Cloke | 204 |

Argyle-road (Third portion).

| | |
|---|---|
| W. Griffiths & Co. | £573 |
| H. Elliott & Co. | 569 |
| T. Adams | 539 |
| E. Free & Sons | 535 |
| J. Mowlem & Co. | 530 |
| W. Iles | 530 |
| G. E. Cloke | 484 |

Clarence-gardens.

| | |
|---|---|
| W. Griffiths & Co. | £712 |
| H. Elliott & Co. | 676 |
| G. E. Cloke | 666 |
| J. Mowlem & Co. | 657 |
| W. Iles | 655 |
| T. Adams | 643 |
| E. Free & Sons | 628 |

Windsor-road Extension.

| | |
|---|---|
| H. Elliott & Co. | £320 |
| W. Griffiths & Co. | 297 |
| W. Iles | 280 |
| J. Mowlem & Co. | 270 |
| T. Adams | 278 |
| G. E. Cloke | 267 |
| E. Free & Sons | 266 |

Etchingham Park-road Extension.

| | |
|---|---|
| W. Griffiths & Co. | £1,317 |
| H. Elliott & Co. | 1,255 |
| G. E. Cloke | 1,219 |
| J. Mowlem & Co. | 1,217 |
| W. Iles | 1,215 |
| T. Adams | 1,187 |
| E. Free & Sons | 1,159 |

Park-avenue.

| | |
|---|---|
| W. Griffiths & Co. | £1,042 |
| H. Elliott & Co. | 1,008 |
| J. Mowlem & Co. | 974 |
| G. E. Cloke | 968 |
| W. Iles | 965 |
| T. Adams | 943 |
| E. Free & Sons | 914 |

FINCHLEY.—For making-up of about 272 yds. run of Holly Park, for the urban district council.—Mr. C. J. Jenkin, engineer:—

| | |
|---|---|
| Mowlem & Co., Westminster | £1,369 |
| W. J. Smith, North Finchley | 1,366 |
| W. Griffiths & Co., Bishopsgate-street | 1,337 |
| G. Bell & Sons, Ltd., Tottenham | 1,299 |
| G. E. Cloke, Brondesbury, N.W. | 1,292 |
| T. Adams, Wood Green, N. | 1,256 |
| O. T. Gibbons & Co., Leytonstone | 1,251 |
| E. Free & Sons, Maidenhead | 1,243 |
| Howard Farrow, Brixton | 1,230 |
| F. G. Brummell, Willesden, N.W. | 1,221 |
| W. Iles, Southend-on-Sea | 1,210 |

LEWISHAM.—For paving George-lane, part 3, for the borough council. —Mr. E. van Putten, surveyor:—

| | Roadway. | Footways at per yd. super. |
|---|---|---|
| | | s. d. |
| Fry Brothers | £390† | — |
| H. Woodham & Sons | 394 | — |
| W. Pearce | 399 | 3 8* |
| J. T. Gleag | 418 | — |
| J. Mowlem & Co., Limited | 454 | — |
| Gibson & Co. | — | 3 10½ |
| J. Wainwright & Co., Limited | — | 4 1 |
| Atlas Stone Company, Limited | — | 4 2 |
| Thomas Stone Company, Limited | — | 4 2 |

LEWISHAM.—For the supply and delivery of tar-macadam, as required during the ensuing season, to the various railway stations in the borough, for the borough council.—Mr. E. van Putten, surveyor:—

Coarse and Fine Tarred Slag Macadam, per ton.

| | s. d. | s. d. |
|---|---|---|
| Tarmac, Limited | 16 3 | 17 4 |
| J. Wainwright & Co., Limited | 16 6 | 17 6 |
| Constable, Hart & Co., Limited† | 16 6 | 17 0 |

Tarred Granite Macadam.

| | | |
|---|---|---|
| Croft Granite, Brick and Concrete Company, Limited | 17 9 | 17 9 |
| Northern Quarries Company, Limited† | 17 3 | 17 9 |

LONDON.—For laying 3,580 yds. of 16-in. main, from the 16-in. main in Clissold Park through Mildmay Park and Southgate-road to connect to the 16-in. main in New North-road, for the Metropolitan Water Board:—

| | Per yard. s. d. |
|---|---|
| Reid Brothers | 8 8 |
| W. & C. French | 6 9 |
| J. Mowlem & Co. | 5 9 |
| Aird's Limited | 5 8 |
| T. Docwra & Son† | 5 5 |

PERRY BAR.—Accepted for the supply of rag and blast furnace cinder, for the urban district council,—

E. Richards, Oldbury (granite).
Martin & Element, Smethwick (slag).

PONTARDAWE.—For laying sewers and constructing manholes, for the rural district council.—Mr. I. Morgan, borough engineer:—

| | |
|---|---|
| R. Rankin, Porthcawl | £40,080 |
| E. Powell, Whitchurch, Cardiff | 24,291 |
| Johnson Brothers, Gloucester | 23,647 |
| J. Riley, Cheltenham | 23,057 |
| E. Thomas & Sons, Seven Sisters | 21,845 |
| B. Jones, Swansea | 21,805 |
| Airds, Limited, Westminster | 21,750 |
| Barnes, Chaplin & Co., Cardiff | 20,844 |
| T. J. Davies, Westminster | 20,110 |
| W. & J. R. Watson, Bridgend | 19,937 |
| Bennie and Thompson, Warrington | 19,627 |
| R. Clarke, Pontardawe | 19,473 |
| G. Archer, Morriston | 18,775 |
| T. Wicker, Clydach | 18,601 |
| R. Lacey, Swansea | 17,693 |
| A. Seaton, Pontypridd* | 17,145 |

Engineer's estimate, £19,734.

WALLINGFORD. For making up a road, for the rural district council:—

| | |
|---|---|
| Langley & Johnson, Slough | £412 |
| J. H. Pearce, Morecambe | 410 |
| T. Catley, Longton | 355 |
| J. Porter, Hackney | 339 |
| Smallbone & Sons, Streatley | 330 |
| P. Trentham, Handsworth | 329 |
| Bosher & Son, Cholsey† | 309 |

WALTHAMSTOW.—Accepted for the erection of a school for girls, for the education committee.—Mr. R. Dempsey, clerk:—

Clark & Sons, Cambridge, £12,303.

WANDSWORTH.—For executing works of repair in three roads, for the borough council.—Mr. P. Dodd, borough engineer:—

Beaumont-road, Southfield.—E. Parry & Co.*, £425 and schedule prices for extras or omissions.

Southmead road, Southfield.—J. Mowlem & Co., Limited,* £113 and schedule prices for extras or omissions.

Part of Augustus-road, Southfield.—E. Parry & Co.,* £230 and schedule prices for extras or omissions.

WEST HAM.—For making up two roads, for education committee.—

Colegrave-road.—Alterations and Additions.

| | |
|---|---|
| W. S. Barton & Co., Chancery-lane | £6,923 |
| A. Webb, Stratford | 6,897 |
| W. E. Blake, Limited, Plymouth | 5,900 |
| J. W. Jerram, East Ham | 5,860 |
| W. J. Maddison, Canning Town | 5,697 |
| J. T. Luton, Stratford | 5,490 |
| A. E. Symes, Stratford | 5,447 |
| H. C. Horswill, Forest Gate | 5,297 |
| F. J. Coxhead, Leytonstone* | 5,240 |

Water-lane.—Alterations and Additions.

| | |
|---|---|
| W. S. Barton & Co., Chancery-lane | £3,577 |
| A. Webb, Stratford | 3,577 |
| W. E. Blake, Limited, Plymouth | 3,400 |
| W. J. Maddison, Canning Town | 3,249 |
| A. E. Symes, Stratford | 3,183 |
| J. T. Luton, Stratford | 3,180 |
| J. W. Jerram, East Ham | 3,144 |
| F. J. Coxhead, Leytonstone | 2,996 |
| H. C. Horswill, Forest Gate | 2,767 |

Forming two short connecting Roads to School Site adjoining Freemasons-road Recreation Ground.

| | |
|---|---|
| W. Griffiths & Co., Limited, Bishopsgate | £650 |
| Parsons & Parsons, Ilford | 675 |
| H. Farrow, Brixton | 500 |
| W. H. Wheeler & Co., Limited, Blackfriars-road | 442 |
| A. T. Catley, Lloyd-square | 240 |
| G. J. Anderson, Poplar* | 235 |

Furniture for Gainsborough-road School.

| | |
|---|---|
| Wellington Furnishing and Manufacturing Company, Limited, Grimsby | £1,537 |
| North of England School Furnishing Company, Limited, Darlington | 1,471 |
| Educational Supply Association, Holborn | 1,455 |
| Bennet Furnishing Company, Peckham | 1,242 |
| Hobbies, Limited, Dereham | 1,209 |
| G. E. Hawes & Sons, Norwich | 1,157 |
| Wake & Dean, Limited, nr. Bristol* | 1,142 |
| Kingfisher, Limited, West Bromwich | 913 |

WEST HARTLEPOOL.—The following tenders have been accepted for relaying the Park Tramways which the council recently purchased:—

J. W. Pearce, Morecambe, £1,731 for paving of track, and £960 for laying of the permanent way; the North-Eastern Steel Company, Middlesbrough, £1,289 for rails; the Hadfield Steel Company, Sheffield, £445 for points and crossings. These tenders total £4,427.

WOOLWICH.—The London County Council sanctioned expenditure not exceeding £5,000 in respect of the installation of lifts in the Woolwich Tunnel. At the request of Improvements Committee, Scott & Middleton, Limited, the contractors for the construction of the tunnel, invited tenders for the installation of the lifts, on the basis of an allowance being made them in respect of delay in the completion of the tunnel and the payment to them of a percentage on the amount of the accepted tender. The following tenders were received:—

| | |
|---|---|
| Easton Lift Company, Limited† | £3,390 |
| Otis Elevator Company, Limited | 3,280 |
| R. Waygood & Co., Limited | 3,150 |

Messrs. Scott & Middleton are prepared to undertake the work, for the sum of £4,360, on the basis of its being sub-let to the Easton Lift Company, Limited, and the committee think this a reasonable arrangement. This amount includes a sum of £170, representing a commission of 5 per cent on the amount of the tender of the Easton Lift Company, and an allowance of £300 in respect of the delay, estimated at not less than four months, in the completion of the construction of the tunnel.

YORK.—Accepted for additions to lodge and converting premises into a laundry, for the corporation.—Mr. F. W. Spurr, city engineer:—

R. Dent & Son, York, £599.

## MEETINGS.

*Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.*

FEBRUARY.

2.—Institution of Civil Engineers (Students' Meeting): Lecture by Captain H. Liall Sankey, R.E., M.INST.C.E., on "Steam Turbines: Some Practical Applications of Theory." 8 p.m.

5. Royal Institute of British Architects: President's Address to Students; Presentation of Prizes; Nomination of Royal Gold Medallist.

5. Society of Engineers: Mr. John Kennedy delivers his presidential address; presentation of premiums. 7.30 p.m.

6.—Institution of Civil Engineers: Ordinary Meeting; papers to be read: "The Water-supply of the Witwatersrand." By D. C. Leitch, M.INST.C.E.; "Investigations relating to the Yield of a Catchment-area in Cape Colony." By E. C. Bartlett, M.INST.C.E.; Ballot for New Members. 8 p.m.

7.—Institution of Civil Engineers: Students' Visit to National Physical Laboratory.

9.—Institution of Civil Engineers (Students' Meeting): Lecture by Captain H. Liall Sankey, R.E., M.INST.C.E., on "Steam Turbines: Some Practical Applications of Theory." 8 p.m.

9. Institution of Municipal and County Engineers: Special General and Metropolitan District Meetings, Caxton Hall, Westminster, 7.30 p.m.

10.—Royal Sanitary Institute: Sessional Meeting at Nottingham.

12.—Institute of Sanitary Engineers: Messrs. A. Alban H. Scott and F. C. Davies on "Hospitals and Sanatoria." Royal United Service Institution, Whitehall. 8 p.m.

16.—Edinburgh Architectural Association: Associates' Annual Dinner. 7.30 p.m.

16.—Royal Institution: Sir John H. A. Macdonald on "The Road: Past, Present, and Future." 9 p.m.

24.—Institution of Municipal Engineers: Council Meeting. 3 p.m.

24.—Institution of Municipal Engineers: General Meeting in London: discussion on "Superannuation and Security of Tenure: the National Association of Local Government Officers and its Bill."

26.—Institute of Sanitary Engineers: Prof. Henry Adams, M.INST.C.E., M.I.M.E., on "Sanitary Building Construction." Caxton Hall, Westminster. 8 p.m.

MARCH.

11.—Institute of Sanitary Engineers: Mr. Percival M. Frazer, A.R.I.B.A. on "The Modern Home." Caxton Hall, Westminster. 8 p.m.

## APPOINTMENTS OPEN.

SOUTH STONEHAM RURAL DISTRICT COUNCIL (NEAR SOUTHAMPTON).

APPOINTMENT OF HIGHWAY SURVEYOR.

The above Council invite applications for the appointment of a Surveyor of Highways.

The district comprises 11 Parishes, 19,387 acres, and about 55½ miles of roads.

Salary £100, rising by £5 annual increments, to a maximum of £120 per annum, with £5 per annum travelling expenses.

Candidates must be able to ride a bicycle, and be between the ages of 25 and 35, and be fully competent to prepare estimates and keep the necessary accounts.

A Guarantee Bond for £200 (by an approved Society) will be required; the premium will be paid by the Council.

Engagement subject to three months' notice on either side.

Successful applicant to reside in or near Westend, about 3 miles from Southampton, devote the whole of his time to the duties of his office, to provide an office at his own expense. Stationery, postages, and use of telephone will be provided by the Council.

The appointment will be made on the 20th February, duties to commence on the 1st April next, and selected Candidates will have notice to attend the Council on that day at Westend. Travelling expenses allowed.

Applications, in Candidate's own handwriting, with copies of three recent testimonials, must reach me not later than 12 o'clock noon on Tuesday, the 13th day of February, 1912, marked "Surveyor."

No forms of application will be issued.

Canvassing Members of the Council strictly prohibited.

Further particulars can be had on application to me, the undersigned. Stamped addressed foolscap envelope to be enclosed.

E. T. WESTLAKE,
Clerk to the Council.

20 Portland-street, Southampton.
January 22, 1912.

EASINGTON RURAL DISTRICT COUNCIL.
SANITARY SURVEYOR'S DEPARTMENT.

The Council invite applications for the position of Assistant Surveyor in the Sanitary Department, at an inclusive salary of £130 per annum.

Candidates must have had a previous experience in a Surveyor's or Municipal Engineer's Office, and must be good draughtsmen, accurate surveyors, experienced in the use of the level and theodolite, competent to prepare plans, sections and detailed drawings, take out quantities, prepare specifications and estimates, and be generally experienced in the design and construction of sewerage and water schemes, and have knowledge of the carrying out of private street improvement works.

Applicants should not be more than 30 years of age, and preference will be given to those connected with either the Institute of Civil Engineers, the Institute of Municipal and County Engineers, or the Surveyors' Institute.

The person appointed must devote the whole of his time to the performance of his duties, and not engage in private practice or be concerned in any other business, and must reside in the district of Easington, and keep a bicycle or other means for travelling in the district.

Forms of application may be obtained from the undersigned on receipt of a stamped addressed foolscap envelope, and must be returned filled up in Candidate's own writing, together with copies of not more than three recent testimonials, not later than Wednesday, 14th February, 1912.

Personal canvassing, either directly or indirectly, will disqualify.

J. M. LONGDEN,
Clerk of the Council.

Surveyor's Office,
Easington, Castle Eden,
Co. Durham.

AGENTS required in unrepresented districts for the Imperial Accident Insurance Co., Ltd. Est. 1878. Horses Insured against Death from Accident or Disease. Mares for Foaling and Loss of Foals; Farmers' Liability for Accidents to Labourers, Servants, and Workmen's Compensation. Claims paid, £500,000. Address Agency Manager, 17 Pall Mall East, London, S.W.

WANTED, experienced Foreman for supervising Road Repairing Gang; must be good book-keeper.—Apply, stating age and experience, Davies Bros., Barmouth.

## APPOINTMENTS WANTED.

SURVEYOR (35), who has had considerable experience in the design, construction, and maintenance of Sewerage, Sewage Disposal, Water Supply, Private Streets, Roads, Bridges, Public Buildings, Housing, and General Engineering and Architectural works under City, Borough, County, Rural and Urban Councils, desires re-engagement; excellent testimonials; moderate salary.—Box 1,120, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

REQUIRED, position as Overseer or Engineer in Charge of Modern Road-Construction Work and Surface Treatment; thorough experience in latest methods of road construction, accustomed to managing men and taking full charge of work; excellent connection with municipal engineers, and would travel if required; good references, age 33 years.—Apply Box 1,123, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

ENGINEER and Surveyor (29), A.M.Inst.C.E., &c., desires appointment; articles under City Surveyor and Consulting Engineers; 13 years' experience Waterworks, Sewerage and General Municipal work.—Box 1,125, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

## MACHINERY AND PLANT.

MALVERN URBAN DISTRICT COUNCIL.
FIRE APPLIANCES FOR SALE.

Owing to a rearrangement of their Fire Appliances, the Malvern Council have for sale Two-Horse Tender, with 50-ft. Escape; One Small Manual Engine, suitable for Village or Estate work; one 35-ft. Hand Fire-escape, three Hose Reels; all in excellent order and condition.

WM. OSBORNE THORP,
Surveyor and Chief Officer.

## MISCELLANEOUS.

ON SALE.—Rivington's Building Construction, 3 vols., cost 22 2s., equal new. Box of Instruments, cost 23 10s., never used, also Ivory Scales, Sett Squares. Manuscript over 120 questions and answers, Surveyors' Examinations. Price the lot (postal order), 46s. nett.—Apply Box 1,124, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

## TENDERS WANTED.

CITY OF YORK.

The Corporation of the City of York invite Tenders for the Supply of the following Material during the year ending March 31st, 1913, in such quantities and at such times as may be ordered:—

| | |
|---|---|
| Portland Cement. | Building and Sewage Lime. |
| Stoneware Pipes. | Pitch and Creosote Oil. |
| Sludge-Press Cloth. | Yorkshire Stone Flags, Kerbing, Edging and Setts. |

Whinstone (Broken and Rough), Slag (Broken and Rough), and Limestone Chippings.

Forms of Tender will be supplied upon application to the undersigned.

Tenders, sealed and endorsed, to be delivered to me on or before noon on Monday, February 19th, 1912.

The Corporation do not bind themselves to accept the lowest or any Tender, and reserve the right to accept one or more Tenders for any portion of the material required.

F. W. SPURR,
City Engineer.

Guildhall, York.
January 27, 1912.

## URBAN DISTRICT COUNCIL OF PENGE.

### TENDERS FOR SUPPLIES.

The Urban District Council of Penge hereby invite Tenders for the Supply of the following, alternatively, for one, two and three years respectively, from April 1, 1912—*viz.*:—

Granite Macadam, &c. (one year only).
Brooms, &c.
Kentish Flints, &c.
Portland Cement.
Disinfectants.
Drysaltery.
Artificial Stone.
Tar-Paving and Tar-Macadam.
Winding and Regulating Clocks.

Forms of Tender (which alone will be received), with full particulars of the various places of delivery, &c., may be obtained on application to the Surveyor, Town Hall, Anerley, S.E., on and after Monday, the 5th day of February, 1912.

Sealed Tenders, endorsed "Tender for —," as the case may be, to be delivered to me, the undersigned, not later than 12 o'clock noon on Saturday, the 10th day of February, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

Dated this 31st day of January, 1912.

ARTHUR E. EVES,
Clerk to the Council.

Town Hall,
Anerley, S.E.

## BEDFORDSHIRE COUNTY COUNCIL.

### TENDERS FOR ROAD MATERIAL AND CARTAGE.

The Bedfordshire County Council invite Tenders for the Supply of the following:—

1. Broken Granite.
2. Slag.
3. Tar-macadam.
4. Flints.
5. Gravel.

And for the Cartage of Road Materials.

Particulars and Forms of Tenders may be obtained at the office of the County Surveyor, Shire Hall, Bedford, on and after the 5th February, 1912.

Sealed Tenders, endorsed "Tender for Road Materials," or "Tender for Cartage," must be delivered at the County Surveyor's office, not later than 12 o'clock noon on Saturday, the 17th February, 1912.

Samples must accompany the Tenders for Road Materials.

The County Council do not bind themselves to accept the lowest or any Tender.

W. W. MARKS,
Clerk of the County Council.

Shire Hall, Bedford.
January 30, 1912.

## COUNTY BOROUGH OF SOUTH SHIELDS.

### TENDERS FOR MATERIALS.

The Corporation invite Tenders for the Supply of the following Materials, required for the year ending 31st March, 1913, *viz.*:—Northumberland Whinstone, Fifeshire Whinstone, Aberdeen and Norwegian Granite, Slag, Granite Chippings, Caithness Flags, Portland Cement, Cement Concrete Flags, Cast Ironwork, Shovels, Scavengers' Brooms and Machine Brooms, Coal, Coke, Disinfectants, Leather Hose, Sewer Boots, Jackets, &c., Sanitary Pipes, Paints, Paint Oils, Glass, Timber, Iron, Horseshoe Nails, Cart Axles, Springs, &c., Tar, Pitch, Oils, and General Stores.

Specifications and Forms of Tender may be obtained on application to the undersigned.

Tenders, endorsed "Tender for Materials," to be delivered at the Borough Engineer's Office, Municipal Buildings, South Shields, not later than 12 noon on Saturday, 2nd March, 1912.

LESLIE ROSEVEARE, A.M.I.C.E.,
Borough Engineer.

Municipal Buildings,
South Shields.

## BOROUGH OF ECCLES.

The Eccles Corporation invite Tenders for the Supply of the following Materials, for the year ending March 31st, 1913:—

Setts (Granite, Grit, Lonkey Paving, Crossing and Flag Rock).
Flags (Best and Seconds Barns).
Flags (Concrete).
Flags (Manhole, Lampeye and Gully).
Kerbs (Rough, Straight and Circular).
Channel Stones (Straight and Circular).
Broken Rubble (per ton).
Granite Macadam and Chippings.
Prepared Tarred Limestone.
Limestone Cube Chippings.
Gravel (Pit or River, per ton).
Cinders (per ton).
Castings.
Pitch, Creosote and Tar.
Simpson's Patent Street Gullies.
Stoneware Passage Gullies.
Stoneware Pipes, Bends and Junctions.
Mortar (per ton).

Forms of Tender and particulars may be obtained on application to Mr. Thomas S. Picton, C.E., Borough Engineer, Eccles.

Sealed Tenders, which must be enclosed in the official envelope provided, to be forwarded to the undersigned not later than noon on Saturday, the 17th February, 1912.

Tenders sent in private envelopes will not be considered, neither must any trade name or mark appear on either side of the official envelope. Samples of all materials tendered for must be supplied, carriage paid, to the Borough Engineer not later than Tuesday, the 20th February, 1912.

The lowest or any Tender will not necessarily be accepted, nor will any allowance be made to persons tendering.

EDWIN PARKES,
Town Clerk.

Town Hall, Eccles.
January 30, 1912.

JOHN YATES & CO., Ltd.,
Aston Manor, BIRMINGHAM.
TELEGRAMS: "Yatonian, Birmingham."
TELEPHONE: Birmingham East 400, 401 & 402
Private Branch Exchange.
Estd. 1804.

TAR BOILERS AND TOOLS.
MACADAM FORKS.
ASPHALTE RAKES.
Also
CORPORATION TOOLS OF ALL KINDS.

TAR BRUSHES, BUCKETS, CARRIERS, CANS, etc.

# The Surveyor

And Municipal and County Engineer.

Vol. XLI. FEBRUARY 9, 1912. No. 1,047.

## Minutes of Proceedings.

**Bituminous Roads.** In a paper which he read a short time ago before the American Association for Highway Improvement, Major W. W. Crosby, chief engineer Maryland Road Commission, dealt with some of the chief points of present interest as regards the use of the mixing, the penetration, and the surface application methods mainly represented in England by "tar-macadam," "pitch-grouting," and "surface tarring." The choice of one of these, Major Crosby pointed out, may be dependent upon traffic conditions, but generally, at the present stage, the choice is largely affected by other considerations—such as the comfort, health, and convenience of "users and abutters." When once a road is well improved the previous traffic records will become almost worthless, except for historical purposes. As regards the sensitiveness of motor cars to slight inequalities of the road surface, this can hardly be regarded as a factor of much importance in the British Isles, since a good motor car of moderate size and well sprung is a vehicle which fails to give its occupants a good idea of the state of the road, because it rides so easily over inequalities. At the same time, taking smaller cars into consideration, and making some allowance for a difference in the meaning of "slight inequalities" on the other side of the Atlantic, and for the large wheels and very large range of resiliency in many American vehicles, the point is, no doubt, one of importance in Major Crosby's experience. A matter affecting the cost of road maintenance to a much larger extent is the destruction by motor cars of the "give-and-take" mat of dust and fine fragments of stone which formerly played a part of considerable importance on many roads. Major Crosby says on this point:

> The dust which formerly lay on a good road surface, and which, when not too profuse, was not only not seriously objected to, but was of some actual value in the protection which it afforded the stones composing the road, has been violently brought to our attention by the motor—so violently and powerfully, in fact, that we are now well aware that, under recent conditions at least, the disadvantages, discomforts, and unhealthfulness of this dust far outweigh any good it may formerly have possessed." In so far as this refers to an actual layer of free dust of any considerable thickness, we find no parallel with good practice in England in the past, but the importance of the self-restoring principle is still a matter to be taken into account.

Major Crosby strongly emphasised the fact that there is no one "best way," nor one "best material," and adds: "It is somewhat surprising how often it appears to be overlooked, even among those who would be expected to appreciate it most." As regards his contention that "the method of surface treatment is particularly applicable to use on old roads," it is not quite clear what this means; but it may be taken for granted that Major Crosby is fully alive to the importance of preparing a road in a suitable manner before surface treatment. At the same time, where the dust nuisance has suddenly become serious on a large mileage of roads of a class considerably less advanced than a good secondary or tertiary road in England, it may be necessary to adopt surface treatment, in the first instance, with a minimum of crust preparation. As regards water-bound roads, the author of this interesting paper is one of those who does not think that "the water-bound road is a thing of the past." He is "yearly building a hundred or more miles of water-bound road, and looks for such work to be continued indefinitely, as there are many localities where dustiness is less objectionable than increased first cost."

As regards the "carpeting" principle, Major Crosby believes that by the use of a carpet of pitch and stone chips "many, if not all, of the defects of concrete for a road surface will be overcome." It is important that the reader should not run away with the idea that the chief engineer of the Maryland Roads Commission has, in the paragraph cited, made any wider claim than that conveyed by the words quoted. It is just the defects of the concrete crust, its failure to adjust itself to settlement, the trouble and difficulty of mending it properly, and its stubbornness generally, that the carpet on a broken stone water-bound crust does get over. The term "concrete" is no doubt intended to include, if not more especially to refer to, tar-concrete or "tar-macadam." Major Crosby concluded his paper by pointing out that the selection of proper methods and materials is the "province of the unbiassed expert, and should not be attempted by the inexperienced, nor entrusted to an ignorant or prejudiced party": . . . that bituminous roads cannot be judged by first cost alone, but, like other roads, "require also maintenance": and that "such maintenance should be, with bituminous roads as well as with any other [illegible]

**River Crossings.** Of all the problems with which the engineer has to grapple there are few more important or more fascinating than those involved in carrying a road across a river, with economy of labour and material and with reasonable security for the work. The design of a river crossing must be approached from two directions, and regarded as the design of a suitable passage for the river or stream, and, at the same time, as the design of a suitable passage for the traffic on the road. Generally the former is dominant in the case of small streams, and with very shallow or very swift rivers, while the latter is dominant in the design of bridges across sluggish rivers, or when the spans are large or the river is crossed by a single large span, one of several hundred feet. Before the engineer attempts to design his bridge as a structure he must grasp the elements of the work regarded as a river crossing, and the economy and security of the bridge often depend upon the thoroughness with which the preliminary studies from this point of

view are carried out. In the present issue we publish the first of a series of illustrated articles on the subject of Preliminary Studies in Bridge Design, by Mr. Reginald Ryves. [illegible] and we commend the series to the attention of those of our readers who are interested in bridge design, and who prefer a rational and logical method of studying it to the plan of making guesses at suitable spans, and treating all other considerations as secondary both in importance and in order of procedure. Design involves something more than a knowledge of materials, for it depends upon the grasp of principles, a faculty for interpreting natural laws; and preliminary studies, though they can be degraded into a process of reviewing all possibilities, are properly of the nature of interpretations of the natural laws which govern the problem in hand. The author of this series of articles is a successful exponent of engineering principles, as is evinced by his treatment of important problems in his book "The King's Highway,"* and recently in articles which have appeared in THE SURVEYOR, as well as in important articles in our contemporary *The Engineer* on the subjects of high masonry dams and coast reclamation. An intimate acquaintance with some of our English streams and experience of the design of highway bridges in the Madras Presidency have enabled him to deal with his present subject in a manner which should make it intelligible to engineers both at home and in distant parts of the Empire, and acceptable, we hope, both as presenting valuable matter and expounding reasonable methods.

* * *

**Massachusetts State Board of Health.**

We have before us a copy of the forty-second annual report of the State Board of Health of Massachusetts, which shows that a vast amount of useful work has been accomplished by that central health authority. In addition to being charged with certain definite administrative functions, the State Board of Health acts in an advisory capacity towards its constituent local authorities, and also towards individuals. Such advice is given at the public expense, and the law requires that it shall be given to the authorities of cities and towns and persons having, or about to have, systems of water supply, drainage, or sewerage, as to the most appropriate source of water supply and the best method of assuring its purity, or as to the best method of disposing of their drainage or sewage with reference to the existing and future needs of other cities, towns, or persons which may be affected. The very wide use which is made of these powers may be gathered from the fact that during the year 1910 no fewer than a hundred applications in regard to the question of water supply alone were received and dealt with.

Another important duty with which the State Board of Health is charged is that of examining at least once every year all main outlets of sewers and drains in the cities and towns of the Commonwealth, and the effect of sewage disposal. The importance of such a periodical examination can hardly be overestimated. It enables the authorities concerned carefully to note from time to time whether any and what improvements in methods or otherwise are desirable, and acts as an effective check on [illegible] and possible outbreaks of disease. There are many other matters which come under the authority of the State Board of Health: in fact, the [illegible] The record of its work therefore is one impressed by its usefulness. A further branch of the work of the Board may perhaps be mentioned—namely, the systematic inspections and investigations which are carried on by a staff of [illegible] Health. The duties of these inspectors are both advisory and executive, but the most important part of their work is that which relates to the prevention of the spread of diseases [illegible] public health. To sum up, we may say that the whole organisation of the State Board of Health is designed so that the attack on preventable disease may be carried on *systematically*. The campaign in America, as in Great Britain, is one of the utmost importance and of considerable magnitude; but we are convinced that with the combined skill of the medical officer and of the engineer, and an efficient organisation, the great spectre of disease can be effectively laid.

* * *

**Crossing Busy Streets: Intermittent "Rapids."**

The best places at which to cross a small stream are where it flows rapidly. A high velocity means either a narrow which can be jumped, or a shallow which can be waded. In the case of street traffic the principle is exactly the same. Where the stream of vehicles is most rapid it is narrower, or the vehicles are spaced further apart lengthwise of the street, either of which conditions to some extent facilitates crossing. The London method follows this principle, but goes a little further, for it is the "dam and discharge" method. The traffic is stopped, the last vehicles to pass being hustled on. After the other line of vehicles and foot passengers has crossed, the pooled vehicles are urged on again, and, taking advantage of the clear road, they proceed swiftly along the space used for crossing the high-speed part of the traffic stream. Counting from "dam" to "pool-head" the speed is above the average, while in the pool it is below the average. The crossing is where the average speed is highest, not through the stream of packing or packed vehicles.

What has led to these observations is the report that in Paris is to be tried the experiment of marking out portions of the streets, thirty yards or so in length, in which vehicles must proceed at a walking pace. The plan may suit a few nervous persons, just as [illegible] for the analogy is complete—the deep and wide part of a stream may be the best crossing for a person who can swim, but has weak ankles and funks the jump or the strong ford. The number of vehicles, however, double or treble the average for the space, will make these places the worst for crossing generally. It may be found, however, that the ebb and flow of traffic will now and then lead to a thinning out of the stream of traffic beyond, that is "downstream of," these walking places; and here *half the street* may be crossed with comparative ease and safety. Since the ebbs and flows of the two streams of traffic will seldom synchronise, it will be useless to place the two walking places some thirty yards apart, but our logical French neighbours will, no doubt, realise that the London plan follows sound principles, and they will stop the stream of vehicles altogether at intervals. There is no escape from the natural law that the "rapids," taking average speed, are the crossing places, and the street crossings of London correspond to fords in a navigable stream, each of which is most easily crossed when the lock upstream of it is being filled.

* * *

**Block Cottage Dwellings.**

[illegible] meeting of the Society [illegible] last night, a discussion on the housing of the [illegible] was initiated by a paper from the pen of Mr. E. P. Monson, [illegible], a member of the Permanent General Committee of the National Housing and Town Planning Council. The question has been frequently discussed of late that it is difficult to say anything at all new or original about it. Mr. Monson, however, wisely abstained from attempting the [illegible] very useful paper, extracts from which will be found elsewhere [illegible] upon his own very wide practical experience as architect to the Sutton trustees. In reviewing the comparative advantages and disadvantages of block dwellings and cottages, the author of the paper emphasised that, in most

cases, the deciding factor in the choice of a type is finance. In great cities it is impracticable to build any dwellings other than those in blocks. It must be remembered, however, that even block dwellings vary enormously in excellence and convenience of design. An example of how *not* to arrange them is provided by the type known as "Associated," in which sanitary conveniences are provided in common. The well-designed block dwelling is both sanitary and convenient, but it is very desirable that it should not contain too many storeys. If more than four or five are provided, the lighting of the lowest dwellings must be interfered with, and the health of the occupants will necessarily suffer in consequence. It will, we suppose, be generally admitted that the cottage type, with a garden attached, is superior to the block type in every case where its adoption is financially practicable. Mr. Monson compared the advantages of terrace, semi-detached and detached cottages respectively, and again concluded that the question is largely a financial one. Mr. Monson's paper was of a most practical character, and the figures which he gave of the cost per room—derived from actual experience—are extremely valuable.

* * *

**The London County Council and Tenderers.**

The General Purposes Committee of the London County Council have exercised a prudent regard for uniformity and equity in proposing that the following be a standing order of the council:—

"Whenever tenders are invited for the execution of any work, the purchase or supply of any goods or materials, the sale or letting of land, or the exercise of any privilege under licence or otherwise, a date and time shall be specified in the instructions to tenderers, after which no tender shall be received by the council, and any tender delivered after such date and time shall be forthwith returned to the person or firm submitting it by the clerk of the council, who shall be authorised to open the tender for the purpose of ascertaining the name and address of such person or firm, but who shall not disclose such name and address or any particulars of the tender."

It appears that it has been the practice of the clerk of the council to decline to receive, or to return, tenders delivered after the specified time, but the practice was not followed in all departments of the service. These exceptions are to be strongly deprecated, as they manifestly open the door to irregularity, while they are also a departure from the conditions under which tenders are invited. Given adequate publicity by means of advertisement, the conditions contained in this announcement with respect to the date for the reception of tenders should be strictly adhered to in all cases; otherwise a feeling of distrust is aroused among tenderers. It is wise, therefore, that the General Purposes Committee should in such a matter as this impose directions that do not permit of exemptions in favour even of unlettered tenderers, such as are in the habit of making application for spaces for swings, side-shows, and so forth, on Bank Holidays. These worthy people should be taught that when the London County Council lays down a condition it must be respected, even as they themselves expect the public to abide by the limitations they fix for the conduct of their own business.

* * *

**National Health League Activities.**

Although the improvement of the public health is a matter for which the local sanitary authorities are primarily responsible, there can be no doubt as to the value, as an auxiliary to their work, of every kind of educational propaganda in regard to matters of hygiene. The conviction that all kinds of disease can be, and ought to be, prevented is becoming more and more prevalent; and those who have practical acquaintance—either as medical officers of health or as voluntary social workers with the conditions under which the poorer classes live are unanimous in the assertion that the chief enemy of improvement is ignorance. It is for this reason that the proposal put forward by the National Health League that a special week should be observed in various localities in order to focus public opinion on matters connected with health, hygiene, and sanitation appears to us to be an altogether excellent one. A very successful meeting was recently held at Kingston-upon-Thames in this connection, and a committee was formed in order to organise such a week in that town. The methods proposed for adoption include demonstrations, sermons on the Sunday, exhibitions, and simple addresses to school children, and the use of the cinematograph. The proposed Health Week for Kingston has the official sanction of the medical officer of health and of the Public Health Committee of the corporation, and it is hoped by its means to create a stronger public opinion in regard to matters of public hygiene, which are of immense importance to every community.

* * *

**Colombo's Public Services.**

The administrative report of the Colombo Municipal Council for 1910 contains much that is of interest to the British municipal engineer, although in regard to some branches of administration the methods adopted cannot be considered to be in accordance with the best modern practice. The principal example of this is provided by the fact that the conservancy system of soil disposal is in operation, although the population of the city is stated to be 207,684. The medical officer of health lays full emphasis on the evils which necessarily attach to any system other than that of water carriage. The difficulty, however, appears to be that there is not an adequate water supply for the efficient working of the public services of the city. The municipal engineer makes complaint of this in dealing with the question of dust prevention; and the report further points out that for the purpose of maintaining pressure it became necessary during the year to shut off the supply of water to the city during the night on no fewer than eighty-eight occasions. On perusing the report as a whole, we fully realise that much excellent work has been accomplished by the municipal authorities, but we are chiefly impressed by the ominous notes of warning which occur in regard to such an elementary necessity for a great city as a fully adequate supply of good water. This seems to be the problem of the future for Colombo.

* * *

**To-Night's Meeting.**

The special general meeting of the Institution of Municipal and County Engineers which it became necessary to call for the purpose of confirming the resolutions with reference to the memorandum of association passed at the special meeting held at the Institution offices on the 13th ult. will take place this (Friday) evening at Caxton Hall, Westminster. As our readers are aware, the Institution a short time ago obtained an admission from the Board of Trade that the view taken by the solicitor to the Institution that the Board had exceeded their powers in causing alterations to be made in any but the "objects" clause was correct, and the two meetings were thereupon convened in order to set matters aright. Something more attractive than the mere confirmation of resolutions is, however, provided by the arrangements for this evening's gathering, as a paper on the relation of modern road surfacings to fish life will be submitted by Mr. W J. Atkinson Butterfield, F.I.C., ASSOC.INST.C.E., a special article by whom, dealing with the properties of tars as regards their suitability for road work, appeared in our issue of April 15th, 1910. The meeting should be full of interest to all concerned in road matters, and it is to be hoped that a large number of members will find it possible to attend.

# Preliminary Studies in Bridge Design.

By REGINALD RYVES, Assoc.M.Inst.C.E.

*(First Article.)*

**When an engineer addresses himself to the problem of designing a river crossing, he brings to the task a general knowledge of the design of bridges as structures, and proceeds, in addition, to make a study of the particular site. The present articles are intended to direct attention to the advantage of making general studies of river crossings, and of typical bridges for different kinds of sites, the crossing of the river and the road being considered apart from any special form of bridge. Three primary types of rivers and streams are considered and five primary types of bridges.**

The various types of stream crossings have been evolved from five primary types, all of which are still to be found in their simplest forms. First, there is the crossing at the "narrow," where the stream runs through a chasm, or in a sharp bend against a hillside, or where it is engaged in cutting back a rocky ledge. On small streams these narrows were jumping places, and were first bridged by trees felled by the stream itself, then by trees felled purposely by man. The earliest arch bridges of single span were probably those across chasms with hard, rocky sides, since no abutments were required, and it seems likely that the first of these were built without the use of centreings, in the way that short spans are made to-day in Moorish Spain. The abutment, consisting of blocks of stone piled up to resist the thrust of the arch, or, in the case of a beam, of stakes driven down to prevent the span from being washed away, was probably of considerably later origin than the span itself.

The second type was evolved from the ford, which in its simplest form is a gravelly shallow, or rocky shelf. In this case the piers, in the form of large stepping stones, jumping stones, or "jumping islands" of heaped shingle, were no doubt of earlier origin than the spans, which at first were slabs of stone or logs placed across the stepping stones. The next stage was reached when the slabs were placed so as to resist being swept away, providing a bridge at low water and a ford during moderate freshets, a form which is of importance to-day as a crossing for wide, shallow rivers. The pile and beam bridge may be regarded as belonging to this type, since it is a development of the crossing stakes of a deep ford.

The third type is the suspension bridge. Suspension bridges may have been evolved from the guide rope of a ford, but the type must be regarded as quite distinct because it includes bridges in which use is made of the action of gravity as a means of crossing a stream. No doubt in its earliest form this type was merely a rope of twisted creepers, tied from tree to tree across a stream, but the advantage of having two ropes, each tied high up on a tree on one bank, and reaching the ground on the other bank, led to the evolution of a form of bridge which to-day plays an important part in transport and communication in the Yün-nan provinces, and seems worthy of adoption in other places where it would be an economical crossing. In the same country (Yün-nan) there are many chain bridges, with roadways of planks. In his book "Yün-nan," Mr. H. R. Davies mentions bridges of spans up to 225 ft. and 240 ft., consisting of ten or twelve chains. In some cases the chains are passed round natural pillars of rock, and in other cases they are imbedded in massive piers of brick or stone.

The fourth type is evolved from the permeable dam, the beavers' dam, or the jam of logs and branches by which an angler may sometimes cross a stream dry shod. The earthen bank, pierced by culverts, belongs to this type, in which we have the principle of pooling up to obtain sufficient head to pass the water rapidly through relatively small openings. Similarly, heading up to obtain a free fall may be adopted in order to make a rapid which will provide a shallow fall. When, however, this amounts to forming a weir with stepping stones, or small spans along its edge, the bridge really belongs to the fourth type. Where hard materials are available this form is a useful one at suitable sites. A low weir at the head of a rapid provides a free fall; the velocity is great, the waterway is reduced, and the amount of masonry required for the bridge itself is therefore small. Where stones abound, and where the site allows of its construction, a temporary bridge belonging to this type may sometimes be made by heaping up stones in imitation of the barriers which dam up some mountain lakes, the water passing through but not over the stones.

In the fifth type, which may be regarded as of modern origin as far as its application to road crossings is concerned, the principle involved in giving a high velocity to the water is carried further than in the fourth type, and the problem may be regarded not so much as that of carrying a road across a stream, but rather as that of taking the stream across the road with the maximum allowable velocity, and therefore the minimum cross-sectional area. It may be used economically where circumstances are favourable, but the crossings for which it is the most economical type are somewhat rare, though the principle of speeding up the water is in itself of considerably wider scope.

Engineers will find that this classification of bridges into five primary types will add to the interest with which they regard the various bridges which they see when they are abroad, while such a classification is by no means without value in the matter of choosing the type of bridge for a particular crossing, and in devising crossings of a cheap or temporary character. In many cases it is worth while to consider each type as regards the possibility of its supplying a candidate for the final comparison of definite designs; but, as soon as definite *forms* have been brought into the comparison, the existence of the five primary types, though present as a background in the designer's mind, must not be allowed to hamper specific comparisons.

### The Problem as a Whole.

The problem involved in making an economical river crossing must be regarded as a whole; the cost of works of diversion or training must be as carefully estimated as that of the structure itself, and the effects of the work in making it necessary to protect the banks or bed of the stream must also be fully considered. At the same time, probabilities must sometimes be balanced against facts, for a work which considerably disturbs the existing conditions may be much cheaper both in first cost and in the long run than a work which does not disturb the conditions. It is easy to see that it will not be economical to bridge a shallow stream 300 ft. wide by means of a single span with abutments untouched even by floods; but it is less easy to see that it may be worth while to reduce all the costly part of the work to a width of 60 ft. or so in mid-stream. Yet this may sometimes be the case. It is hoped that the studies which follow may be useful in helping young engineers to think, in the matter of the design of ordinary road crossings over streams, as well as in suggesting simple and inexpensive means of providing crossings, sometimes of a temporary character, pending traffic developments, and sometimes as permanent works where more costly ones cannot be afforded. Both at home and in the colonies there is scope for

work of this kind, since at home we encounter, on "tertiary" roads and by-roads, crossings which offer varying degrees of impediment up to the point where it becomes absolutely necessary to make a bridge, while in the Colonies there are many important routes which are impeded here and there by crossings which are not likely to be provided with good bridges for a long time to come.

In the first place it is necessary to make a distinction between impediments which are permanent, such as a deep gorge or a perennial stream always of considerable depth, and those which are temporary, such as places which are now and then flooded, but the crossing of which at other times presents little difficulty. At the same time, the

FIG. 1.

latter class often present a permanent impediment of a less severe nature, as well as the occasional impediment of a more severe nature. In some cases it may be economically sound to take measures to overcome the former; in other cases it is more worth while to make adequate provision to meet the temporary impediment. For instance, where the sandy bed of a usually dry river is a serious obstacle, causing delay, tiring draught animals, and jeopardising motor vehicles, it may be worth while to pave the portion of the bed at the crossing in order to destroy its foundrous or rough character,

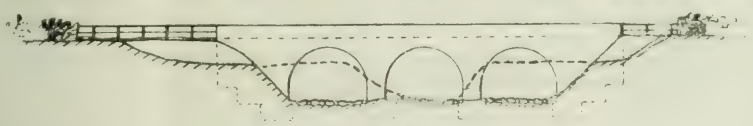

FIG. 2.

protecting the paving from the scour of floods, but taking no measures to provide a crossing at times when the river is running several feet deep. A decision on this point depends upon the amount and importance of the traffic, the usual duration of the flood, and the distance of the nearest bridge. Supposing, however, that a river has a firm, gravelly bed, and gently sloping banks, and can easily be crossed at ordinary times, it may be desirable to spend the available funds in providing a ferry which may be used when the river is too deep to be forded, or in making a road which will

FIG. 3.

shorten the distance to the nearest bridge. Works of both classes may be found in various combinations. The main point to be borne in mind is that some measures of value, however arbitrary, must be assigned to reduction of effort and reduction of delay, in order that the relative values, as well as costs of different proposals, may be estimated. A good ford of ample width may be better than a narrow bridge which will not take the heaviest vehicles, these being taken with difficulty through an unimproved ford. In another case a bridge, however light, may be badly needed. A satisfactory ford, suitable for a warm climate, and where the natives have no objection to wading thigh-deep, is no precedent for a similar work in a cold country where boots are worn. An intermediate type, between a bridge and a ford, is suitable for many crossings such as those of wide Indian rivers. At ordinary times the structure is a bridge, but during freshets it is a raised ford, the water passing over the top as well as through the vents.

### CONDITIONS AT THE SITE.

In making the preliminary survey and estimates there are some conditions which can be fixed at once within moderate limits of divergence, and others which can only be found with some trouble. In the case of a bridge or causeway we may be able to decide at once that, for the sake of the traffic, we will not make the road rise above a certain level nor depress it below a certain level. If the stream runs in a deep bed, and it is shown by calculation, or by what happens at other bridges near the site, that the waterway can easily be made ample, it is not difficult to fix the length of the bridge proper between the approaches. In another case, where the stream runs in a shallow valley and in a shallow bed, it may not be enough to make a span or spans equal in area to the cross-section of the stream flowing full as in Fig. 1. On the other hand, we must not jump to the conclusion that the amount of water passing down can be judged by the width and depth of the stream and the flooded parts on both sides of it; the discharge must be calculated at some place where the average velocity can be estimated with reasonable accuracy.

When the bed is not big enough to take the whole of the discharge in times of flood, it may be a matter for careful consideration whether we shall enlarge the bed at the site and a little above it and below it, blocking the rest of the valley below road level with an embankment as in Fig. 2, or whether we shall make the vents in the bed of the stream sufficient for the ordinary flow only, providing flood vents on the higher ground on one or both sides, as in Fig. 3. It may not be necessary to do either if the bed of the stream falls steeply enough below the site, because in that case the heading up of flood waters against the embankment may give the water sufficient velocity to pass the whole flood discharge through an opening no wider than the bed of the stream in normal flow.

### THREE TYPES OF STREAMS.

Before discussing the design of the bridge, it is necessary to know to what type the stream belongs. We may, for the purpose of classification, distinguish three types: (*a*) A stream which has cut itself an actual bed below well-defined banks, and sufficient to take the maximum flood discharge; (*b*) one which, while running in a well-defined bed,

demands, in addition, a flood channel; or (*c*) a stream which may change its course suddenly or gradually.

Let us take first the case (*a*) of streams in deep beds sufficient for the greatest flood discharges. This will include those which, after a long drought, and especially after a succession of dry seasons without any big flood, flow in a reduced channel. The higher parts of the banks and low-lying places usually flooded each year may be partly occupied by bushy growths, and such places should be recognised for what they are, and should not be occupied by permanent works which are not intended for such situations. Downstream of the bridge it may be necessary to clear away such growths from time to time. Such a stream may change its course very slowly, but in a settled country this is seldom a serious matter to a bridge designer, having regard to the resources of the country, the other interests involved and the small choice of site. The persons responsible for the bridge will not, as a rule, be alone in wishing to keep the stream from attacking the abutments or approaches. In a newly-settled country, however, where there is usually a choice of sites, and where financial resources are often small, a tendency to movement of the bed of the stream may be a serious matter. There is no confusion here with streams of class (*c*), the definitely wandering type, nor is it forgotten that a tendency to movement of the bed may take place in the case of a stream of class (*b*). In the latter case, however, the matter is not usually so serious, and it is convenient to consider it under class (*a*), which includes most of the swiftest streams.

THE ATTACK ON AN ABUTMENT.

If a stream in a deep channel tries to change its course, developing a set against one of its banks, it may make a strong attack upon the abutment of a bridge, and outflank it or destroy it.

It is important in such a case to build the bridge where the stream is least likely to change its course, or, if we cannot do that, do one of two other things. One of these is to anticipate the next move of the

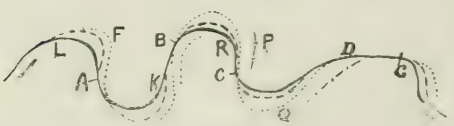


Fig. 4.

stream, and so lengthen the period of the next phase as far as that particular reach is concerned. The other is so to design the abutment that it may stand alone if necessary. Let us consider the three cases as applying to a stream in a fairly deep bed which is sufficient, or nearly sufficient, for the flood discharge. The diagram (Fig. 4) represents typically the course of a stream or river. There are, from the present point of view, good sites at B, C, and G, and of these G is the best, and B the next best.

THE SITE ON THE STRAIGHT REACH.

Generally the best sites are near the downstream ends of straights, and for choice a straight like D G, which is in line with the general direction of the stream. This is because the stream tends to move its bed as shown by the dashed and the dotted lines, and although this tendency may be resisted for very long periods where the soil is hard, it must be regarded as a serious matter where the soil is soft. In any ground less hard than rock it may be serious, and the engineer has to decide what is the measure of its probable importance in any given case. Each curve tends to move forward, more or less in the direction of the straight above it. As regards the curves to right and left of the main course of the stream, the lengthening of this part of the course in a direction not directly down the valley, but more or less across it, results in a reduction of the fall or slope, and a consequent slowing of the stream. The attacks upon the banks at the ends of such reaches are therefore relatively feeble, and the bed tends to silt up in the part between a bend to the right, say, and the next bend to the left. On the whole the curves tend to move downstream, each curve pushing its way on by erosion of the bank. The longer the straight reach above any point, such as B, the longer will it be before this action reaches B. Taking the points A and B at the period denoted by the dashed lines, A is now at the head of a straight, and liable to attack, while B is as yet in the middle of a straight. Later on, the phase denoted by the dotted line, B is beginning to be attacked, the stream tending to move towards the position shown by the chain line. The action must have its limits. As the bed lengthens and the fall diminishes there is a tendency to silting up and a raising of the actual bed of the stream. If it is a small one the reduced velocity, by allowing of encroachment from the banks, still further reduces the capacity of the channel. When a big flood comes the channel has not sufficient capacity for it, and it flows across from bend to bend. This may happen several times, and in the case of a river in class (*b*), a river which has a flood channel, it may be the usual condition. But sooner or later a weak place is found in the bank at the lower of the two bends, and cutting back from this the flood waters establish a spill channel which is deepened by successive floods, deepened later on by taking a part of the normal flow, and finally becomes a part of the river-bed proper, leaving the bend as a pond, which, if the river be liable to floods, will gradually silt up. We now see why the bend which had reached the limit of divergence from the main course would not be a good site for a bridge. When, however, the soil is hard and the river is not a swift one the kind of action described may be so slow that, as far as the present generation is concerned, it can only be called a "tendency." Even then the amount of cutting action at a bend may be sufficient to make the site a bad one for a bridge which should, other circumstances permitting, be built near the downstream end of a straight. If the soil is soft and the cross-sections of the valley very flat the river may belong to the wandering type, in which case we see why G is the best site. Whatever happens the reaches L A, K B, and R C can only have a life through one phase, and they are discarded when the river makes short cuts and starts on fresh curves. But short cuts occurring above the reach D G may be such that D G is still a part of the bed of the river, and it may remain so through another phase.

This consideration, however, only applies to streams of the wandering type.

Even when building a farm bridge across a meadow brook it is worth while to put it on a straight, or at any rate not at a sharp bend. Another plan, applicable to ordinary highway bridges, is to choose a bend where the stream is not in the alluvial soil of the valley bottom, but is up against a bank of solid ground. In many cases, however, such a site is a bad one, because one bank is much higher than the other. Where an old valley road, bridle path, or "trail" which crosses from one side of a valley to the other is being improved, and it is found that the crossing is at such a bend, it may be worth while to divert the road in order to get a better crossing. When the stream is a small one, and the bends are on a small scale, a very little diversion of the road may make an important difference, and in this connection it must be remembered that the best place for a ford is often by no means the best place for a bridge, or even the cheapest, counting the necessary road diversion to a better site. This sometimes makes the improvement of an old bridle path into a good road a matter of difficulty, as the path crosses the rivers by the fords.

*(To be continued.)*

# Water Supply in South Africa.

## PAPERS AT THE INSTITUTION OF CIVIL ENGINEERS.

Two papers dealing with water supply questions in South Africa were presented at a meeting of the Institution of Civil Engineers last Tuesday, the authors being Messrs. D. C. Leitch, M.INST.C.E., and E. C. Bartlett, M.INST.C.E. Abstracts of the papers are appended.

### THE WATER SUPPLY OF THE WITWATERSRAND.

By D. C. LEITCH, M.INST.C.E.

The works described in this paper serve an area of 365 square miles, with a population of 139,000 white and 226,000 coloured inhabitants. Seven municipalities and seventy-three mining companies take water from the Board. The Rand lies at a considerable elevation, and divides the streams flowing to the Orange River and the Atlantic from those which flow to the Crocodile River and the Indian Ocean. The gold-bearing conglomerates of the district dip to the south; they are overlaid by volcanic rocks, and still farther south by dolomite, from which the present supply is obtained. The catchment area of the Klip River valley, above the Board's wells, is about 308 square miles, the average rainfall being 29·5 in. per annum. The Klip River valley has for many years been regarded as a possible source of supply for the Rand; other schemes had been considered, but, owing to various reasons, none passed the preliminary stage. The scheme now described includes reservoirs and distributing mains on the Rand, and a rising main from Zwartkopjes, where there is a central pumping station. At this station there is electric generating plant, and main pumping engines, the latter delivering the water on the Rand, a single lift of over 820 ft. The former provides current to actuate the pumps at the wells in the vicinity, which include nine pairs of shafts and boreholes in an area of about 50 square miles; these pumps raise the water from underground and deliver it at the pumping station at Zwartkopjes. The supply is obtained from fifteen shafts and five boreholes, sunk, with two exceptions, in pairs, the units forming a pair 110 ft. apart. In most cases boreholes were sunk in the first instance from the level of standing water, and sometimes yielded an adequate supply; in other cases a shaft was sunk and headings were driven, using the permanent pumping plant to keep down the water. The total supply available is about 7½ million gallons daily. Headings were driven by native labour to intersect water-bearing fissures, where these were not met with in shafts, and all boreholes were torpedoed to improve the yield of water.

The central pumping station at Zwartkopjes contains the steam-driven pumps, boilers and superheaters. There are four sets of main triple-expansion pumping engines, which are of the vertical inverted type, driving the pump-plungers direct off cross-heads. The maximum capacity of each engine is 100,000 gallons per hour, against 960 ft. head. There are three high-speed electric generating sets, each of 360 kilowatts, supplying three-phase current at 3,300 volts. On trial, with a superheat of 500 deg. Fahr., the main engines consumed 11·25 lb. of steam per nett horse-power hour—a record performance; in ordinary working this consumption is increased to about 13 lb. Current is delivered to motors at the wells at the full voltage of 3,300 to 3,000, by overhead transmission lines of stranded copper, carried on timber cross-arms and steel poles, which also carry telephone lines. The well pumps are of the bucket-and-plunger type, driven by rods and bell cranks from a headgear and motor placed centrally between each pair of pumps. The fly-wheels, on crank shafts of the headgears, weigh about 4 tons each, and a considerable saving in cost was effected by constructing them of reinforced concrete from material on the spot. The capacity of the pumps ranges from 45,000 to 8,000 gallons per hour. These electric motors are connected to the headgear by double-reduction spur-gearing. Six of the motors are of 50 b.h.p. and four of 75 b.h.p. each; the overall efficiency of motor, gear, and pumps is about 70 per cent.

The water pumped from Zwartkopjes to the summit at Turffontein Nek gravitates to the pumping station at Village Main Reef. Here up to 100,000 gallons per hour can be pumped to Yeoville Reservoir, against a head of 270 ft.; of the remander, part is taken by mining consumers before reaching Village Main Reef, and the balance is distributed east and west along the Rand. In order to accelerate the delivery eastward, steam-pumping plant, capable of delivering 200,000 gallons hourly against a head of 80 ft. is provided. The pumping engines are of the Worthington duplex, triple-expansion type, with pneumatic compensators, driving the high-lift pumps direct off the crossheads and the low-lift pumps off the tail-rods of the high-pressure plungers; the latter pumps can be readily connected or disconnected. There are also several small electrically-driven pumping stations, drawing supplies, in all about 500,000 gallons daily, from wells. The rising main from Zwartkopjes is constructed of 27-in. and 29-in. welded steel pipes, with both riveted and Kimberley collar joints. As the maximum head may reach 960 ft., the lower portion of the pipe is strengthened by steel-wire binding. The length from Zwartkopjes to the summit is about 6½ miles, divided into four sections by reflux valves of special construction for high pressures. Expansion joints are provided, and the pipes are protected by a bituminous coating; precautions are also taken against sand cutting. The leakage amounts to only 150 gallons per hour. The distribution system is then described, comprising 133 miles of steel mains, averaging 14½ in. in diameter. Provision is made against subsidence over mine workings. The storage reservoirs on the Rand have a total capacity of about 10,000,000 gallons. In addition there are settling tanks at Zwartkopjes, with a total capacity of 6,070,000 gallons, and also two clear-water tanks, each containing 75,000 gallons. These tanks are all uncovered, and are constructed of reinforced concrete. The whole of the water delivered to consumers is measured.

The average hardness of the Zwartkopjes supply is about 19 parts per 100,000; this is reduced to 14 parts by the addition of hydrate of lime, a solution of which is added to the water entering the settling tanks from the wells. As much as 2 parts of iron per 1,000,000 is found in the water from some of the wells which afford the most copious yield. Growth of weed is prevented in these cases by adding 1 part in 3,000,000 of copper sulphate; while the oxide, formed as soon as the water is aërated, is removed by passage through a cinder filter. Owing to the occasional presence in summer of b. coli, probably due to insect sources, it is desirable to have means of sterilising the water. This is done by the addition of 7½ to 15 lb. of chloride of lime per 1,000,000 gallons.

The works described were carried out mainly by local contractors, under the direction of the author, material being purchased in England under separate contracts. The total cost was about £900,000.

Particulars are given of the working of the plant and the cost of dealing with the water. Thus, during the first half of 1910, the difference between the water pumped and water sold was about 6·2 per cent on a total of 172,000,000 gallons per month, and with about 10,250,000 gallons in circulation, in mains and reservoirs. During the second half of 1910, the average demand rose to 235,000,000 gallons per month, and the cost of pumping and delivering water to the consumers was 7½d. per 1,000 gallons. Adding to this fixed charges on Rand Water Stock—paid by direct contribution from the municipalities and producing mines—which amounted to 1s. 4·84d., the total cost of water was 2s. 0·34d. per 1,000 gallons.

### INVESTIGATIONS RELATING TO THE YIELD OF A CATCHMENT AREA IN CAPE COLONY.

By E. C. BARTLETT, M.INST.C.E.

The objects of this paper are to render available the results of rain and river gaugings taken over some years on a mountainous area in Cape Colony, to indicate the large variation in the intensity of rainfall over small areas in mountainous districts, and to emphasise the necessity of taking gaugings of river discharge for at least twelve consecutive months, in order to obtain a reliable approximation to the available yield of the catchment area. Reference is made to the physical features of the catchment area of the Berg River and of the most important tributary near its source—namely, the Wemmers Hoek River—on the catchment area of which these investigations were

made. The mountains forming the watershed of the Wemmers Hoek River attain a height in places of over 5,000 ft. above sea level, the level of the river where it emerges from the catchment area of 34¼ square miles being 800 ft. above sea level.

Rainfall records at three valley gauges were obtained for nearly four years, and at later dates additional rain gauges were erected, so that for nearly a year readings were obtained at twenty-six gauges. The method of computation of the mean rainfall is described, and a comparison is made of the results obtained at different dates. A plan of the catchment area shows the position of and the computed mean rainfall at each gauge, the mean rainfall varying from 40 to 210 in., and the computed mean rainfall over the whole area being 76 in. The gauge weirs erected across the Wemmers Hoek River are described. Figures are given showing the maximum, minimum, and mean rates of river discharge. Attention is called to the rapid increase in the rate of river flow which is caused by rain, and to the equally rapid decrease of flow after the flood has reached its maximum. The effect of underground storage is considered, and an attempt is made, first by comparison of the results obtained on this and on a small and comparatively non-absorptive catchment area, and secondly, by an examination of the Wemmers Hoek River discharge during the wet season, to obtain the effect of the underground storage on the river discharge at the commencement and termination of the wet season and on the dry-weather flow. The daily river discharge during three dry seasons is shown in diagrams, and the same curve is plotted on each of these diagrams to show approximately that portion of the river flow during these periods which was due to water derived from the winter rains, but retained by the natural storage of the ground until the summer months. An examination of these diagrams and of the rainfall and river discharge shows that of the rain which falls during the six dry months, only a small percentage flows off the catchment area.

The author advances the opinion that, on this catchment area and on others similarly subject to five or six months of low rainfall and high evaporation, an estimate of the yield should be based on a consideration of the rainfall of the six wet months more than on the yearly rainfall. Further, he does not consider that the assumption of an arbitrary number of inches of rainfall as a deduction for the losses due to absorption and evaporation is applicable except in temperate countries like England, where the rainfall is fairly evenly distributed throughout the year. An analysis is made of the rainfall during the six months of the wet and dry seasons of a certain year, which shows that during the twelve months the distribution of the rainfall was exceptionally unfavourable for the production of a yield in a normal proportion to the amount of rain which fell, and, based on this analysis, an estimate is made of the average yield that may be expected from the catchment area during the driest three consecutive years.

The quantity of compensation water to be provided, as determined by the Cape Legislature, is stated, and the author believes that this is only the second case in Cape Colony where compensation for the extraction of water for domestic purposes has been provided otherwise than by money payments.

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**Large Contract for Sewage Plant.**—Messrs. Mather & Platt, Limited, have just been instructed to proceed with a large contract for the Accrington and Church Outfall Sewerage Board, comprising twenty-four of their Pipe-Arm type of revolving distributors, each 62 ft. diameter, complete with all appurtenances, as well as a sewage pump, screening mechanism, and motors to drive the machines and the lighting work. Messrs. Mather & Platt, Limited, are in a favourable position to undertake such contracts, as they are makers not only of spreaders, but also of pumps and electrical machinery, and so forth.

**Petrol Fire Engines.** Nine motor-propelled vehicles making seven altogether have been added recently to the equipment of Glasgow Fire Brigade—eight turbine pumps and one motor car. The cost of converting the motor fire engines works out at £70 each, as compared with £81 10s. in the case of the steam engines drawn by horses. The bought Gotham has also obtained a new motor fire engine. In the course of a recent test it has run at 35 miles an hour on the road and has lifted water from a depth of 20 ft. in less than ten seconds. It was supplied by Messrs. Dennis Brothers, of Guildford.

## THE ASSOCIATION OF CONSULTING ENGINEERS.

### A CRITICISM AND A REPLY.

The matter of qualification for admission to the ranks of the newly-formed Association of Consulting Engineers was dealt with by the *Times Engineering Supplement* in its issue of the 24th ult. Referring to the opening remarks of Mr. James Swinburne, who presided over the recent meeting, our contemporary remarked: "Mr. Swinburne admitted that the inauguration was half a century later than it should have been, and the general impression conveyed by the official report is that its birth and baptism might have been delayed for another fifty years without serious detriment to the welfare of the profession or the happiness of nations. It was recognised by the chairman that all applicants for admission into the association should be full members of the institution controlling the branch of engineering in which they practise, and it was further insisted that in addition they should, at least to begin with, belong to the Institution of Civil Engineers. This device of course saves the association all expense and most of the responsibility involved in the examination and selection of candidates, and leaves it merely the pleasant task of placing the crowning glory upon the heads of those whom it deems worthy to pass into the full blaze of notoriety as consulting engineers. It does not seem to occur to the chairman that the greater includes the less. An engineer who has been duly elected by the council of his specialist institution into the full fellowship of his specialist branch, and who has, moreover, had bestowed upon him the diploma of the Institution of Civil Engineers by its honoured council, has all he wants. To submit himself to further analysis by the council of a lesser body is of no advantage either to himself or to that council. In other words, the association seeks to paint the lily. The situation is not devoid of humour, and, as usual, it has arisen from a misconception of the scope and definition of the word 'consulting' as applied to engineers. There is no added virtue or qualification necessary for a qualified engineer to take up consulting work. In a certain sense, all qualified engineers are consultants."

Replying to the foregoing in a letter which appeared in the following issue of the *Times Engineering Supplement*, Mr. A. H. Dykes, the honorary secretary of the Association of Consulting Engineers, suggests that the object of that body has not been made clear to our contemporary. He says: "If the aim were merely to form a body of expert engineers to read papers and discuss matters of engineering interest, it is apparent that the field is already covered and such an association is unnecessary. The existing Association of Municipal Engineers is an association of duly qualified engineers who are connected with municipal work; in the same way the Association of Consulting Engineers is composed of expert engineers who are engaged in consulting work. The association is of opinion that the question as to whether a man is an expert engineer or not is very well dealt with by the existing institutions, but it will not be contended for one moment that all, or even an appreciable percentage of, the corporate members of the Institution of Civil Engineers are also consulting engineers. The consulting engineers themselves are obviously the people best qualified to judge whether an engineer is in addition professionally a consulting engineer. A great deal of the difficulty and misunderstanding at present existing is due to people attaching different meanings to the term 'consulting engineer.' Of course, any expert engineer who is consulted on an engineering point is, in one sense of the word, a consulting engineer, and it is to be deplored that there is no more definite term which describes an expert engineer who devotes himself to advising the public on engineering works, has his own office and staff for that purpose, and is in addition free from any commercial or manufacturing interests. It is such men as these whom the association seeks to bring together for their mutual advantage and for the advantage of the public, and it is difficult to see what real objection can possibly be taken to such a course. The association does not claim for one moment that its members are more highly trained than any other expert engineers, but merely that they devote themselves to consulting work in the same way that others devote themselves to manufacturing, contracting, or municipal work."

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**The Cheapest Way Out.**—Held to consider the provision of a parish water supply, a Stalbridge (Dorset) parish meeting resolved "that the question be adjourned till the next dry summer."

# Institute of Sanitary Engineers.

## MR. A. J. MARTIN'S PRESIDENTIAL ADDRESS.*

*(Conclusion.)*

The question of standards has come prominently to the front in connection with sewage disposal. A demand has been put forward, in many quarters, for a definite and authoritative standard to which all sewage effluents shall conform. Such standards are already in force locally, as, for instance, in the areas controlled by the Lancashire and Yorkshire Rivers Boards, where an oxygen absorption of 1 grain per gallon, and an albuminoid ammonia figure of 0·1 grain are laid down as limits not to be exceeded. This standard, which is based on long experience of the effluents produced by chemical precipitation and filtration, affords a very good guide to the condition of such effluents; but it breaks down utterly when applied to those from other processes. Thus, Prof. Dunbar showed at Glasgow, in 1904, that effluents obtained by the biological treatment of strong sewage, and containing as much as 2·19, or even 3·55, grains of organic nitrogen per gallon, were non-putrescible and free from smell, an observation which accords with the experience of all who have had much to do with biological processes.† A fatal objection, moreover, to hard-and-fast standards for effluents is that they take no account of the volume and circumstances of the stream into which they are discharged; and even if standards could be devised to do so, there is no security that they would not be rendered obsolete almost before they were in force by fresh discoveries with regard to the purification of sewage. The situation which was created a few years ago by the indiscriminate insistence on land treatment is a standing example of the unwisdom of binding the practice of the future by the light of the knowledge of the past.

This consideration, I am aware, will not weigh with those who look on sewage purification merely as a task which all local authorities are set, and who see an injustice in allowing one council or one manufacturer to turn out a less highly purified effluent than another. But the purification of sewage is not an arbitrary task, but a means to a practical end, and that end is not to turn out an effluent of a given composition, but to prevent pollution, whether of water or air. Those who argue in favour of fixed standards base their case mainly on the need for definiteness. They want some simple test which will show at once whether a local authority is doing its duty or not. The formulation of a set of standards to meet varying requirements affords a tempting field for legislative ingenuity; but surely the only requirement to which a local authority should be called upon to conform is that they should dispose of their sewage without causing a nuisance, or doing substantial damage to any person or body. It remains to find a satisfactory mode of ascertaining the existence of such nuisance or damage, and its extent. This duty is generally assigned to a bewildered judge, with the assistance of an army of expert witnesses, cheerfully swearing to diametrically opposite versions of the same facts. Often the judge, in despair, eventually relegates the matter to an expert assessor. There is much to be said in favour of referring cases of this kind to the expert assessor at the outset, and leaving him to ascertain the facts for himself.

The Royal Commission on Sewage Disposal have earned the gratitude of the public by their steady resistance to the pressure which has been brought to bear on them in favour of fixed standards. It is to be hoped that the central authority, the appointment of which they recommended so long ago as 1903, will take the same view of the matter. Meanwhile, the Tame and Rea Drainage Board are to be congratulated on the recent discharge, by the House of Lords, of the injunction which had been obtained against them for their failure to comply with the impossible requirements of the Public Health Act, 1875.

Before passing on from the question of standards for sewage effluents, it is interesting to note the standard which Colonel Black and Prof. Phelps have just proposed to regulate the discharge of sewage into New York Harbour. They recommend that the dissolved oxygen in the water of the harbour shall not be reduced by the oxidation of the organic matter in the sewage to less than 70 per cent of its saturation value, this limit being fixed as the lowest which will support major fish life. Nuisance was found to result when the dissolved oxygen was reduced below 50 per cent.

### THE EVOLUTION OF THE ENGINEER.

The next standard to which I propose to call your attention is that of the qualifications of the engineer. He has undergone a notable evolution since he first began to "direct the great sources of power in Nature for the use and convenience of man." The engineers of the Middle Ages were men of many parts. Foremost among them stands the commanding figure of Leonardo da Vinci, best known just now, perhaps, as the painter of the missing "Gioconda." It is said of him that "in the fine arts he was the most accomplished painter of his generation, and one of the most accomplished in the world, a distinguished sculptor, architect and musician, and a luminous and pregnant critic. In invention and experimental philosophy he was a great mechanician and engineer, an anatomist, a botanist, a physiologist, an astronomer, a chemist, a geologist and geographer—an insatiable and successful explorer, in a word, along the whole range of the physical and mathematical sciences, when most of these sciences were new."

It is only within the last two or three generations that engineering has existed as a distinct profession. Down to then all the great engineering works had been carried out by men who had been trained to other occupations. Sir Hugh Middleton, who brought the "New River" into London, was a goldsmith of the time of James I. Smeaton, the builder of the Eddystone Lighthouse, and Watt, the inventor of the modern steam engine, were makers of mathematical instruments. Telford, the constructor of many noted roads and bridges, including the suspension bridges over the Menai Straits and the Conway river, was a stonemason.

To these and other pioneers succeeded a race of engineers who devoted themselves more or less exclusively to engineering, yet, like the two Brunels, still covered the whole field of their profession. But as the field widened, a process of specialisation set in, and this steadily continued, until, in place of the one profession of civil engineer, we have the railway engineer, the dock and harbour engineer, the waterworks engineer, the sewerage engineer, the gas engineer, the mechanical engineer, the electrical engineer, and many more.

Side by side with this differentiation of function, there has lately set in a movement in the opposite direction. The local authorities having charge of the various districts, urban and rural, into which the country is divided, have each their engineer or surveyor, whose duty it is to attend to the engineering works within the district. Not very long ago the chief thing which was expected of the district surveyor was to do as little as possible, and it is not surprising that engineering experience was not always regarded as an indispensable qualification for the appointment. This state of things, happily, is fast passing away. Local authorities have begun to take a more enlightened view of their duties, and the office of the district surveyor nowadays is anything but a sinecure. The work of all classes of local officers has for years past been growing by leaps and bounds, and in no domain of public work has the increase been more rapid than in that of the local surveyor. One result of this has been a steady improvement in the holders of municipal appointments. Whereas formerly the chief qualification required was "masterly inactivity," the candidates, at all events those for the higher appointments, have to fit themselves for their work by a long and expensive course of professional training, with not infrequently a series of still examinations. Severe and thorough as the preparation is, it is none too much so for the work which the local surveyor is called upon to perform. Not only is he charged with the maintenance and repair of all the works belonging to the district, embracing such diverse items as highways, bridges, buildings, sewers, waterworks, gasworks, electric generating plant, refuse destructors,

* This address, the first portion of which appeared in our last week's issue, was delivered on the 31st ult. at Caxton Hall, Westminster, Sir John McCall, Agent-General for Tasmania, presiding.

† *Journal Royal Sanitary Institute*, Vol. xxv., p. 601

baths and wash-houses, cemeteries, and other public grounds, and the control of the men employed thereon, but he is often called upon in addition to design and construct any new work of the kind which may be necessary. The council may require a new town hall, a library, a market, or an infectious diseases hospital; a bridge, a refuse destructor, or a crematorium: new sewers or waterworks; or a system of electric tramways; a memorial tower, or a bacterial sewage purification works. This is but a short and incomplete list of the works which fall to an up-to-date local authority, and in respect of which they require advice and assistance. In some cases they call in an outside professional man who has made a speciality of the class of work in question; in others they turn to their own surveyor, who is often called upon, at short notice, to prepare plans and estimates for any of the works enumerated, with a staff barely equal to the regular work of the office, and in the midst of a daily round of exacting routine duties which cannot be neglected and of multitudinous committee meetings which must be attended.

In striking contrast with the complexity and magnitude of these duties, the adequate fulfilment of which would tax to its utmost the all-embracing genius of a Da Vinci, is the meagre scale on which they are too often paid for.

### THE EDUCATION OF THE ENGINEER.

The question of the education and training of the engineer is very much to the fore just now. It has recently received the attention of a large and representative conference of engineers and others, specially convened to discuss it, and within the last two or three months it has been dealt with in the inaugural addresses of the presidents of the English and Irish Institutions of Civil Engineers. I do not propose to take up your time by discussing afresh a subject on which so much has already been said. I should like, however, to invite your attention to the revolution which has taken place of late years in our views on the subject. Not so very long ago we were in the habit of worshipping "practice," and we had a profound contempt for what we were pleased to call "theory." Accordingly, the young engineer learnt his profession in the office and in the shops. Attention is concentrated nowadays on the education which is given in our colleges and universities. We are drifting towards the American plan according to which the young man graduates as a full-fledged engineer. Is there not a danger that the pendulum may swing a little too far, and that the value of a training in which the work is done for a practical purpose may be lost sight of? The advantages of a definite scientific grounding are unquestionable; but many an engineer has made his way to the front rank of his profession without it. I trust that high scholastic attainments will never be regarded as a *sine quâ non* for membership of the profession which numbers among its founders such men as Brindley, Telford and the two Stephensons.

### ENGINEERING QUALIFICATIONS.

I do not, of course, suggest that anyone should be allowed to call himself an engineer, or to undertake engineering work, whether he is qualified or not. On the contrary, I regard it as a reproach to British common sense that such should now be the case, and that men utterly devoid of engineering qualifications should be free to pose as engineers, and to undertake work of the gravest import to the life and health of the community. There is no more justification for allowing an unqualified man to represent himself as an engineer than there is for permitting him to practise as a medical man or a solicitor. The public, indeed, stand in greater need of protection from the unqualified engineer than they do from the unqualified lawyer or the unqualified doctor. For there are many local authorities and private owners in remote parts of the country who have never had occasion to consult an engineer, and who, therefore, when they do happen to require one, have to call in a stranger from a distance. They are necessarily far less able to judge of his qualifications for themselves than in the case of a lawyer or a medical man practising in their midst.

Registration for engineers is not yet in force, and there does not seem to be much prospect of obtaining it. Meanwhile, the only lists to which a council can refer are the voluminous membership lists of the professional societies, which give no indication whatever of the class of work with which each man is accustomed to deal. Moreover, as things stand, membership of a professional society is not an infallible criterion of competence; and, on the other hand, it is only fair to remember that there are just a few men whose ability and integrity are beyond question, but who, for various reasons, do not belong to any professional society.

The Association of Consulting Engineers, which has just been formed, should meet a long-felt need by bringing together those engineers who are not only competent in their respective lines, but are not hampered by commercial ties, and who conform to those rules of professional conduct which are essential for the protection of the local authority and the engineer alike.

### COMPETITIVE SCHEMES.

In the absence of a practical working standard of professional competency, local authorities requiring the services of an engineer not infrequently advertise for competitive schemes. The practice is referred to in the Thirty-second Annual Report of the Local Government Board, in a passage which deserves to be more widely known:—

"We have observed an increase in the number of cases in which local authorities proposing to carry out works of sewerage, sewage disposal, or water supply, have adopted the plan of advertising for the best scheme, and offering a premium for the one which meets their requirements. It appears to us that there are disadvantages in this course which may not have been present to the minds of the authorities concerned.

"In the first place, we are advised that the engineers who have the largest experience in works of this nature will not enter these competitions.

"Secondly, as the acceptance or rejection of a particular scheme by a local authority depends to a large extent upon its estimated cost, there is a noticeable tendency to cut down the estimates in connection with these competitive schemes. The consequence of this underestimating of the expense is seen in the number of cases in which supplemental loans are required to meet excess expenditure, such excess amounting, in many cases, to 50 per cent of the whole cost of the works as originally estimated.

"Nor can the competing engineers be held solely to blame in such cases, for a reliable estimate of cost can only be made after a very careful examination of the locality and some expenditure of money, as well as time, in examining the subsoil and all the peculiarities of the district.

"The engineers have no security that they will be reimbursed the preliminary expenses incurred by them in connection with the preparation of these schemes, and, as might be expected in such circumstances, these expenses are often reduced to an extent which is incompatible with the proper examination of the locality for the purpose of preparing the most efficient scheme."*

There is a still more serious objection to this method of selecting an engineer which local authorities would do well to bear in mind. The work of an engineer consists not merely in preparing a scheme, but also in carrying it out. He has to see that the materials used are in accordance with the specification, that the work is properly done, and with due despatch, and last, but by no means least, that its cost is not inflated by a formidable bill for extra works. In these days of close tendering a contractor often looks for his profit to his extra works, and the resource and ingenuity with which he piles up his bill is apt to be an eye-opener both to the council and the engineer under whom he is working. In saying this, I do not wish to cast any reflection upon contractors as a body. On the contrary, I should like to take this opportunity of testifying to the fair and honourable conduct of the majority of those with whom I have had to deal. But the best of contractors is placed under strong temptations when he has to deal with an incompetent or inexperienced engineer. Such a man, by his weakness, may positively invite unsound and unsatisfactory work; or, as sometimes happens, an excess of zeal in the discharge of his duties may betray him into a course of vexatious and arbitrary interference, seriously hampering the contractor in his work, and eventuating in a costly lawsuit.

There can be no question that the administrative functions which an engineer has to discharge are no less important than his skill in designing works. The weak point of the competition system is that it merely tests the scheme: it affords no criterion of the competence or honesty of the man. The ability to prepare a presentable scheme, or one which falls in with the

* "Thirty-second Annual Report of the Local Government Board," pp. cxxxiii., cxxxiv.

preconceived views of the assessor, may, as many a local authority know to their cost, exist quite apart from the ability to carry the scheme to a successful issue. It is hard on a council that the very precaution which they have adopted with the object of securing the best possible scheme should land them with an engineering fiasco, a costly lawsuit, or a heavy excess expenditure; and the pity of it is that it is all so unnecessary. However much the schemes of competent engineers may vary in detail, there will, as a rule, be very little difference in their efficiency. The competition system, therefore, offers no advantage at all commensurate with the grave risks which it involves.

PROFESSIONAL ETHICS.

There are no standards more necessary, and at the same time more difficult to lay down, than those which regulate the conduct of a professional man in his relations with his professional brethren. It is an honourable tradition of our profession that an engineer shall not advertise for work, nor shall he directly or indirectly solicit it. I cannot help thinking that the reprobation in which these two practices are held is in inverse ratio to their actual importance. Advertising by engineers is, so far as I am aware, unknown in this country; and such a thing would doubtless be scouted on all hands. But if the newspaper reports of the proceedings of local authorities are to be relied on, solicitation goes on merrily, and it is not confined to those who might be supposed to be hard up for work. There are few of us, probably, who cannot recall occasions when councils for whom we have been acting have been bombarded with applications for the very work on which we have been engaged. We have doubtless thought ourselves fortunate if no more energetic steps have been taken to wrest the work out of our hands. Is it not somewhat pedantic to taboo advertising while we tolerate solicitation?

I have no wish to see any change in the time-honoured practice of our profession with regard to these matters, but I do say emphatically, if we must have either solicitation or advertising, let it be advertising. There can be no question which of the two is the more honourable, straightforward, and fairer to all concerned. And it is important to note that the leading engineers in America, whose professional standards are certainly not lower than our own, advertise regularly.

It is as well to look facts in the face. It is natural that a young man, starting in practice as an engineer or an architect, should wish to make the fact known to those whom it may concern. It is natural also that a local authority, requiring the services of an engineer or an architect, and not knowing (as many of the remoter authorities do now) whom to call in, should advertise their need. What else are they to do? They sometimes apply to the Local Government Board to recommend an engineer, which the board very properly decline to do. The duty is far too invidious for any Government department to undertake. The need, however, is urgent for some arrangement whereby a local authority requiring the services of an engineer may obtain reliable and impartial guidance. Why should they not be able to see at the offices of the Local Government Board a register of all the engineers who have carried out works of the kind they have in view within a specified time, and, having selected one or more names for consideration, why should they not be able to ascertain from the board the number and magnitude of the works of that kind which their prospective adviser has carried out, whether or not excess loans were applied for in connection with them, and, generally, whether the engineer had carried out his duties satisfactorily?

Rules of professional conduct are doubtless necessary, but we must not expect too much from them. It is impossible to frame a code of rules which shall prohibit every form of unprofessional conduct. The more usual effect of rules is to favour the wrongdoer at whom they are aimed, but who ignores them or dexterously steers clear of them at the expense of his more scrupulous brethren. The real standard of professional conduct, which every engineer recognises in his heart of hearts, and to which he lives up as closely as the frailty of human nature will permit, is that he shall do nothing, either directly or indirectly, to cause work to come his way. The weak point of written rules is that, by concentrating attention on the letter of the law, they tend to distract it from the spirit.

PROFESSIONAL FEES.

The question of fees is on a different footing, for this is obviously not a matter which can be regulated by considerations of right and wrong, but a question of professional comity. Some arbitrary standard therefore is absolutely necessary. Other professions have their scales of fees for various classes of work; and there is a widespread desire that a similar scale should be drawn up for the guidance of engineers. It is sometimes contended that a scale of fees would be useless, because of the difficulty there would be in enforcing it. This objection involves a misconception of the purpose which such a scale is intended to serve. Few of us, I imagine, would wish to use it as a rod for the backs of evil-doers. What we do want is an authoritative statement of the custom of the profession, to which we can refer our clients in case of need. As things stand at present, if Mr. A. tells a council that the regular commission for carrying out work of a certain magnitude is 5 per cent, and if Mr. B. assures them it is 4 per cent, it is not surprising, in the absence of documentary proof to the contrary, that they prefer to believe Mr. B. A scale of fees would be of great use in such cases, for it is generally recognised that labour paid for below the standard rate is apt to be dear labour; and, although some local authorities may say that they have no concern with professional ethics, most of them are wise enough to perceive that a man who is lacking in a sense of duty towards his profession is not likely to be scrupulous in his dealings with his client.

Those councils who imagine that they necessarily pay less to an engineer who does his work for 4 per cent than to another who charges 5 fall into a grievous error. Four per cent on £50,000 comes to just as much as 5 per cent on £40,000. This observation does not imply that the man who charges low fees intentionally inflates the cost of his work. Every engineer knows that in the course of almost every engineering work occasions arise when, by dint of great care and strict attention to detail, important economies may be effected. A large part of his time, in fact, is spent in carefully weighing alternatives, in order that the desired result may be attained at the smallest cost consistent with efficiency. The man who competes for work by cutting fees is not likely to spend much time in reducing his remuneration still further by keeping down the cost of the work.

A good deal has been heard of late about bribes and secret commissions. I believe that the engineers of this country will compare favourably with any body of men in the world; but it is too much to expect that a profession which is open to all who care to enter it should be absolutely free from black sheep. A very heavy responsibility rests on those local authorities who foster a low standard of professional ethics by encouraging the cutting of fees, and tempting their engineers to supplement their earnings from other sources. It would not, of course, be fair to say that *every* engineer who takes work below the recognised rates is corrupt, as a young engineer, over-anxious to gain work and experience, may be tempted to put up with a reduced commission for the sake of doing so.

RESULTS OF THE ENGINEER'S WORK.

From this review of the internal affairs of our profession I should like to pass on to some of the results of its work—more particularly its influence on the standard of general well-being. But a retrospect of this kind is a commonplace of presidential addresses. There is no need for me to remind you how great a part the engineer has played in bettering the conditions of life—in affording to the labouring classes of to-day an environment and a standard of living better in many respects than those of the nobility a few centuries ago. We, as engineers, have every right to be proud of our contribution to the sum of human progress. In conjunction with the allied profession of medicine we have banished a number of devastating diseases; and that is all to the good. We have also pulled down the death-rate to a small fraction of what it stood at 200 years ago. That, too, is a noteworthy achievement; but it is possible to make too much of it. For Death is not necessarily an enemy to be combated. In many cases—perhaps in most—he comes as a merciful and gracious visitant, bringing release from pain to the sufferer, and rest to the worker whose task is done. And Death, it is important to remember, is Nature's appointed agent who removes from the battlefield of life those who cannot stand the stress of the campaign. If the reduction in the death-rate meant merely the keeping alive of those who would welcome death, it would hardly afford ground for satisfaction; for it is not the quantity of life that matters, but the quality of it. What we have to do is not merely to keep people alive, but to raise the standard of living. And that is what we have done; for the reduction in the death-rate is but one phase in a

general uplifting, in a process which not only saves the dying, but makes the weak strong, and the strong stronger.

But we are making wofully little headway. Amid the triumphs of sanitary engineering and preventive medicine we are confronted by a mass of preventable disease and the ugly spectre of physical deterioration. Physical deterioration is due to many causes, for certain of which the engineer is, in some degree, responsible. The overcrowding of our great towns, for instance, could not have reached its present pitch were it not for the facilities which he provides. But it is mainly the outcome of forces beyond his control; for while the engineer and the doctor are pulling in one direction, the individual citizen is pulling as hard as he knows how in the other. A highly artificial existence, late hours, excitement, over-indulgence in rich foods and stimulating drinks, sedentary habits, lack of exercise—these, and a dozen other adverse influences, all help to counteract the laborious work of the sanitarian. And the worst enemy of all is ignorance—that pitiful and all but total ignorance of everything that conduces to healthy, vigorous life. The process of specialisation, to which I have already referred in connection with the engineer, has borne particularly hard on the citizen. Just as the all-round capable artisan has given place to the mere tender of a single machine, so the one-time self-reliant, self-supporting citizen has lost his functions one by one to the State, to the voluntary society, or to the army of specialists which has arisen to minister to his needs. He hires a soldier to fight for him, and scouts the idea that he has any responsibility for the defence of his home and family; he employs a parson to pray for him, and washes his hands of religion; he pays his rates for the relief of the poor, and passes by on the other side. And, similarly, he entrusts his health to the care of the doctor and the engineer, and flatters himself that he has no further concern with it. But there he is wrong. Divest himself of his functions as he may, the individual is, and must remain, the custodian of his own health.

If we would stem the current of physical deterioration, the first thing we have to do is to set up a standard of healthy living, and to bring to the aid of the medical officer and the sanitary inspector the powerful support of an enlightened public opinion. How is this to be done?

### A NATIONAL HEALTH WEEK.

In my presidential address last February I ventured to suggest the establishment of a National Health Week. By a rare stroke of luck the seed fell on good ground. The Press received the suggestion kindly, and gave it a wide currency; the health societies and the medical officers combined to carry it into effect; the Agenda Club provided the funds and the organisation; and the project is now well under way. The central committee includes representatives of nearly all the leading health societies, and some of the best-known medical officers; and we have the good fortune to have for our chairman the president of the Society of Medical Officers of Health. Local committees are being formed in the metropolitan boroughs and many of the great towns; and Sunday, April 28th, will witness the beginning of an organised effort, on sober, non-sensational, practical lines, to bring home to the people of this country a sense of the value of health, and their personal responsibility for its maintenance, and to get them, for the future, to pull with us instead of against us.

As my name has been coupled with Health Week, I may be permitted to point out that I can claim no priority in the idea on which it is based. The need for educating the public in matters of health has long been a commonplace with all who have to do with sanitary administration. It is gratifying to me to find that attention was drawn to it wellnigh forty years ago by a member of our own profession. On May 2, 1873, that veteran sanitary engineer Mr. Lewis Angell, in his presidential address to the newly-formed Association of Municipal and Sanitary Engineers and Surveyors (now the Institution of Municipal and County Engineers) referred to the point as follows:

"One of the greatest difficulties we have to contend with as sanitary engineers is to induce people to appreciate sanitary principles, a difficulty by no means confined to the illiterate or the penurious. The elements of sanitary science by which I mean those general laws and conditions of health, affected by the action of physical agents and local circumstances sufficiently within control to enable us to promote comfort, prevent disease, and prolong life, should be generally known and taught from the lowest grade school to the university. One of the objects of our association will be to promote such knowledge, so that our work may be better appreciated, our office better supported, and the public correspondingly benefited." *

I venture to repeat Mr. Angell's appeal, in the confident hope that the engineering societies will take a worthy part in promoting that education of the public for which he so eloquently pleads.

### VOLUNTARY SOCIETIES.

And now I should like to say a few words about those voluntary organisations, general as well as professional, to which the cause of sanitary reform in this country owes so much. We may well be proud of our voluntary societies, and of the quiet, unostentatious, business-like way in which they are doing their work—without any help from the State, in the face of every difficulty and discouragement, and, in most cases, with miserably inadequate resources. Our statesmen and politicians would do well to note the work which is being done by these societies, and the slender incomes on which they are doing it, and to compare both with the huge expenditure of our Government departments and the meagre results which they too often have to show for it. And this is more than a matter of pounds, shillings and pence. This country has no greater asset than that fine public spirit which leads so many thousands of our busiest men and women to spend their scanty leisure in patient, unremitting, unrequited work in our many voluntary societies, our local governing bodies, and, till very recently, in Parliament itself.

We are sometimes told that we have too many societies; but the field is a vast one, and it cannot, by any stretch of the imagination, be said to be overstocked with workers. I should be the last to extenuate overlapping or division of effort; but it is very doubtful whether we should gain in the long run if all our health societies could be rolled into one. Every independent society is a fresh centre of activity and interest; it appeals to different people in a different way; and I think there can be no question that, in the aggregate, they secure a larger measure of support than any amalgamation of societies could hope for. We are told, too, that there are differences between them and conflicts of opinion. Of course there are. You can never get a large number of keen, intelligent people working side by side in the same field and seeing absolutely eye to eye. If we are going to condemn the health societies because of their differences, we must certainly begin by abolishing our political parties, which, in this respect, are incomparably greater offenders. In saying this I have no wish to minimise the differences which hamper the work of some of our societies, and which not only give the enemy occasion to blaspheme, but are the occasion of grave misgivings in the minds of some of our friends. They can be put a stop to without either suppressing or amalgamating the competing societies. A practical step in this direction, and one which might be taken to-morrow, would be the formation of a co-operation committee, to include a representative of every health-promoting organisation. The functions of such a committee would be to seek out and utilise opportunities for united effort, and to prevent overlapping and clashing of fixtures—in both cases without prejudice to the right of every society to carry out its own programme on its own lines. We have an example of such a body in the National Health Week Committee, on which representatives of a dozen societies meet month by month and discuss matters keenly, without the least trace of sectionalism or division of aim.

Why cannot this precedent be followed? Why cannot we have a permanent co-operation committee of all the health societies? Such a committee could speak with authority, and would command a respect which would not be yielded to any single society. It might well demand a voice in all legislation affecting health; and it might appropriately be entrusted with any administrative health work which could not conveniently be done by the State. And there is a great deal of work which might well be left to the societies. Without looking askance on every extension of State or municipal activity, and fully recognising that there is a great deal of necessary work which could be done in no other way, there are many of us who deprecate the present-day tendency to resort to legislative short-cuts for the solution of every social problem. We admit that all is not well with the body politic; but we are conscious also of its ex-

* "Proceedings" of the Association of Municipal and Sanitary Engineers and Surveyors, Vol. i., pp. 20, 27.

ceeding complexity, and we doubt the competence of Parliament to play the part of physician. We look in vain for evidence of that severe scientific training, that judicial habit of mind, and that unwearying patience which we expect in a medical attendant. A wise physician applies his remedies tentatively; he watches the patient, finger on pulse, day after day, and varies his treatment from time to time to suit developments. But Parliament has to launch its scheme of treatment ready made, and to apply it indiscriminately. The scheme may be well devised, or it may be crude; but it is the law, and it must be obeyed; and if, in the working, imperfections appear, as they usually do, it may be years before they can be rectified. Remembering all this, and bearing in mind the complexity of the social organism, it is hardly surprising that some of us should hail the advent of Government in the field of social amelioration with much the same enthusiasm with which we should welcome a bull in a china shop. I admit that the simile does not hold good at all points. We treat the bovine intruder with courtesy and deference in our endeavour to show him the more excellent way (the way out). The Minister in charge of a Bill receives no such consideration; he is goaded and buffeted unmercifully, and pestered with squibs and darts, and the contents of the national china shop suffer accordingly.

One can understand the attitude of those who look to legislation as the panacea for every social evil. Voluntary effort, they tell us, has been tried, and has failed. All around us we see sickness, distress, poverty, misery; and they have got to be put a stop to.

I cannot admit that voluntary effort has failed. It has never had a fair chance. Most of our health societies are starved for funds—a state of things not wholly unconnected with the ever-increasing demands of the tax-collector. And the public, distracted as it is by a tumult which is none of their making, has never given them a tithe of the support or the attention which they deserve.

We cannot, if we would, shut our eyes to the existence all around us of conditions of life which make a mockery of our twentieth-century civilisation. The strange thing is that we should so persistently shut our eyes to the cause of it all, and that we should ascribe to our social system, capitalism, our land laws, free trade, drink—whatever our own pet aversion may happen to be—a state of things the real reason for which is only too painfully familiar to all of us. The fact is that we are living in a state of war. Conflict is in the air. In the political world the best energies of some of our ablest public men are absorbed in the endless and barren party duel. If this were all, we might face it with a comparative equanimity. But throughout the country there rages a bitter and unremitting warfare between class and class, poor and rich, trade and trade, employer and employed. We deplore unemployment, with all its attendant evils; yet we deliberately create it on a vast scale in the hope of bringing our antagonists to their knees. A petty squabble in an obscure mill brings the industries of a county to a standstill. The interests of the public and the sufferings of the poor count for nothing if there is a point to be scored off an opponent. What wonder that the weakest go to the wall, and that the unskilled, underfed, inefficient worker is trodden under the heel of his stronger brethren? That is what paralyses every beneficent and philanthropic agency, and sets back the clock of social amelioration. You cannot carry out beneficial reforms on a battlefield.

And the remedies for this state of things? I need not name them. They are dinned into our ears at every general election; and we see each half of the population fighting for dear life for a set of panaceas which the other half denounces as worse than the disease. It is magnificent as an exhibition of credulity and make-believe, but it is not business, and it does not carry us any further. And all the while we know, in our inmost heart, that there is only one thing that can save us; and that is Peace.

### PROFESSIONAL SOCIETIES AND THE EMPIRE.

And one more thought in conclusion. We have been born to a goodly heritage. We have an Empire on which the sun never sets, an Empire founded on regard for the well-being of the governed, administered with an ability and single-mindedness which are the envy and admiration of the world. How much longer are we going to keep it? Shall we, in our lifetime, see Great Britain stripped of its possessions as Spain has been stripped—as Turkey is being stripped to-day? Such a calamity may be improbable, but who will dare say that it is beyond the bounds of possibility?

In our profession we learn to leave nothing to chance. We examine our foundations; we test our materials; we inspect our work; and, when it is finished, we watch it with ceaseless vigilance. And yet, now and then, a viaduct yields before the gale, and a train, with its living freight, plunges headlong into the gulf below. A dam bursts, and devastation and death sweep down the valley. A chance pollution reaches a water supply, and a fatal disease is sown broadcast through the town. And so, when we see the British Empire standing broad and fair, we are not content to take its security for granted. We want to know beyond all doubt that every conceivable danger has been foreseen and guarded against—that no precaution is spared to make the Empire doubly and trebly sure.

Some of us cry out for a larger army and more Dreadnoughts—I suppose we shall soon be demanding more airships. That is all very well so far as it goes, but it is not enough. For an army and a navy are merely weapons. They will break in the hands of a nation which does not know how to use them. The world-power of the future will be a nation that keeps before it a high standard of duty and patriotism—an educated nation, a disciplined nation, an organised nation. Can we claim to be such a nation?

This country of ours is very like the curate's egg. Parts of it are excellent; but we have some terribly weak spots, and one of the weakest is our national educational system. I must not dwell on our educational system. I did so at some length in my address last year; and, as I then gladly acknowledged, our educational authorities are alive to the imperfections of the system, and they are earnestly striving to improve it. But we have a lot of leeway to make up.

Happily for the country the work of education is not confined to the schools; nor does it cease when we pass out of our teens. There are other agencies which carry on the work. And foremost among them is that great post-graduate university which comprises our scientific and professional societies, our friendly societies, and our trade unions.

An institute like our own has many functions to perform. In the first place it has to promote the sectional interests of its members. That is surely the very least of its duties. A professional or trade society which devotes the main part of its energies to fighting for its own hand, and which places its sectional interests above those of the public at large, is not only false to its duty, but it defeats its own objects; for by so doing it necessarily alienates sympathy, and arouses antagonisms which tend to defeat the object which it has in view. The second function of a professional society is to promote professional knowledge, and to increase the utility of the profession to the public. But most important of all, and none the less so because it is not explicitly aimed at, it serves as a school for those qualities of loyalty, mutual helpfulness, and self-suppression without which we cannot hope to keep our place in the sun.

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**Millions for Quebec Highways.**—At the opening of the Quebec Legislature, Sir Lomer Gouin, the Premier, asked for a loan of £2,000,000 for improving the highways of the province. He announced that the Government would guarantee half the interest and pay the sinking fund, the municipalities paying the other half of the interest.

**Glasgow Building Scheme.**—The Glasgow City Improvements Committee have approved the adoption of plans prepared by the city engineer, Mr. A. B. M'Donald, for the reconstruction of the Trongate area, which was recently destroyed by fire. On the north side between Tontine-lane and High-street it is proposed to construct two blocks of buildings, of which the front one will have a floor area of 22,000 sq. ft., with shop floor and basement facing the Trongate, and five upper storeys. The back block between Tontine-lane and several courts will have a floor area of 21,000 sq. ft. on the ground floor and four upper storeys. The buildings are to be built as warehouses, and are so designed as either to serve one occupant or to be divisible into flats. They are to be fireproof throughout, and are to be provided with lifts for passengers and goods. The estimated cost of the new buildings is £25,150, and they will cover an area of 1,500 sq. yds. The city engineer has been instructed to prepare working drawings, and tenders are to be invited.

# Block *v.* Cottage Dwellings.*

By E. C. P. MONSON, F.R.I.B.A., F.S.I.

In introducing this subject I can only touch slightly upon its fringe and deal principally with one point—namely, the problem of to-day in providing suitable housing accommodation for the poor worker or artisan and such as would be provided under the housing clauses of the Housing and Town Planning Act and other such-like Acts. In the eighteenth and nineteenth centuries great strides were made in building houses for the middle and poorer classes of the community, and in London itself many hundreds of streets were laid out and developed about that time. In fact, previous to then London was more or less a small place to what it soon afterwards became, owing to all sorts of restraints, Acts of Parliament and the like which had been attempted and passed to keep down house building. Many of these areas, however, which were so hurriedly covered with speculating-built houses, soon came to grief and developed into slums, and besides being insanitary, were badly designed, and numbers were built either on the old-fashioned back-to-back principle or else provision was made for only a very small back yard, and only in the cases of the large and more important houses was there any more than a very limited air space provided, and anything was thought to do for the poor. These are now being or have had to be removed to make way for something else. Better houses, however, were built, fronting around a square, which, of course, was what we consider more up to date.

In connection with every housing and Garden City scheme several points arise which I propose to go into in some detail, and they are as follows: Which is it advisable to build? (1) Block dwellings, or (2) cottages; (3) the block *v.* the cottage; (4) if cottages, whether detached, semi-detached, or in rows; (5) number of houses to the acre; (6) the essentials of the best house built cheaply.

### BLOCK DWELLINGS.

These are divided into two kinds.

(*a*) *The Associated.*—A type, however, which is quite out of date. They comprise living-room and one or two bedrooms only, and all scullery and sanitary arrangements are apart from the living rooms, and used by the tenants of more than one tenement.

(*b*) *The Self-Contained.*—This type is good, each flat being what it says self-contained—that is, having everything which an ordinary cottage would have and combining all the comforts of a house without interference from anyone.

*Cost of Block Dwellings.*—The cost of block dwellings, according to Alderman Thompson, altogether apart from the cost of the land, averages about £100 per room, and the land cost about £75 per room, making the total about £175 per room. This is higher than the cost of the cottage per room, but it can be readily seen that where the site is in London or other large cities it is impossible or impracticable even from a philanthropic standpoint to build other than block dwellings. Block dwellings, however, should not be built higher than five storeys, and only four if the cost of the land is such as will allow this, owing to the vital question of adequately lighting all the rooms.

In the case of the trustees of the will of the late W. R. Sutton, the site at the corner of Old-street and City-road, London, E.C., comprised only 1¾ acres, and cost about £95,000, and the buildings just over £70,000, a total of £165,000 for 284 tenements and 14 shops—885 rooms and sculleries and shops, &c.—which works out about £80 per room for the buildings, and about £107 per room for the land, and on another site where buildings are now being erected at Chelsea the cost of the land was £76,000 for about 3¼ acres, and the building contract is £176,000, a total of £252,000 for 675 tenements and 34 shops—2,175 rooms and sculleries and shops, &c.—which works out about £80 per room for the buildings and about £35 per room for the land, and in both these schemes, after deducting 40 per cent. for repairs, rates and taxes, and other outgoings, the rents are so arranged as to produce 2½ per cent. only on the total capital outlay.

The blocks here provide for one, two, three, or four roomed tenements, and in all these tenements accommodation is made for a scullery, bathroom, separate water-closet, larder, coal cellar, &c., which are not counted when speaking of the number of rooms. The entrances to the flats are all from staircases. Every floor is of fire-resisting materials, as also are the staircases and roofs; the playgrounds and roadways are made with tar-macadam; shrubberies are planted wherever possible, and care is taken to tend the trees and shrubs so that they shall have a fair chance of life. Staircase walls are in glazed bricks, and generally the whole of the work is carried out not so much with the idea of building cheaply as of saving in the cost of upkeep and renewals.

In Liverpool the block dwellings are to comprise living-room, one or two bedrooms, scullery, water-closet, but no bath. The entrances to tenements are from balconies placed outside the buildings, but, personally, I am not greatly in favour of this particular method of entrance. It, however, has something to be said for it. It saves space, because one staircase can be made to serve a larger number of tenements than if the entrances were direct from the staircase.

### COTTAGES.

The Sutton Trustees are purchasing a site at Birmingham, about 21½ acres in extent, at a cost of about £18,500, including roads and sewers, and the proposition is to build 215 houses and cottages of varying sizes, from six rooms to one room two-storeyed maisonettes, accommodating a total of 251 families in 1,050 rooms and sculleries, the whole scheme working out with roads and sewers at about £60,500, which gives an average cost per room of £40 for the buildings and £18 for the land and roads.

These figures from my own work prove conclusively that the cost per room in the cottage for buildings and site is less than the cost per room and site in the block. The cost of cottage building as given in "Housing Up to Date," by Alderman Thompson, averages roughly from £50 to £70 per room, and the average site cost about £7 10s. per room, but it is impossible to make any comparison because, as I have said before, cottages can only be built to be productive where the cost of the ground is comparatively low.

### THE BLOCK *v.* THE COTTAGE.

The great question with regard to block dwellings is whether they are more or less healthy than the cottage.

The primary command of creation was "Let there be light," and it is because the builders of block dwellings in some countries have neglected to obey this command that the block dwellings exercise such a mischievous influence in regard to the health of the people. In the New World as well as in the Old this primary command has not been obeyed.

Another point against block dwellings is that they are liable to be overcrowded; this, however, ought never to happen where the superintendent and his assistants keep a sharp look out.

Although I am designing many block dwellings, I am not greatly in love with them, and if I were able I would build cottages of the type which I consider a workman's home should be, as described in the next paragraph, but with sites of the cost values of those just referred to, it is manifestly impossible to consider the question of cottages thereon, even when the small return of 2½ per cent is taken into account.

In discussing this housing question with workmen I find that no point is more popular than that of the need for proper bedroom accommodation. Each normal dwelling for a workman's family should also have a good living-room—spacious, well lighted, bright and clean. It should be the brightest and most cheerful room in the house. It has to serve as the work-room for the wife, the playroom for the children, and the dining-room for the whole family. Connected with this room there should be a scullery in which the rougher domestic work of the household can be performed. Each dwelling should also be provided with a bath and the practice of placing the real necessary of modern healthy life in the scullery may be recommended where the cost of a separate bathroom cannot be afforded.

With regard to the provision of a best room, or parlour, there is much difference of opinion among housing reformers in Great Britain. Personally, I am a strong advocate of the parlour or best room. I regard the quiet, but strong, desire of the workman's wife to have one good room for pleasure as a healthy desire of great social value.

This, then, is the standard of a normal, healthy

* Paper read last night at a Meeting of the Society of Architects.

home for a workman's family: three bedrooms, large living-room, scullery and bath—and wherever possible a parlour. There is one external feature of the good home which should also be clearly stated—viz., the need for garden space. No workman's home can be regarded as properly equipped unless it has a garden, however small. Valuable as public gardens are, they do not serve the same purpose as the home garden. This garden may not be more than a few square yards, but it nevertheless gives the wife an opportunity of enjoying pure air and direct sunshine while still within the area of her home. Of the garden Francis Bacon says: "God Almighty first planted a garden, and indeed it is the purest of human pleasures." The block dwelling has banished this purest of human pleasures from the lives of working people. It is not enough that public gardens and parks have been provided. Valuable as these are, they are not proper substitutes for the home garden.

On the broad question, taking all things into consideration in connection with this clause, I think all will agree with me that the cottage comes out best and wins the case, and should be built wherever possible, of course every care being had and due account being taken of the situation of the building and the cost of the land.

THE COTTAGE: WHETHER DETACHED, SEMI-DETACHED, OR IN ROWS.

Whether the cottage should be detached, semi-detached, or in rows depends very largely upon the number it is desired to place upon any given plot of land, and makes a considerable difference in the number to be so placed, because if they are in rows more land is available for building—and the overcrowding of houses is to be deprecated—but even if they are so placed, it is far better, in my opinion, to provide a small yard, then the back way, and beyond that the garden, and to, say, every four or six houses run a passage way from back to front, with rooms over, to connect up the back way as much and as often as possible, and prevent it becoming the nuisance it sometimes does. But if the number of houses to be erected to the acre is, generally speaking, says Mr. Raymond Unwin, reduced to anything like fifteen, terrace houses with back passages will be found to be a more expensive method of development than with passages between the houses.

Is it better, however, to build houses semi-detached? Here, again, the question of money comes in, for it is impossible to build in this manner as cheaply as terrace houses; there are three main walls to be erected to start with instead of two. The objectionable features, however, which may arise in connection with the back way in the terrace house are done away with, and every house has its garden directly attached thereto.

Detached houses are much better, but, again, the cost is still more.

Looking at this matter dispassionately in all its lights, I consider that the best way of arranging houses economically is semi-detached, but the passage between the houses should be not less than 4 ft. wide, and can be used jointly by the occupiers on either side: this method does away with the back passage.

NUMBER OF HOUSES TO THE ACRE.

This is a very vexed question, and one which has already caused much heart burning at present in certain districts as many as thirty to thirty-five and even more houses are built on an average upon every acre of ground. This, of course, means overcrowding and discomfort, terrace houses, and practically no gardens, but thirteen to the acre is a very usual number, and is good. The Birmingham Corporation in their town planning scheme for East Birmingham have fixed the limit at ten per gross acre, with a density rate of twenty per gross acre; this has, however, not caused satisfaction, and the builders and land owners are grumbling. Personally, I think a good all-round average is thirteen to fourteen per gross acre, and with this number it is possible to give plenty of garden ground, as will be seen from my first scheme for the Birmingham site above spoken of, and the one now suggested to be carried out.

A report by Mr. Raymond Unwin dealing with the effect of limiting the number of houses to the acre, reads as follows: "For a moment let us confine our attention to land worth £300 per acre, which will be found to be a fair average for undeveloped land purchased in large quantities on the outskirts of existing towns. Diagrams give in a graphic form the main fact that the advantage of increasing the number of houses to the acre is very much smaller than would at first be supposed even if measured solely by the money result per plot, while if anything is allowed for the size of the plot, it becomes evident that the crowding of large numbers of houses upon the land is really a most uneconomical proceeding. The additional cost of road required to provide the extra frontage for the added number of houses increases the total cost of development so rapidly that raising the number of houses from 9·6 per acre gross to 25 per acre only reduces the cost of land and roads per house from £68 to £40, while the size of the plot which each house enjoys is reduced from 423 yds. to 127 yds.

"To put it in another way, with twenty-five houses to the acre, the tenant pays 7½d. per week for 127 yds. With 9·6 houses to the acre, if the tenant paid 1s. 0½d. per week, he could have 423 yds. for his plot, and the landlord would make the same profit upon his land, because, while the effect of reducing the number of houses to the acre from 25 to 9·6 is to increase the cost per plot by 68 per cent, its effect also is to increase the area of the plot by 333 per cent.

"To put it in still another way, from the tenants' point of view, with 9·6 houses to the acre, he pays at the rate of £778 per acre for the nett area of his plot, which is 3s. 2½d. per yard, while with twenty-five houses to the acre he pays £1,515 per acre for the nett area of his plot, or 6s. 3½d. per yard."

HOW TO BUILD HOUSES CHEAPLY.

Under the Housing and Town Planning Act and the various Small Holders and other Acts great incentive will be given to people to build houses for themselves, either through some of the approved societies or by borrowing the money in other ways with the aid of the Acts.

I do not propose to go into the many methods by which this can be done, but will only say that I consider the best way to build cheaply is for the client to employ a thoroughly practical and responsible architect, not a faddist or dreamer after the impossible, but one who understands his subject and can give the best results for the least money, due care being had to all the conditions obtainable.

## LOWER THAMES VALLEY DISTRICT SURVEYORS' ASSOCIATION.

A well-attended meeting of the above association was held at the Town Hall, Twickenham, on Saturday last, when the president, Mr. Edward Willis, ASSOC.M. INST.C.E., engineer and surveyor to the Chiswick Urban District Council, presided.

The association had under serious consideration the effect of motor-omnibus and similar traffic on roads which were not constructed for this class of traffic, and passed a resolution with regard to the matter, deciding at the same time to forward a copy to the Institution of Municipal and County Engineers for their consideration.

Further discussion ensued on Mr. Jeffes' paper, entitled "Some Notes on the Construction, Laying Out and Making Up of Private Streets." This was of such an interesting nature that it was decided further to adjourn it until the next meeting.

The association also had under consideration the question of advertisement signs of all classes, and a discussion of some length took place on this topic.

**The Visit to Paris.** As we go to press we are given to understand that Messrs. T. Cook & Son have informed Mr. Thos. Cole, the secretary of the Institution of Municipal and County Engineers, that provincial members who propose to take part in the visit to Paris at Whitsuntide will, in cases where the journey exceeds a distance of 30 miles, be able to obtain return tickets to London at a single fare and a quarter.

**New Panel Wood.**—We have received from Messrs. Green & Sons, Limited, timber importers and saw mill proprietors, of 41 Pitfield-street, Old-street, London, E.C., a sample piece of their new panel wood, "Oko," which is supplied in ¼-in. layers, at the price of 2d. per square foot. The wood, which shows a beautiful grain, is scraped and sanded on one side, and as it is claimed to be dampproof and not to crack, shrink, split or blister, its suitability for wall panels, dados and interior decorative work generally will be obvious. Sample sheets will, we understand, be sent on application to Messrs. Green & Sons.

## INSTITUTION OF MECHANICAL ENGINEERS.

### DRAFT SCHEME FOR ASSOCIATE MEMBERSHIP EXAMINATIONS.

At the sixty-fifth annual general meeting of the Institution of Mechanical Engineers, which is fixed to take place on Friday, the 16th inst., at 8 o'clock, the members will have before them for discussion the annual report of the council, in which is set out a draft scheme for associate-membership examinations. The time has come, in the opinion of the council, for instituting an entrance examination for the younger applicants for admission to the institution, and it has been resolved, after discussion in committee, to make the following suggestions:—

(1) That the examination should be taken, especially by graduates, at as early an age as possible, and, in order to bring such a scheme gradually into operation, it might be desirable that it should apply in the first year only to candidates of twenty-eight years of age and under; in the second year to candidates of twenty-nine years of age and under; and in the third and subsequent years to candidates of thirty years of age and under.

(2) That no examination need be held abroad at present; the effect of which would be that candidates residing abroad, and not having passed an exempting examination, would have to wait until they reached the age limit at which they could be admitted without examination. The question as to whether the examinations should be held in London only, or should be held also in the provinces, would have to be considered.

(3) That, as far as possible, examinations of universities and colleges or other public examining bodies should be accepted as exempting from the institution examination, it being understood that only such examinations as were of at least a standard equal to the institution examination would be accepted.

(4) That the following examinations, among others, might probably be accepted as exempting examinations: Engineering degrees of any British or Irish university; diplomas in engineering of the City and Guilds' College, University College and King's College; Whitworth scholarships and exhibitions; some other examinations (for instance, those of colonial universities), after inquiry had been made in each case, and the examination papers had been inspected; groups of technological examinations equivalent to the institution examination could probably, in some cases, be arranged.

A scheme of subjects for examination (with provisional syllabuses) has been drawn up by members of the council, assisted by specialists in the various subjects, and is set out in the report.

#### PRESIDENT'S NOTE ON THE PROPOSALS.

In a note with regard to the proposals of the council, the president, Mr. Edward B. Ellington, says:

"It has long been recognised that, under the existing regulations, very great difficulty is experienced in determining with anything approaching precision what is the "good general and scientific education" which candidates for admission into the institution are assumed to possess when approved by the council for ballot. Certificates of proficiency in certain engineering subjects obtained after study at evening classes at some technical institute, or from the Board of Education, are at the present time all that can be shown by perhaps the majority of candidates; and in such cases practically the only test of qualification that can be relied upon is the nature of the apprenticeship served and the subsequent experience.

"There is, however, a general consensus of opinion that a mechanical engineer's training in the present day should embrace a wider field of study and of knowledge than can be obtained in the workshop alone. It is conceded that this does not in the least diminish the great importance of training in and on works, but young men cannot be properly trained to take control of works in mechanical engineering at the present day who have not effectively studied and mastered those scientific and technical principles which are the very foundation of all engineering progress. The argument that is sometimes heard that many of the best engineers now living have not had the kind of training referred to, and that their success proves that theoretical studies are of but comparatively slight importance, is invalid, because the conditions governing the question are no longer what they were when such men were learning their business. It is quite evident that the successful control of engineering works is becoming more and more dependent upon scientific methods, and men who are lacking on the scientific side of their profession will find themselves more and more handicapped in the struggles of their careers.

"So far, there is not probably any very acute difference of opinion. Controversy arises on the question as to whether an examination is of any great value as a test of real knowledge. It may be admitted that too great an importance is frequently, if not generally, attached to the results of examinations, and that it is, after all, the prolonged and consistent study with a view to the academic training of the candidate which is of the greatest consequence. Nevertheless, the examination is, in fact, the only test that is available.

"It is considered that an examination test is imperative in order to secure the minimum of study desirable, but the results of the examination should be subject to a common-sense review by the Examination Committee who would control, not only the appointment of examiners, but even, to some extent, the examination questions set. The committee could take into account the opportunities for study available for the candidates, and have before them the general reports of the tutors under whom the candidates were studying. There are pitfalls in any examination system, but it has become essential that examinations should be required from all the younger candidates in order to secure the desired status of membership of the Institution of Mechanical Engineers. Examinations have been in force in the Institution of Civil Engineers for many years. The Institution of Electrical Engineers have determined to adopt the system, and it is clearly desirable that the Institution of Mechanical Engineers should require for admission an equivalent qualification. From a national point of view, English engineers should not be satisfied with less than has been recognised as necessary for superintending engineers in foreign countries.

"The examination period in an engineer's life should not extend beyond the age at which full membership is possible, but all candidates under that age (at present fixed at thirty years) should be required to pass this test without in any way lessening the importance of thorough practical training in works and drawing office. The present age limit for admission to associate membership is twenty-five years, and a great practical advantage of the examination to the younger men would be that any candidate who had passed satisfactorily through both his practical training and the examination would, if he were engaged in engineering work, be passed for ballot, even though his position did not indicate much independent responsibility. A young man thus admitted as an associate member of the institution would, if the suggestions of the council are realised, be better fitted to obtain a really responsible position than others who could not show such a qualification. It is quite reasonable that those who have not gone through a similar course of study and training, or have shirked the ordeal of examination, should have to wait until they have obtained a recognised position of responsibility before becoming eligible for admission as associate members or members. Candidates at the age of twenty-five, if fully trained in theory and practice, and if doing engineering work, should be eligible for associate membership. If they are graduates it is not asking too much to require them to pass such an examination as has been outlined, or some other equivalent examination, after a recognised course of study in some engineering college or technical institute. There should, however, be an interval of time before the full scheme comes into operation, and it is with this object that it has been suggested that for the first year the age limit for admission without examination should be twenty-eight years the maximum age for graduates to remain in the institution as such. In the second and third years after the examination system had been started it is recommended that the age limit would be twenty-nine and thirty years respectively; and it is suggested that any extension of age limit in the future should be limited by the age at which full membership is allowed by the by-laws.

"The success of the scheme as a whole must depend on mutual confidence and understanding between the council and the members generally, and it is essential for the prosperity of the institution at this critical time in its history that members should have the opportunity of freely expressing their views upon the proposals made."

## NATIONAL HEALTH LEAGUE.

### MEETING AT KINGSTON-UPON-THAMES.

In its issue of Saturday last the *Surrey Comet* reports at length a meeting held at Kingston-upon-Thames to consider a proposal by the National Health League that a special week should be observed in that town with the object of focussing public opinion on matters connected with health, hygiene and sanitation. The gathering in question, at which the mayor, Councillor G. E. J. Street, J.P., presided, forms the subject of the following interesting "leader" in our contemporary:—

"So apt are people to assume nowadays that everything requiring to be done for the public health is already being done by the public authorities, or, if anything else needs to be done, that it is their duty to do it, that the proposal to institute a 'Health Week' by way of strengthening the hands of our public authorities may not at first sight make appeal. But however efficiently public sanitary work is being done, there are few members of our local authorities who would not admit that, provided the public be with them, there are yet other things to which they would gladly turn their hands whereby the public health could be improved. Local authorities cannot progress in advance of public opinion. Nor is it mainly because it may be desirable to win public opinion over to new methods that a 'Health Week' is to be instituted. Everybody knows what remarkable ignorance exists, not merely in one class of society, of the laws of hygiene, and how that if better knowledge could be imparted and further co-operation secured between local authorities and their constituents, very great advantage would ensue to the community. Upon this, which may be called the educative side of the proposed 'Health Week,' the promoters would probably lay as much or more stress as upon any other. To spread knowledge of the laws of hygiene and sanitation, even to create a demand for knowledge, is to lay the axe at the root of the tree of ignorance, and to do lasting good. So much at least will be granted—that the proposal itself is good, provided means of a practical kind can be found of bringing home to the minds of people not already interested in health questions the benefits to themselves and their families and to the community at large which must result by having constant regard to hygienic and sanitary laws.

"With one assertion that was made at the meeting on Wednesday we are not at all in agreement. We are far from believing that from a public health point of view Kingston is pre-eminent. Kingston will compare well enough, no doubt, with most of its neighbours, if not with all; but there is no pre-eminence about Kingston or any other district while houses exist in which there is dirt and squalor, and people live in them who have no hope or care for better conditions. If by any means the attention of such people can be arrested, by the aid of the cinematograph, or by any other methods then the institution of a National Health Week will undoubtedly be justified. Directly or indirectly also the movement must facilitate other work of great importance lying before our health authorities. We refer to the medical treatment of school children shown by inspection to be in need of care and treatment which their parents are unable or unwilling to provide for them. While Sir George Newman, the principal medical office of the Local Government Board, can report that 63 per cent of the children attending the public elementary schools of this country have some sort of disease, there can be no talk of pre-eminence, but there is every need of this new movement, or any influence which will strengthen the hands of the imperial and local authorities in dealing with the gravest of national perils.

"The saving of infant life which has been effected, as shown by the reduction of the national infantile death-rate; the decline of mortality from enteric, which is now but a fifth of what it was thirty or forty years ago; the reduction of the mortality from tuberculosis, still one of the greatest scourges human beings have to fear, these are achievements of which our health authorities may well be proud, though much more yet remains to be done under the same heads, but the problem that presses to-day is how to improve the health of the nation's children, for it may be said with Sir George Newman that 'every step in the direction of making and keeping the children healthy is a step towards diminishing the prevalence and lightening the burden of disease for the adult, and a relatively small rise in the standard of child health may represent a proportionately large gain in the physical health, capacity and energy of the people as a whole.' The meeting at which it was decided to hold a 'Health Week' in Kingston was not a large one, perhaps because the proposal was but little understood, or, maybe, because there are few outside the membership of our local authorities who concern themselves in matters of public hygiene. But if the latter reason be the correct one, no better argument can be found for at least making an attempt to create a stronger local sentiment and interest in such things, for they do really matter both to the individual and to the community."

## SOME RECENT PUBLICATIONS.*

The Public Authorities Protection Act, 1893 (56 and 57 Vict., c. 61), considered in the light of the relevant judicial decisions on similar statutory protections of earlier date, as well as of all the reported English, Scottish and Irish decisions on the Act itself. By John Chartres, of the Middle Temple and South-Eastern Circuit, Barrister-at-Law, some time Powell Prizeman in Common Law. Price 12s. 6d. London: Butterworth & Co.

The principle of the protection of public officials from stale and bogus claims is by no means new. On the contrary (as Mr. Chartres points out), it has been known to the law of England for hundreds of years. Before the passing of the Act of 1893 there were numerous statutes—some public, others local or personal—conferring various privileges (such as —*e.g.*, the right to have notice before the commencement of proceedings) on persons acting in the execution of public duties. The Act of 1893, therefore, was to a certain extent a consolidating Act, though it also brought the statutory law up to date by remedying defects revealed by litigation and abolishing outworn technicalities.

A considerable portion of this volume, therefore, is naturally devoted to the examination of judicial decisions under the repealed statutes—decisions which are by no means obsolete, involving as they do principles still applicable in connection with the present Act. The work comprises seven chapters, the first being introductory, and each of the remainder treating of a sub-division of the subject. Each chapter is prefaced by a series of brief and lucid statements, giving a sort of digest of the conclusions which are discussed at length in the sequel. The text of the Act is set out in an appendix, and there are also a full index and tables of abbreviations, statutes and cases. The work should prove a valuable guide to public authorities and their advisers on this important branch of the law.

The Law relating to Private Street Works under the Act of 1892. By W. Carlyle Croasdell, Barrister-at-Law. Price 8s. 6d. London: Hadden, Best & Co.

The author of this volume possesses a double qualification for dealing with the subject of private street works. In addition to his legal learning, he has had the advantage of becoming acquainted with the practical working of the Act by six years' experience as clerk to one of the most progressive urban district councils. He is therefore peculiarly able to tell where the shoe pinches, and where it is easy. The main body of the work consists of the text of the Act of 1892 at large, with very copious annotations following each section, the text and notes being distinguished by a difference of type. There are two appendices, the first comprising various relevant statutes, or portions of statutes, from the Wales and Berwick Act, 1746 (sec. 3 of which says that "England" in an Act of Parliament includes Wales and Berwick-on-Tweed), to the Port of London Act, 1908; and the second containing various forms and precedents likely to be of practical use in connection with private street works procedure.

The notes, as already stated, are very full, and give the results of many decisions as to various points arising under the Act, important judgments being in some instances set out *in extenso*, and the work appears to be thoroughly up to date. As a guide to the law and practice under the Act of 1892, so far as we have been able to judge, it is likely to be found a complete *vade mecum*.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

# Law Notes.

Edited by J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

*The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries which should be written legibly on foolscap paper, one side only, should be addressed to "The Law Editor," at the office of* The Surveyor, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—*i.e.*, without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

## QUERIES AND REPLIES.

*In order to avoid confusion querists are requested to use distinctive words as* noms de plume. *The letter X, combinations such as X.Y.Z., and words such as* "engineer" *and* "surveyor," *should never be used.*

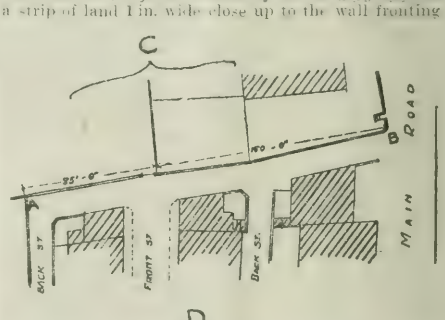
Private Street Works. Width of Street.—"Thames" writes: Some time prior to 1896 an estate was opened up in my district through which a road was roughly made, and from time to time has been allowed to get into an insanitary condition. This road remains a private road, and for the major part of its length forms the back access to houses facing the river Thames. For this length represented on the plan [not reproduced] by the stretch between points marked A and B the road has a permanent fence erected on each side of it, while for its extension from points B to C the fence exists only on one side, and the vacant land on the other side is undeveloped. I have now received instructions to prepare plans for the making up of this entire road from A to C under the provisions of the Private Street Works Act, 1892, and my difficulty is to determine the width of the road from the points B to C, which, as before-mentioned, is undefined, inasmuch as the previously existing road has been worn out, and to an extent is overgrown with grass. The width of the road between fences from point A to B is 36 ft., while, so far as I can trace, the only by-laws that have operated in this district have required that "Every person who shall lay out a new street which shall be intended for use as a carriage road shall so lay out such street that the width thereof shall be 40 ft. at the least." Moreover, I can get no information on the subject from the present owners of the open grass land, while the only evidences of what previously existed are an old gate post which stands at a distance of 26 ft. 4 in. from the opposite fence and a gravel pit, the edge of which is about 38 ft. from the opposite fence. Your opinion is asked upon the following points: (1) Will the proposed making up under the Private Street Works Act notices to the owners constitute the laying out of a new street? (2) If so, would the council be entitled to take so much of the grass land as is necessary to make the road the by-law width of 40 ft.; or (3) Seeing that, so far as can be ascertained, the whole length of road from A to C was planned in the original laying out of the estate, would the council be correct in the presumption that B to C was originally of the width of from A to B, and, acting on that presumption, be within their legal right to make the width from B to C 36 ft., in spite of the by-law requiring the width of 40 ft.? I should mention that the development of that portion of my district beyond the road in question practically depends upon the construction of this road, and my council feel obliged to take steps under the Private Street Works Act owing to the failure of the owners to keep this road in a sanitary or trafficable condition.

(1) No. The laying-out of the road as a new street probably took place at the time of its being roughly made. (2) The council are only entitled to do private street works upon the *street* (*i.e.*, so much of the land as has been laid out and dedicated as a street. (3) I think it is a reasonable presumption that the street was laid out and intended to be dedicated of a uniform width throughout. Even if there was a contravention of any by-law in laying out the street less than 40 ft. wide this would not bind the council to make up that width.

Parish Award. Road Repair. Surveyor's Duties.—"A Reader" writes: (1) The surveyor of the rural district of A borrowed the parish award from the vicar of the parish of B, promising to return it. The rural district council have taken possession of it, and will not allow it to be returned. Can the parish council the district council to return it to them? (2) An inclosed road is mentioned in an award dated 1783 as being a public road. It has recently been repaired without orders from the council. Owing to its bad condition, the users are trespassing on the grass land, and the tenants of this land have asked the district council to repair it. The latter refuse, stating that they did not take it over. Is the district council liable for its repair by reason of its being a public road in 1783, although not having been put in repair or enclosed? (3) Who is liable for the repair of public footpaths (including foot-planks and footbridges) across fields which are mentioned in the award above as being repairable by the owners of the lands through which they run? (4) Is it the duty of a surveyor and inspector of nuisances to a rural district council to prepare plans, &c., for a sewage scheme in one of their parishes?

(1) If the parish award concerns (*a*) parish property not relating to the affairs of the church or held for an ecclesiastical charity, or (*b*) the holding or management of a village green or allotment for recreation or otherwise for the benefit of the inhabitants, in my opinion (having regard to sec. 6, iii., of the Local Government Act, 1894) the parish council are entitled to have it returned to them. (2) Unless otherwise provided in the award, the council are in my opinion liable for the repair of the road. (3) From the statement in the award it would appear that these are repairable *ratione tenuræ*. The occupiers of the lands would be liable in the first instance, but occupiers not being also owners could claim reimbursement from the owners. (4) This depends upon the terms upon which "A Reader" was engaged, and the regulations made by the council as to the duties of the surveyor and inspector of nuisances under sec. 189 of the Public Health Act, 1875.

Private Street Works Act, 1892: "Extra Commercium."—"Finesse" writes: The street A to B is a private one, and my council have resolved to deal with it under the Private Street Works Act, 1892. A difficulty arises as to who should be charged for the frontages of 85 ft. and 150 ft. on the north side of the street A—B. When the land was laid out the owner of the estate D, on the south of the street, failed to make satisfactory terms with the owner of estate C on the north side, and eventually reserved for himself a strip of land 1 in. wide close up to the wall fronting




to the street on the north side with the object of preventing owner C having access to the street. D has sold off his land, and now the three gable ends belong to different owners, but the strip 1 in. wide still belongs to D. Will D be able to plead *extra commercium*, and thus evade his share of the cost? If so, can the owner C be brought in as a frontager? or who, in your opinion, should be charged with the cost? The freehold owned by C does not extend into the street beyond the face of the wall. The point is a fine one, and should be of considerable interest to municipal surveyors.

The only ground on which the owner of the one-inch strip could claim exemption on the "extra commercium" principle would be that the strip is irrevocably stamped by law for some public purpose with an absolute incapacity (removable only by Act of Parliament) to be let at a rack rent. That does not appear to be the case, and therefore (subject to any circumstances not disclosed in the query) in my opinion the owner of the strip is chargeable. (See *Williams* v. *Wandsworth Board of Works*, 13 Q.B.D., 211.)

Private Street Works.—"A. O. H." writes: Two rows of houses in different streets have been erected by a builder, who has sold each of the twenty-nine houses put up to separate purchasers, and has left a plot of land unbuilt upon purposely with a view to deterring the paving of the streets abutting thereon. The length of the plot abutting on the back road is about 150 ft., and on account of the cost of the paving it is not probable that this plot will now be built upon, and, being subject to a yearly ground rent, there is no value in the land. One street has been completed, but the remaining streets are in a very bad condition. The purchasers desire these to be

# The Surveyor

And Municipal and County Engineer.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now completed, and if there were no difficulty, this would be done under sec. 150 of the Public Health Act, 1875. I am aware of the proceedings that may be taken under sec. 257 of that Act, but presuming the builder (who has discontinued building altogether) to have no other property or effects, and that a charge on the vacant land would be of no value, what steps would you suggest should be taken? The council are desirous that the streets should be completed if possible, without incurring any liability in respect thereof.

If the builder has no other property, and the land is of no value, I do not see how the council are to recover the proportion of expenses chargeable against the uncovered plot. The charge on the land given by sec. 257, however, can be enforced at any time within twelve years from the completion of the works (*Thames Iron Board v. Mortarch Investment Building Society*, 25 Q.B.D., 11). Possibly before that time the land may become valuable.

HIGHWAY FLOODING: LIABILITY FOR CLEARING WATERCOURSES AND REMOVING ARTIFICIAL OBSTRUCTIONS.—"A. M." writes: A stream, in time of heavy rains, overflows the district council's highway, in consequence of a riparian owner, a short way down the stream, having constructed a dam for the purpose of laying up the water in time of drought, and also by reason of neglect of the same owner to clean out the stream where it runs through his property. The highway in question crosses the stream, and then for some little distance runs alongside it, but separated from it by a hedge planted and kept up by the council for the safety of the users of the highway. Have the district council any remedy against the owner of the dam, and can they be considered as "proprietors or occupiers of land" in respect of that portion of the highway which runs alongside the stream, so as to give them a remedy under the Land Drainage Act, 1874, sec. 14.

The only land drainage Act of 1874 is the Drainage and Improvement of Lands Amendment Act (Ireland), 1874 (37 and 38 Vict., c. 32) which is not relevant. The rural district council are not "proprietors or occupiers" of a highway merely because it is a highway. The ownership of the soil of the highway remains vested in the person or persons who dedicated it to the public as a highway, or his or their successors in title. If A's acts prevent the public from freely, safely and conveniently passing along the highway so as to constitute a nuisance he is liable to be indicted.

HOUSE DRAINAGE: SCAVENGING. — "Normanton" writes: (1) A street of houses have no drains, an open channel runs at the rear, and all the slops are thrown into the channel. The council lay a sewer, and serve notice on the owner to provide the branch drains, but he refuses, and states that the houses were already drained by the channel, and if the council want anything further they must provide it. I contend that the houses are without proper drains. (2) Scavenging is being adopted for a parish with a large area. One portion of the parish has an area of over 5,000 acres, and there are only sixty-nine houses on the area. Can this portion be left out? I take it the charge will be on the whole parish. Would it be legal to allow each occupier in this area to do his own scavenging, and pay him at the same rate as is paid for the other part of the parish?

(1) If the houses literally have "no drains," the council can compel the owner to make or pay for drains under sec. 23 of the Public Health Act, 1858. If, however, there are drains connecting the houses with the open channel the latter is probably a "sewer," for the state of which the council are responsible. (See *Wilkinson* v. *Llandaff and Dinas Powis R.D.C.*, 1903, 2 Ch., 708. And if such drains are themselves sufficient the section will not apply, and the alteration will have to be made at the expense of the council under sec. 24. (2) Under sec. 42 of the above Act a local authority may undertake removal of house refuse and cleansing of privies, &c., for the whole or any part of their district. This would apparently enable the council to undertake this work for a portion only of a parish. The expenses would be "general expenses" in the absence of an Order of the Local Government Board making them "special expenses." There does not appear to be any power to pay occupiers for doing their own scavenging.

ROAD WIDENING. "Conveyance" writes: Have local authorities any powers to buy land for the purpose of making a new road or widening a road? Can a local authority widen even the carriageway of a dedicated road unless the landowner dedicate a strip of the margin *quâ* carriageway? Under what powers, if any, would a local authority spend money on making a road—added width—on a strip acquired by the Road Board under their powers? The general idea is that local authorities have no powers except to *maintain* roads, and that the Development Act cannot confer such powers upon them by implication.

Under sec. 154 of the Public Health Act, 1875, urban authorities may purchase premises for widening any "street" (*i.e.* any highway, public bridge (not a county bridge) road, lane, footway, square, court, alley or passage, whether a thoroughfare or not). And under sec. 57 of the Towns Improvement Clauses Act, 1847 (incorporated with respect to urban districts by sec. 160 of the Act of 1875) they may agree with owners of lands for the purchase thereof for the purpose of widening any of the streets. By sec. 8 of the Development and Road Improvement Funds Act, 1909, the Road Board, with the approval of the Treasury, may make advances to county councils and other highway authorities in respect of the construction of new roads or the improvement (which includes widening) of existing roads. By sec. 10 (subsec. 1) where the Road Board make an advance to a highway authority in respect of the construction of a new road the Board may authorise the authority to construct the road and any cost beyond the advance is to be defrayed as expenses incurred by the authority in exercise of their powers as highway authority. By sec. 11, subsec. 3, where a highway authority are authorised to construct a new road or have an advance for the improvement of an existing road, they may acquire the necessary land. And by subsec. 5 if they cannot get it by agreement on reasonable terms they may apply to the Development Commissioners for power to purchase compulsorily.

STORAGE OF CARBIDE.—"W. S." writes: In this district we have several persons licensed for the storage of carbide for acetylene lighting. Others are endeavouring to evade having a licence, alleging that they store the carbide on premises belonging to another person, and for which he holds a licence. Can one person hold a store in this way for the use of several other persons?

The Petroleum Acts, 1871 to 1881 (with certain variations), were applied to carbide of calcium by an Order in Council of the 1st April, 1897. Sec. 7 of the Act of 1871 (as varied by the Order) provides that petroleum (and therefore by virtue of the Order carbide of calcium) shall not be kept except in pursuance of a licence given by the local authority. Sec. 9 provides that there may be annexed to the licence such conditions as to the mode of storage, the nature and situation of the premises in which, and the nature of the goods with which, petroleum (say carbide) is to be stored, facilities for testing, mode of carrying, and generally as to safe keeping as may seem expedient to the local authority. If a person is licensed to store carbide on certain premises, and chooses (for payment or otherwise) to allow other persons to store carbide there also, then, so long as the conditions of the licence are observed, I do not think it probable that either he or such other persons would be held to have contravened the Act. The object of the Act in this connection is presumably the prevention of danger arising from the storage of petroleum on premises; and so long as the requisite precautions are observed it would not appear to be material whether the petroleum stored on given premises belongs to one person or to several persons.

CLEANSING CESSPOOLS.—"Max" writes: Where there is no sewer within 100 ft. from a dwelling-house situate within the area of an urban district council, the owner will be obliged to drain in a cesspool under sec. 25 of the Public Health Act, 1875. Can the owner compel the urban district council to empty the cesspool periodically?

Local authorities are not bound to undertake the cleansing of cesspools unless required by order of the Local Government Board. If such an order has been made it can be enforced either by indictment or mandamus (Lumley's "Public Health Acts," 7th Edition, p. 111.).

**We have to draw the attention of queriists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6 in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.**

# Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

## QUESTIONS.

This week answers are invited to the following questions:—

**223. Reinforced Concrete Bridge.**—Design a reinforced concrete bridge to carry a 36-ft. main road over a river (at right angles), single span 60 ft. between abutments, 36 ft. wide, 20 ft. from mean surface of water to the crown of arch. Banks 5 ft. above mean water level; foundations 15 ft. clay, then hard red sandstone. Allow for usual main road traffic, and show calculations. (A. P., *Liverpool.*)

**224. Town Planning.**—What are the chief points to be considered in laying out a new town?

## REPLIES TO QUESTIONS.

**218. Cost of Roads.** What is the cost per square yard complete, of constructing roads in (a) asphalte, (b) wood-block, (c) granite pitching, (d) macadam, (e) cobble-stone, (f) tar-macadam? (Brazilian.)

The cost of roads should be considered from the points of view of construction, maintenance, and scavenging respectively.

The cost of excavation and preparing the road to the correct contour is common to all roads. In country roads the cost of excavation would be a large item, probably, on account of the nature of the ground, and on account of possible deep cuttings and high embankments. A price of 2s. 6d. per yard cube would cover excavation and removing to within ¼ mile in country districts and in ordinary soils. The excavated earth would be tipped to form the embankment required, and for rolling the embankment a price of 1d. per yard super. would be sufficient.

In towns such excavations would probably not be required, the turf being stripped (if on grass land), and the surface formed to a proper contour. A price of 4d. per yard super. would include all this.

| Nature of road. | Excavation. | Construction. | Maintenance. | Scavenging. | Remarks. |
|---|---|---|---|---|---|
| Asphalte ... ... | 2s. 6d. per yard cube in country districts, 4d. per yard super. in towns | 13s. per yard super. | 1s. 6d. per yard super. per year | ½d. per yard super. per year | 1½" asphalte on 6" concrete. |
| Wood block.... .. | ditto | 12s. ditto | 2s. 6d ditto | 5d. ditto | 9" × 3" × 6" creosoted blocks laid in bitumen on 6" Portland cement concrete. |
| Granite-pitching .. | ditto | 14s. ditto | 3s. ditto | 2s. ditto | 6¼" × 3¼" by 5" × 7" long granite setts on 6" Portland cement concrete. |
| Macadam ... ... | ditto | 7s. ditto | 1s. 6d. ditto | 8d. ditto | Granite 9" thick. |
| Cobble-stone ... | — | — | — | — | These roads are not considered good, owing to uneven surface. The joints being very wide afford an opportunity for large collection of slush and filth, and therefore, if they are to be kept even moderately clean, are of great cost in scavenging. |
| Tar-macadam ... | ditto | Initial cost not much in excess of ordinary macadam, say 9s. ditto | 40 to 60 per cent less than macadam | 40 to 60 per cent less than macadam | Two coats; bottom 3½", 2" gauge material; top 1", ¾" gauge material. |

The prices will, of course, vary with the cost of labour and any special local conditions. (G. A. W., *Fulham.*)

**219. Tram Rails.**—Describe an accurate, practical method of measuring the wear of a steel-girder tram rail. (T. R.)

An apparatus (made of steel preferably) which would give accurate results is shown in the sketch which follows (Fig. 1).

The rag bolts, about 1 in. diameter, with their tops level, are put in concrete; the tops must be below (about 1 in. to 2 in.) the surface of the roadway, in order to avoid wear (these holes in the road would be temporarily plugged). These bolts always give a permanent base of constant level on which to place the apparatus.

The bottom of the screw would be made always just to touch the rail, then the wear of the flat part is the difference between the scale readings of the head of screw when the rail is *first* laid and a similar reading on some later date.

**226. Sewage Pumping.**—Show calculations arriving at the diameter of a sewage pumping main sufficiently large to meet the requirements of the Local Government Board for a population of 4,500 upon the partially separate system, the velocity through the main being at the rate of 4 ft. per second, the water supply of the district being at the rate of 16 gallons per head, the population being distributed in 1,000 houses scattered over about 4 miles of roads, the pump well being so situated that an overflow, if allowed by the Local Government Board, could be arranged so as to discharge into a brook near to. ("Student.")

**227. Refuse Disposal.**—Describe, with illustrations, the most efficient and economical form of refuse destructor for a village of 500 inhabitants. (M.Inst.Mun. and C.E., *Secundus.*)

**229. Swimming Bath.** Give sketches showing plan and cross-section of a covered swimming bath, say 70 ft. by 30 ft., with a detail of the roof. What method would you adopt for heating the bath? (M. and C.E.)

The wear in the groove is best measured by means of a template. A template, made of thin sheet iron, would be made when the rail is first laid, and another at the same time as the apparatus is used.

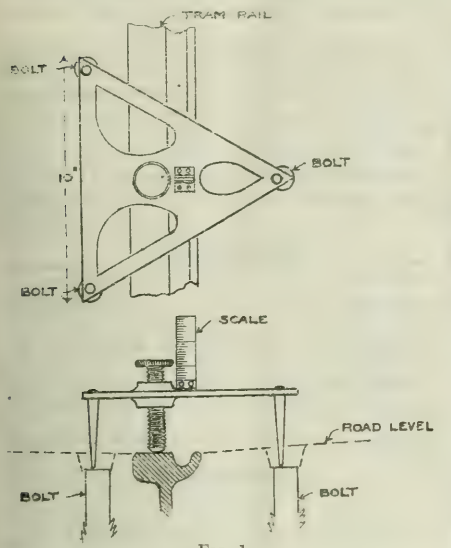


FIG. 1.

To make a template, a stiff piece of wire (copper for choice) would be hammered and made to fit well in the groove; this shape would then be marked

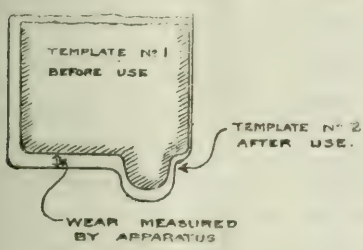


FIG. 2.

off on a piece of sheet iron and cut out. The template thus obtained would be made to fit the rail accurately by means of a little filing.

The two templates would then be compared as shown in Fig. 2, and the wear at any point measured off. (W. E. B., *Southampton.*)

**An Appreciation.** We quote, with gratification, the following extract from a letter, dated December 15th last, from the Metropolitan Sewerage Commission of New York: "Please accept our thanks for a copy of THE SURVEYOR containing a review of the first report of the Metropolitan Sewerage Commission. This excellent article had escaped our notice, although most of the members of the Board read THE SURVEYOR, and take much interest and profit in it."

**Motor-Omnibus Traffic.**—The subject of motor-omnibus traffic was considered this week at a meeting of representatives of metropolitan borough councils at Westminster City Hall, and in the course of the proceedings it was resolved: "That the proprietors of mechanically-propelled vehicles using the main and other roads in the County of London should by means of the petrol tax and other duties levied on each vehicle be brought under contribution for the repair and upkeep of the roads over which they travel in metropolitan boroughs." It was also agreed: "That the borough council should have a veto on the use by mechanically-propelled vehicles of roads which in their opinion were unable or otherwise unsuitable for such traffic." Resolutions suggesting a much reduced speed limit for motor vehicles in crowded and narrow streets and the compulsory provision of proper and efficient mudguards were also adopted.

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Belfast R.D.C.** (January 31st. Mr. A. D. Price).—£1,000 for the extension of the Carnmoney burial ground.—It was stated that it was proposed to acquire over 6 acres of land at a cost of between £700 and £800. Mr. John Mackenzie, of Messrs. Young & Mackenzie, engineers to the council, said the ground would have to be drained, but there was a natural fall in it. In order to avoid the pollution of a neighbouring stream, witness suggested that the council should construct a small tank on the ground and run a pipe from it to Church-road. The pipe would have to be carried 1,900 yds. along Church-road to connect with a sewer. He thought the pipe might be made for £400, and there would be in addition a small distance of way leave and the cost of the tank, but these would not amount to much.—The inspector said it seemed to him the total cost would exceed £1,600.

**Darlington T.C.** (February 2nd. Mr. H. Shelford Bidwell).—This was an inquiry into an application for powers to borrow moneys for the purposes of improvements in the water undertaking of the corporation, and for sanction to the borrowing of £2,000 for works of private street improvement.—The town clerk (Mr. H. G. Steavenson) explained that the corporation's total borrowing powers were £150,000. That application was due to the fact that they had spent all their money, and probably more than they had powers for. In order to comply with the statutory obligation, they were bound to take steps to cope with the gradual increasing demand for water. The average yearly amount handed to the rates from the water undertaking was £5,850. There was a possibility of new works being put down in the district, through which it was intended to take a new main, and the management would not consider an area less than 150 acres for their requirements. In view of these possible further developments and requirements, which had not been before the council when the resolution was passed authorising application for £30,000, the town clerk thought it desirable to alter the sum from £30,000 to £50,000.

**Exeter T.C.** (January 31st. Mr. R. Deane Sweeting). £15,000 for the purpose of enlarging and equipping the sanatorium.—According to a statement made by the town clerk, the city authorities have entered into an arrangement with several neighbouring authorities, including Exmouth, Sidmouth, and Budleigh Salterton, to take their infectious cases and deal with them. The present building, begun in a small way, had been enlarged from time to time to meet the additional requirements, and at the present moment such is the pressure when there is any emergency that the sanitary committee felt that the time had come for enlarging, modernising, and more completely equipping the range of buildings at Whipton, now used to receive infectious cases. This view of the matter was enforced by Dr. Brash (medical officer) and other witnesses, and the surveyor, Mr. T. Moulding, put in plans and particulars of the proposed extension.

**Honiton T.C.** (January 18th. Mr. F. O. Stanford). £800 for new sewerage works.—The town clerk, Mr. E. W. Hellier, said the council proposed to lay down certain storm water sewers, to relay the present sewer under the bed of the river, and to improve the outfall works. At the present time there was a large quantity of river and storm water getting into the sewers, and the scheme was intended to exclude this. Mr. A. Tillotson, borough surveyor, said the sewer in the bed of the river was known to be defective, and admitted large quantities of river water.

**Ilkley (Yorks) U.D.C.** (February 2nd. Mr. A. W. Brightmore).—£2,100 for waterworks purposes. Of the total £1,140 is to be expended on the extension of mains and £960 in the construction of mechanical filters and the substitution of iron pipes for the present earthenware pipes conveying water from the springs to Ghyll Head Reservoir.

**Kinsale R.D.C.** (January 23rd. Mr. P. C. Cowan). £750 to provide a supplementary water supply for Crosshaven.—The clerk, Mr. Murphy, said it was proposed to borrow the money for a period of thirty years. He proceeded to state that Mr. Evans, engineer, had submitted a scheme, but they thought the cost too high. A suggestion that the water should be pumped into tanks was then submitted to Mr. Evans. He reported that the total yield of the existing works was 5,760 gallons for twenty-four hours. The yield of springs

proposed to be raised would be 17,280 gallons for a similar time. Uniting both there would be a total of 23,040 gallons. The probable cost of the work, exclusive of compensation, if any, for water and land, would be £450.

**Newquay U.D.C.** (January 31st. Mr. M. K. North).—£4,250 for the provision of a pavilion and shelter on the sea front, at the corner of Beach-road.—The clerk, Mr. Fraser Nicholls, for the council, stated that the local authority were convinced that Newquay needed such a pavilion as it was proposed to erect. The town had no public hall of its own. Every season there was a large influx of visitors, Newquay being a health resort that was growing in popularity.

**Plymouth T.C.** (February 1st. Mr. M. K. North).—£1,600 for purposes of the museum and art gallery.—The town clerk applied for thirty years for repayment of the loan, stating that was the period granted for the building. The present application referred merely to its completion, with certain things necessary to bring the art gallery into full use.

**Pontefract T.C.** (February 6th. Major J. Stewart).—£700 for the erection of additional stables in connection with the scavenging depot, and for £380 for a public mortuary and post-mortem examination room.—In regard to the second application the inspector said the plans were on most up-to-date lines.

**Poole T.C** (January 16th. Mr. F. O. Stanford).—£907 for works of private streets improvement in Gordon-road, Branksome.—In reference to the work it was stated that the only objections had been in regard to the apportionment of the cost, and these had been heard and disposed of by the Justices.—The borough surveyor, Mr. S. J. Newman, gave details of the work to be carried out.

**Runcorn U.D.C.** (February 2nd. Mr. F. H. Tulloch). £8,000 for sanitary works in the town, and £2,000 for water main extensions.—Considerable opposition was forthcoming to the first part of the application from property owners. The authority proposed to serve notices on the owners of a large number of houses, compelling them to convert the existing ashpit-privies to the water-carriage system. If the notices were not complied with the council would do the work and bear half the cost. There were 2,600 ashpit-privies in the town.—Mr. Richard Collinge, a property owner, speaking for himself and others, urged that the cost of the conversions was excessive.—The inspector said that property owners who did the work themselves and paid the whole cost need not confine themselves absolutely to the specifications, but were bound to do the work to the satisfaction of the council.—There was no opposition to the application for a loan for water purposes.

**Rugby U.D.C.** (January 31st. Mr. R. H. Bicknell).—£750 for additional slipper baths and a superintendent's house at the public baths in Moat-street. Mr. Arthur Morson, clerk to the council, said that immediately after the opening of the public baths in 1910 it was found that the seven slipper baths provided were not sufficient to meet the demand, and the need for more had become permanent.—No opposition was raised to the proposal, and the inquiry was closed.

**Surbiton U.D.C.** (February 1st. Mr. Edgar Dudley).—£14,700 for the purchase of the Alexandra recreation ground and allotments at Tolworth.—Mr. Frank Bell, deputy consulting solicitor, stated that the purchase price of the land was about £300 per acre, and £2,200 had been earmarked to meet the cost of laying out the recreation ground. Evidence was given by Mr. H. T. Mather, the surveyor, with respect to the proposed works, and testimony with respect to the value of the land was offered by Mr. T. R. Terry, of the firm of Messrs. Dawson, Son, & Terry. Some opposition came from allotment owners, who objected to their plots being removed.

### APPLICATIONS FOR LOANS.

**Birmingham T.C.**—£32,809 for tramway extensions.

**Bognor U.D.C.**—£538 for paving works.

**Braintree R.D.C.**—£390 for the erection of two workmen's dwellings.

**Chelmsford T.C.**—£200 for the enlargement of the fire station.

**Crediton U.D.C.**—£16,300 for sewage disposal works.

**Eastbourne T.C.**—£5,800 for a new sewer, £925 for a motor fire-engine, £4,097 for a public school at Hampden Park, and £166 for furnishing and fitting the same.

**Lancashire C.C.**—£7,985 for a new school at Tyldesley, £6,351 for a school at Waterloo, and £270 for the purchase of additional land for Prescot council school.

**Leicester T.C.**—£3,580 further loan in connection with the extension of the town hall.

**Lowestoft T.C.**—£10,000 for paving with Jarrah wood blocks.

**Maidenhead T.C.** £300 for alterations to the town hall.

**North Riding C.C.**—£15,300 for main road improvements.

**Penge U.D.C.**—£519 for street improvement purposes.

**Southgate U.D.C.**—£6,742 for the provision of workmen's dwellings.

**Stone R.D.C.**—£1,100 for a sewerage scheme.

**Todmorden T.C.**—£5,603 for paving works.

**Wolstanton (Staffs) U.D.C.**—£7,650 for a school at the Watlands.

### LOANS SANCTIONED.

**Hastings T.C.**—£220 for the erection of ornamental shelter seat.

**Hawarden R.D.C.**—£2,436 for the Aston and Queen's Ferry sewerage scheme.

**Maidenhead T.C.**—£3,127 for road improvement purposes.

**Penmaenmawr U.D.C.**—£195 for the extension of electric lighting, and £690 for laying out a recreation ground.

**Wilts C.C.**—£1,200 for a police-station at Wootton Bassett.

### FORTHCOMING INQUIRIES.

FEBRUARY.

| | | £ |
|---|---|---|
| 12.— | **Chesham.** For street improvement purposes (Mr. R. H. Bicknell)... ... ... | 175 |
| 13.— | **Acton.** For the purposes of tar-paving and new public offices (Mr. Edward Leonard) | 2,517 |
| 13.— | **Cannock** For the purposes of council offices (Mr. F. H. Tulloch) ... ... | 1,300 |
| 13.— | **Clare.** For water supply purposes (Mr. A. W. Brightmore) ... ... ... ... | 200 |
| 13.— | **Durham.** For sewage disposal purposes (Mr. R. G. Hetherington) ... ... ... | 3,600 |
| 13.— | **Rochdale.** For electricity extensions (Mr. T. C. Elkin) ... .. ... ... ... | 8,700 |
| 13.— | **Torquay.** For the provision of conveniences and a shelter (Mr. P. M. Crosthwaite) | 770 |
| 14.— | **Birtley.** For the provision of a recreation ground (Mr. M. K. North) ... ... | 2,550 |
| 14. | **Marlborough.** For paving works (Mr. Courtenay Clifton) ... ... ... ... | 1,500 |
| 14. | **Otley.** For sewage disposal purposes (Mr. R. G. Hetherington) ... ... ... | — |
| 14.— | **Radcliffe.** For electricity purposes (Mr. T. C. Elkin) ... ... ... ... ... | 17,550 |
| 14. | **Tamworth.** For sewage disposal purposes (Mr. A. G. Drury) ... ... ... ... | 2,550 |
| 14. | **Turton.** For street improvement purposes (Mr. F. H. Tulloch) ... ... ... | 1,404 |
| 15. | **Blaydon.** For street improvement purposes (Mr. M. K. North) ... ... ... ... | 1,270 |
| 15.— | **Crediton** For the purposes of the waterworks (Mr. P. M. Crosthwaite) ... ... | 480 |
| 15. | **Lancaster.** For the purposes of a new street (Mr. F. H. Tulloch) ... ... | 1,200 |
| 15.— | **Sheffield.** For electricity extensions (Mr. T. C. Elkin) ... ... ... ... ... | 61,099 |
| 16. | **Bournemouth.** For depot purposes and the provision of an underground convenience (Mr. Courtenay Clifton) ... ... ... | 1,590 |
| 16. | **Jarrow.** For the provision of public conveniences and firemen's dwellings (Mr. M. K. North) ... ... ... ... | 830 |
| 17. | **Wallasey.** For the provision of a recreation ground and street purposes (Mr. F. H. Tulloch) .. ... ... ... ... | 4,569 |

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**Ferro-Concrete Bridge for Swansea.**—The borough surveyor of Swansea, Mr. G. Bell, has submitted a design for a reinforced-concrete bridge from Victoria Park across the Mumbles-road and the railway to the sands. The structure would have a span of 110 ft. and a width of 20 ft.

# Municipal Work in Progress and Projected.

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The following are among the more important projected works of which particulars appear below: Buildings—Birkenhead £8,400, Birmingham £3,000, Lancashire, Worksop; housing and town planning—Annfield Plain £15,540, Bognor £7,200, Cuckfield £4,422; roads and materials—Conway £7,890, East Sussex, Lowestoft £10,000; sewerage and sewage disposal—Brixworth, Uckfield £12,200; water, gas and electricity—Coleford, Diss, Doncaster, Scunthorpe; miscellaneous—Birmingham, Doncaster.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

## ADMINISTRATION.

**Larne U.D.C.**—It has been decided to increase the weekly wages of the roadmen from 16s. to 17s.

**York T.C.**—In reference to the duties in future of the city surveyor, Mr. F. W. Spurr, in architectural and other matters in connection with the Education Committee, a joint committee which was requested to consider the matter have submitted a report recommending that in the event of any work of an architectural or other character in connection with the Education Committee, it should not devolve upon the city surveyor, and that the committee should make their own arrangements in connection therewith. It was understood that the city surveyor should complete the work in connection with the alterations to the White Cross Lodge, and any other works which he had in hand for the Education Committee.

## BUILDINGS.

**Birkenhead T.C.**—A proposal has been made to erect public baths, at an estimated cost of £8,400.

**Birmingham T.C.**—Alterations are to be carried out at the council house with a view to providing a drawing office for the joint use of the staffs of the city surveyor (Mr. H. E. Stilgoe) and the public works and other departments of the corporation. The estimated cost of the work is £3,000.

**Lancashire C.C.**—The council have confirmed their previous resolution to promote a Bill in Parliament to provide for the erection of a new and wider bridge over the river Ribble at the foot of Fishergate-hill, Preston—the link between the townships of Preston and Penwortham. The old bridge, repairable by a toll, has been out of date for a generation, and checks tramway extension.

**West Sussex C.C.**—The county surveyor, Mr. H. W. Bowen, has submitted a plan and estimate amounting to £350 for alterations and additions to the toll house at Norfolk Bridge, for which tenders are to be obtained.

**Worksop U.D.C.**—The question of providing a more commodious town hall has been referred to the General Purposes Committee.

## HOUSING AND TOWN PLANNING.

**Annfield Plain (Durham) U.D.C.**—It has been agreed to erect sixty houses, under the provisions of the Housing of the Working Classes Act. The total outlay will be £15,540, with an estimated annual income of £982 16s.

**Blackburn T.C.**—A general scheme on broad lines for the improvement of the town is being prepared, with the object, in the words of the mayor, of "converting Blackburn, with its present ugly, ill-shaped streets, into a very handsome town, which they hoped would some day become a city, and the centre of the commercial prosperity of this part of Lancashire.

**Bognor U.D.C.**—After consultation with the officials of the Local Government Board, revised plans have been approved to admit of the erection of thirteen cottages instead of twelve, and capable of being let at 5s. 3d. per week instead of 6s. The scheme is estimated to cost £2,600. Application is also to be made to the board for sanction to the erection of forty-eight additional cottages at a rent not exceeding 4s. 6d. per week, and for sanction to borrow £7,200 for the cost of the erection.

**Cuckfield U.D.C.** A proposal has been made for a housing scheme in London-lane, estimated to cost £4,422. The Works Committee are giving the matter consideration.

**Hanwell U.D.C.** Authority has been received from the Local Government Board for the preparation of a town planning scheme.

**Loughborough T.C.**—A resolution has been adopted affirming that the Housing and Town Planning Act should be amended so as to give a right of appeal against a closing order under the Act to a court of law instead of to a Government department.

**Lurgan U.D.C.**—Mr. James Hunter, of Lisburn, has been appointed architect for the erection of the fifty-eight houses under the improvement scheme, his plans having been adjudged by the assessor to be the first in merit of those submitted.

## PARKS AND OPEN SPACES.

**Billinge (Lancs) U.D.C.**—Steps are being taken to secure a plot of land for a recreation ground.

**Edinburgh T.C.**—A sub-committee of the Parks Committee have approved a plan prepared by Mr. M'Hattie, the city gardener, showing the improvements proposed to be made in the East Princes-street Gardens. The proposal is to provide two additional entrances into the gardens, making four entrances in all to the gardens from Princes-street. It is proposed to make a promenade at the edge of the gardens at the pavement side. The plan also shows how the upper part of the gardens could be left open to Princes-street.

**Glasgow T.C.**—The corporation have accepted the offer of a plot of ground extending to 470 yds. at the corner of Oak-street and Lancefield-street as an open space and children's playground.

**Hexham U.D.C.**—Alderman Benson, of Allerwash, has presented to the council a pair of gates to form the entrance to the Abbey Grounds. The gates are of handsome design, and the approximate cost is £500.

## REFUSE COLLECTION AND DISPOSAL.

**Westhampnett (Sussex) R.D.C.**—The Sanitary Committee have been authorised to take the necessary steps for the removal and disposal of house refuse at Selsey by contract.

## ROADS AND MATERIALS.

**Bognor U.D.C.** It has been decided to make up with artificial stone the footpath on the Chichester-road from Sheepwash-lane to the Big Tree, at an estimated cost of £538.

**Chailey (Sussex) R.D.C.**—The clerk at the meeting last week read a number of letters from various district councils, rural and urban, with regard to the resolution passed at the last meeting of the Chailey Rural Council, and forwarded to them upon the question of the Road Board devoting half of their proposed grant of £5,000 to the East Sussex County Council to the improvement of roads in the rural and urban districts, and half to the county roads. Those who supported the resolution were: Steyning Rural Council, Newhaven Rural Council, East Grinstead Urban Council, Eastbourne Rural Council, Seaford Urban Council, Portslade Urban Council, and Haywards Heath Urban Council. The Road Board wrote stating that they had before them now a definite proposal by the East Sussex County Council to spend a total of £13,000 upon improving the main roads provided that the board would contribute the sum of £5,000. They therefore pointed out that if the Chailey Council considered their application of greater public importance than the county council scheme they should make application to the board, enclosing specifications and estimates. The board stated that they were governed entirely by their view of the relative public importance of the works proposed. They also asked whether the Chailey Council wished the county council to main the roads in question, and with what result. In view of the Road Board's letter the matter was referred to the Highway Committee for further consideration, and a report will be presented at the next meeting.

**Conway R.D.C.**—It has been decided to submit to the Road Board a scheme for a new road between Colwyn Bay and Llandudno, at an estimated cost of £7,890. The Llandudno Council have already approved the scheme.

**East Sussex C.C.**—The sub-committee dealing with the matter recommend that, subject to the discretion of the county surveyor, Mr. F. J. Wood, no portion

of any hill should be tar-treated where the gradient is 1 in 20 or steeper, and that eight tarring machines should be purchased, at an estimated cost of £932. The Road Board were asked to contribute £5,000 towards the expenditure of the proposed £13,711, and replied that they could grant £2,500 towards a scheme of road-tarring amounting to £10,500, and suggested that the various highway authorities should submit to them schemes for the improvement of roads in their respective areas. Consequently, the county surveyor submitted an amended proposal for tarring 1,660,949 sup. yds., at an estimated cost of £10,380. This the Roads and Bridges Committee have recommended for adoption, together with a scheme for road strengthening, at an estimated cost of £3,820, provided the Road Board make a substantial contribution to the cost.

**Fulham B.C.** The plans of the borough surveyor, Mr. Francis Wood, for the proposed improvement in Fulham-road, have been submitted to the Improvement Committee of the London County Council.

**Lowestoft T.C.**—The road surface between the tramway track, which is in a very bad condition, is to be relaid with Jarrah wood blocks, at an estimated cost of £10,000.

**Middlesex C.C.**—The council have accepted the tender of Messrs. E. Catchpole & Sons, Ploughbridge, Rotherhithe, London, for the supply of their distilled coal tar for treating the county roads during the forthcoming summer. This is the third year in succession that Messrs. Catchpole's material has been used by this authority.

**Nottingham T.C.**—The council on Monday last adopted a scheme for the improvement and widening of Loughborough-road from 48 ft. to 56 ft. and raising it above flood level.

**Todmorden T.C.**—The surveyor, Mr. J. A. Heap, has received instructions to prepare plans and estimates for paving works at Dorlale.

## SEWERAGE AND SEWAGE DISPOSAL.

**Brixworth (Northants) R.D.C.**—The surveyor, Mr. A. Lewis, has been instructed to prepare a rough estimate of a sewage scheme for Thornby.

**Droxford R.D.C.** A scheme of sewage disposal for Bishop's Waltham and Newtown, based on the bacterial system has been submitted to the Local Government Board. The total estimated cost is under £900.

**Grangemouth T.C.**—Messrs. J. and A. Leslie and Reid, of Edinburgh, have been appointed to carry out the drainage scheme.

**Hanwell U.D.C.**—The surveyor, Mr. S. W. Barnes, has produced a plan for a public convenience in the Broadway.

**Hornsey T.C.**—The Works Committee have had before them a report of the borough engineer and surveyor, Mr. E. J. Lovegrove, outlining a scheme for lifting the sewage directly into the outfall sewer, which will, after further consideration, be reported on to the council after the next meeting of the committee.

**Orrell (Lancs) U.D.C.**—Consequent upon a recommendation by the Local Government Board that the council should take every opportunity of securing the conversion of the existing privies to the water-carriage system, wherever sufficient sewers and water supply are available, instructions have been given for the preparation of a report on the water supply and sewers.

**Uckfield (Sussex) U.D.C.**—The plans and estimates of the proposed sewage disposal works, as prepared by Mr. W. H. Overton, have been approved, and application is to be made to the Local Government Board for sanction to borrow a sum not exceeding £12,200, repayable in thirty-five years.

## WATER, GAS, AND ELECTRICITY.

**Cheltenam T.C.**—The tender of Mr. T. J. Mason, of Stourbridge, at £1,785, has been accepted for the construction of a concrete filter tank and filter-house at the pumping station.

**Coleford (Glos.) U.D.C.**—Mr. W. H. Radford, engineer, of Nottingham, has been instructed to prepare alternative water schemes at Brow Ash and Staunton.

**Diss U.D.C.** The council are proceeding with the preliminaries of the public water supply scheme. The meetings for threshing out the details have been in committee, and it is understood that the scheme of Mr. W. H. Booth, the engineer appointed by the council, is about to be carried out. Instead of one big contract, tenders have been accepted from about half a dozen firms for various portions of the work, including water tower, tank, mains, driving power, pumps, softening plant, &c. The contracts have not yet been actually signed, but the contractors have practically agreed to carry out the work, and one firm, that of Messrs. Higgs, of Herne Hill, have already commenced operations in the construction of the water tower, which will be 45 ft. in height.

**Doncaster T.C.**—The Gas Committee's recommendation that additional washing and scrubbing plant, purifiers, holder storage, and probable extension of mains in connection with the gas undertaking be provided for, at an estimated cost of £33,000, to cover a period of the next three years, has been adopted.

**Navan U.D.C.**—The council have approved a report by Messrs. Hinde & Cheeke, engineers, of Dublin, advising the installation of a suction-gas plant, the overhauling of the present engine and pumps, and repairs to the mill buildings, estimated to cost in the aggregate £973.

**Scunthorpe (Lincs) U.D.C.**—The council have deposited a Bill for next session. According to the preamble the council's waterworks have not yielded so large a quantity of water as was anticipated. The Bill, therefore, proposes to authorise the council to sink a well and erect a pumping station at Roxby-cum-Risby, and to connect these works with the existing main of the council. The estimated cost of these works is put down at £6,548, and to meet this expenditure power is sought to borrow £7,000, in addition to the sum required to pass the Bill through Parliament.

**Ticehurst (Sussex) R.D.C.**—Alternative schemes of water supply for Trant, costing respectively £1,870 and £4,650, have been referred to the parish meeting for consideration.

**Totnes R.D.C.**—The sanitary inspector, Mr. Pearce, has prepared plans of the proposed reservoir, and an estimate of the cost of building, fixing standpipes, &c., the amount being between £400 and £500.

## MISCELLANEOUS.

**Birmingham T.C.**—The Tramways Committee have received authority to construct the tramways authorised by the Handsworth Urban District Council Act, 1911, at an estimated cost of £32,809. It has also been agreed to reconstruct the tramways in Wheeler-street and Great Hampton-row with overhead equipment, at an estimated cost of £12,822; to make certain additional loops and to lengthen certain existing loops or passing places on the Pershore-road tramways, at an estimated cost of £5,900; and to provide ninety additional tramcars, at an estimated cost of £72,000, to meet the necessities of the heavy early morning traffic. By a majority of 14 the council on Tuesday rejected the proposal to purchase German tram rails at a cost of £11,460, and resolved instead in favour of the purchase of rails made in Leeds at the price of £13,155.

**Blackpool T.C.**—A report has been submitted by the borough surveyor, Mr. J. S. Brodie, in the matter of the problem of the unemployed. Every one of the 187 applicants recommended to him by the committee for employment has had an opportunity of obtaining work, due notice of this fact being sent to each. Only 110, however, have actually presented themselves as candidates for work, and of these ninety-six have kept the work offered, the other fourteen relinquishing the work for various reasons. The surveyor states that no man who has been sent to him in this way has been refused work or discharged. The total wages paid to these "unemployed" up to last week since the beginning of the winter, amounts to £231, the work having been chiefly found at the Gynn, the new Central-drive Recreation Ground, spare land in Waterloo-road, and the tramway track relaying works.

**Coleraine (Co. Londonderry) U.D.C.**—The town surveyor has prepared a plan and estimate (£200) for a proposed new bathing pond on the riverside.

**Doncaster T.C.**—The council have adopted a recommendation of the Electricity and Tramways Committee that the Balby line of tramways be extended to Warmsworth, and that the necessary steps be taken to obtain powers to make the extension, and also to borrow the sum of £14,000 for the purpose when the application for permission to make the proposed extension of the tramways to Brodsworth is proceeded with.

**Hastings T.C.**—Mr. W. Carless, solicitor of the Hastings Harbour Commissioners, has written to the council stating that an offer had been received by the commissioners from the British Construction Company to complete the harbour for £225,000. He asked the council to push the matter forward, as the contractors required an answer within three months. He enclosed a communication from the Construction Company agreeing to complete the work in two years, and a letter from the chairman of the commissioners (Mr. W. J. Larcombe) setting forth the advantages to the town which would accrue from the completion of the harbour. The question has been referred to the Law and Parliamentary Committee.

**Nottingham T.C.**—Replying to a question at the council meeting on Monday last, the chairman of the Tramways Committee stated that the development of the trackless trolley had been very carefully watched, and so far as he was concerned personally, although the committee had not discussed it, he was of opinion that in several parts of the city the system might be used with advantage.

**Poole T.C.**—A special report of the Sanitary Committee has been adopted providing for (*a*) an improved scheme for a more thorough and efficient sanitary inspection of the borough; (*b*) The division of the borough into districts with an inspector in each district under a chief inspector; (*c*) the appointment of at least one additional inspector; and the provision of a steam disinfector.

**Wandsworth B.C.**—A communication has been received from the London County Council's Highways Committee stating that careful consideration is being given to the question of the construction of tramways between High-street, Wandsworth, and the East-hill terminus. The Highways Committee of the borough council recommended that the London County Council should be pressed to take the necessary steps with a view of the work being proceeded with at an early date.

## PERSONAL.

Mr. S. S. Haywood, surveyor to the Brighouse Corporation, has been voted an increased salary of £25 per annum.

Mr. Ernest Jenkins, surveyor to the Penybont Rural District Council has had his salary increased by £80 per annum.

Mr. L. J. Wood has been appointed surveying assistant in the surveyor's department of the Broadstairs Urban District Council.

Mr. Marconi will preside at the annual dinner of the Junior Institution of Engineers at the Hotel Cecil on Saturday, the 17th inst.

Mr. J. K. Grant, a member of the Bromley borough engineer's staff, has been appointed general engineering assistant at Birkenhead.

Mr. Henry Peake, of the borough engineer's office, Leamington Spa, has been admitted as a student of the Institution of Civil Engineers.

Mr. E. Graham, of Jarrow, has been appointed assistant surveyor and draughtsman to the Chester-le-Street (Durham) Rural District Council.

Mr. G. Packer, of York, has been appointed district surveyor under the West Riding County Council for the central division of the county, at a salary of £150, rising to £180.

Mr. J. S. Parrott, surveyor to the Downham (Norfolk) Rural District Council, has been voted £20 for special services in connection with the new roads recently taken over by the council.

Mr. Roland Fletcher, ASSOC.M.INST.C.E., assistant engineer and surveyor to the Cannock Rural District Council, has been appointed assistant county road surveyor under the Worcestershire County Council.

Mr. Ebenezer Howard, the founder of the town planning movement, is to be entertained at a complimentary dinner at the Holborn Restaurant on March 19th, when Lord Grey has consented to preside.

Mr. John Brown, F.R.S., of Dunmurry, co. Antrim, whose death, at the age of sixty, was recorded in our columns a short time ago, has left property valued at £28,186. He was the author of many scientific works, and was the inventor of the viagraph.

Mr. William W. Kelso, chief sanitary inspector, Paisley, delivered a lecture last week before the Edinburgh Sanitary Society on "Sanitary Conditions in relation to Consumption." He stated that an investigation made in Paisley a few years ago showed that one and two apartment houses constituted 72 per cent of the total houses in the town, and that 80 per cent of the deaths from consumption took place in them.

Mr. Thomas Shelmerdine has just completed his fortieth year of service as city surveyor of Liverpool. He succeeded the late Mr. E. R. Robson, who went to London. Mr. Shelmerdine had served his articles with the late Mr. Walter Scott, who was one of the valuers engaged by the corporation in most of their compensation cases. Subsequently he entered his father's office, where he gained a wide experience of the management of large properties.

**Garden Cities and Town Planning.**—A suggestion has been made that a national congress should be called at Cardiff for the promotion of town planning and garden city development.

**Funeral Tramcars.**—The funeral tramway-car with which experiments were made recently, was in use for the first time last week at Vincennes. There are five compartments in the vehicles—the first for the coffin, the second for the wreaths, the third for the clergymen, the fourth for the family, and the fifth for the other mourners. In the ordinary way the journey from Vincennes to the cemetery takes about an hour and a-half. The tramway-car-hearse shortens that time to twenty minutes.

**Abstraction of Moisture from Sludge.**—"N" writes: I am desirous of obtaining particulars of the "Schaefer-ter-Meer" machine, a sort of centrifugal machine for abstracting the moisture from sewage sludge in lieu of pressing? I find it referred to in a paper by Mr. Langden Pearse—"The Sewage Disposal Problem in the United States and Abroad" *Journal* of the Western Society of Engineers (Vol. xvi., No. 7, page 578, September 11, 1911). Possibly some of your readers may know of the machine?


## FOR OTHER ADVERTISEMENTS

See End of Paper.

CITY OF BATH.

SEWERAGE AND SEWAGE DISPOSAL.

The Bath Corporation are prepared to receive Tenders from competent Contractors for the laying of about 5 miles of 30-in. Cast-iron Pipe Sewage Pumping Main between Bath and Saltford, together with other Pipe Sewers, Manholes, and appurtenant Works.

Plans may be seen, and Quantities obtained, at the Office of the Engineer, Mr. W. H. Radford, C.E., Albion Chambers, King-street, Nottingham, on deposit of Three Guineas, which sum will be returned on receipt of a *bonâ-fide* Tender and the return of the Quantities.

Plans will also be on view at the City Surveyor's Office, Guildhall, Bath, on and after the 15th instant.

The lowest or any Tender will not necessarily be accepted.

Sealed and endorsed Tenders to be sent in to the undersigned on or before the 28th February, 1912.

FREDK. D. WARDLE,
Town Clerk.

Guildhall,
Bath.
February 7, 1912.

COUNTY OF SOUTHAMPTON.

MAIN ROADS.

Applications are invited from Competent Men for the post of Road Foreman in the North-West Division of the County.

Only those need apply who have thorough, practical experience of modern methods of road making and the management of workmen.

Wages to commence at 30s. per week, rising to £2, to include the provision and upkeep of a bicycle.

Applications, in candidates' handwriting, stating age, experience, and enclosing copies of two recent testimonials (which will not be returned), are to be delivered to the undersigned, on or before 19th February, 1912.

W. J. TAYLOR,
County Surveyor.

The Castle, Winchester.
February 7, 1912.

## BOROUGH OF NELSON.

*PUBLIC BATHS.*

TO CONTRACTORS.

The Water and Baths Committee invite Tenders for the Erection of Public Baths at Bradley.

Plans and Specifications may be seen, and Bills of Quantities and Forms of Tender for the

(1) Excavator, Mason and Bricklayer's Work,
(2) Carpenter and Joiner's Work,
(3) Plumber and Glazier's Work (including Patent Glazing),
(4) Plasterer and Tiler's Work,
(5) Painter's Work,
(6) Slater's Work,
(7) Reinforced Concrete,
(8) Heating,
(9) Ironfounder's Work

obtained, on payment of a deposit of £1 1s., at the Office of Mr. W. Shackleton, A.M.INST.C.E., Borough Engineer and Surveyor, Town Hall, Nelson. The amount of the deposit will be returned only after the receipt of a *bonâ-fide* Tender.

Tenders, endorsed "Baths —— Work," must be sent to me on or before Saturday, 2nd March, 1912.

The lowest or any Tender will not necessarily be accepted.

J. H. BALDWICK,
Town Clerk.

Town Hall, Nelson.
February 7, 1912.

## BOROUGH OF NELSON.

ANNUAL CONTRACTS.

The Plans and Buildings Committee invite Tenders for the Supply and delivery of the following Materials for the year ending 31st March, 1913:—

1. Granite Macadam.
2. Limestone Macadam.
3. Limestone Paving Chippings.
4. Barns Flags.
5. Yorkshire Flags.
6. Grit Setts.
7. Straight and Circular Kerb, rough and dressed.
8. Portland Cement.
9. Pitch and Creosote Oil.
10. Paraffin and Engine Oils.

Specifications and Forms of Tender may be obtained on application at the Office of Mr. W. Shackleton, A.M.INST.C.E., Borough Engineer and Surveyor, Nelson.

Tenders, endorsed "Tender for ——," must be sent to me on or before Saturday, 16th March, 1912.

The lowest or any Tender will not necessarily be accepted.

J. H. BALDWICK,
Town Clerk.

Town Hall, Nelson.
February 7, 1912.

## URMSTON URBAN DISTRICT COUNCIL.

Wanted Youth to assist in Office of Surveyor and Sanitary Inspector. Age 18-20. State wages required and experience. Applications, addressed to the undersigned, to be received not later than noon on the 12th instant.

T. J. ROWLAND,
Clerk to the Council.

Council Offices, Urmston.
February 7, 1912.

## BOROUGH OF WIMBLEDON.

The Corporation of Wimbledon invite Tenders for the Surfacing of a portion of High-street, Wimbledon, with a material which has stood traffic in a similar position.

Plans and Specifications can be obtained on application to the Borough Surveyor, Town Hall, Wimbledon.

Tenders to be addressed to the Chairman of the Highways and Sewerage Committee, and delivered at the Town Hall, Wimbledon, not later than noon on Monday, the 19th inst.

The Corporation does not bind itself to accept the lowest or any Tender.

A. STEELE SHELDON,
Town Clerk.

February 9, 1912.

## THE EFFECT OF FROST UPON ROAD SURFACES.

### ROADS IMPROVEMENT ASSOCIATION'S INVESTIGATIONS.

The Roads Improvement Association has taken the opportunity afforded by the frosty weather to make a special inspection of London road surfaces, constructed on modern methods, and with tar or bituminous binding, in order to ascertain the effect of the frost upon them.

One of the association's experts and an assistant travelled over a large number of roads in the metropolitan area on three or four mornings last week to examine the surfaces and to ascertain:—

(1) How much slipperiness was caused by the hoar frost.

(2) What methods were adopted by the authorities to diminish the danger of any slipperiness by gritting, &c.

(3) How far the understanding arrived at between the association and the representatives of the authorities at the conferences held last year—*viz.*, that, *inter alia*, smaller material should be used for gritting purposes—had received attention.

We append the official report of the association with regard to their investigations:—

"On the morning of the special inspection there was a white frost, and consequently a heavy deposit all over the metropolitan area of hoar frost on ground surfaces. The whole of the wood-paved streets were more or less coated with hoar frost, the smooth wood pavements having the lesser deposit, and the older and rough ones the greater. With few exceptions these wood pavements had been gritted with the larger sizes of crushed flints, but they were nevertheless slippery and dangerous. The few horses that were about slipped between the pieces of flint gritting, which were of little or no value for preventing this.

"The ordinary macadam certainly did not have so much deposit as the wood pavement, and wherever surface tarring had been carried out the macadam roads that had been so treated had the least deposit, and such deposit as did exist was confined to rough places where the tarring had broken through, or where it had been carried out on old roads which had an uneven surface. In no case could it be found that any of the new roads—*i.e.*, those at Fulham, or elsewhere, where deep bituminous or tar treatment had been tried—presented any slipperiness due to hoar frost; there was very little hoar frost on those roads, except where the streets were unscavenged, and there was roughness, such as horse manure, paper, straw, &c., each piece of which was the centre of white frost. These remarks apply also to the ordinary asphalte roads, which were equally free from deposit, and were not slippery, although they had not been gritted.

"No attempt had been made to grit any of the newly-surfaced roads, the tarred roads, or the asphalte roads.

"As the result of these inspections, the association's expert has drawn up the following list of materials composing road surfaces, arranged in order of non-slipperiness:—

First and best, asphalte and experimental roads deep treated with tar or bitumen.
Second, smooth untarred roads—*i.e.*, those that have been tarred on an existing smooth macadam surface.
Third, smooth untarred macadam roads.
Fourth, rougher and uneven untarred macadam roads.
Fifth, new, and consequently smooth and even, wood pavement.
Sixth and worst, old and uneven wood pavement.

"In regard to the question of gritting, the association's expert reports that there was very little trace of improved methods and material. The old method of scattering a very small supply of large material—*viz.*, ½-in., ¾-in., and upwards—over the surface of the wood blocks had been largely adhered to. The effect was that these large particles had already been moved by the traffic from high points, where the hoar frost was at its maximum, and lay in the channels where there was no hoar frost, and where the gritting was perfectly useless. All this would have been avoided and effective gritting have been obtained if the ⅜-in. material, the size suggested at the conferences in 1910/1911, had been used. The inevitable loss which gritting by large-size material entails to all users of rubber-tyred vehicles is well known.

"This report will in due course be considered by the council of the Roads Improvement Association."

## MUNICIPAL WORK IN CEYLON.

### REPORTS OF COLOMBO ENGINEER AND MEDICAL OFFICER.

Although somewhat late in appearing, the administrative report of the Colombo Municipal Council for the year 1910—a copy of which has just reached us—provides interesting reading, that section of the publication in which Mr. R. Skelton, the municipal and waterworks engineer, describes the work done in his departments in particular furnishing an excellent insight into the special difficulties confronting public officials in the East.

In connection with road matters, for example, we read that the obstacles in the way of obtaining road metal increase yearly, the contractors being a constant source of trouble. Reprimands, although frequent, have small effect, and punishment is practically out of the question. It appears that the demand for Government and private works is so great that the quarry owners readily find purchasers for their material. Approval has now, however, been given to the acquisition of municipal quarries, and from these will come the means of controlling the metal supply in future, both as regards quality and quantity. In this connection, it should be noted, Mr. Skelton makes the important suggestion that the municipality's quarries should be furnished with stone breakers, and other plant necessary to render them as independent as possible of the conditions which cause the private quarries to be an irregular and inadequate source of supply.

Alluding to the subject of dust prevention, the municipal engineer states that most of the watering carts have been fitted with box sprinklers, which he regards as an improvement. He adds, however, that watering in Colombo is most unsatisfactory unless it is done so frequently as to become a serious charge upon the water supply. The roads are dry within an hour of watering, and frequent watering produces dust and mud; moreover, in the dry weather suspension of street watering is the first means of economising the water supply. The remedy he suggests is the use of liquid fuel, careful observations of the trials of which having shown that this employed alone or mixed with tar is the best preventative of dust on metalled roads in the city. The material appears to remain effective for one month, although in one thoroughfare it did duty for over two months. By its use the road surface is given a dark appearance, affording a great relief from the glare of the sun on the white metalling.

Mechanical transport is touched upon in the report. This matter apparently received the consideration of the authorities some time in the past, but was not followed up. In the opinion of Mr. Skelton the absolute dependence upon bullock transport for so many municipal services is a serious danger to the public welfare, and he considers that a beginning should be made by providing mechanical transport for the output of the council's quarries, in order that epidemics of cattle disease may have only a limited power of disorganisation.

In regard to scavenging the report states that this work, which up to the end of 1904 was under the medical officer's department, was reorganised in 1905. As compared with 159 loads of rubbish daily, the collection has now reached 342 loads, in addition to which 130 loads of dust, weeds and silt are dealt with—no fewer than 373 coolies and 217 carts being engaged.

It became necessary during the year under review to shut off the supply of water to the city during the night on eighty-eight occasions. The consumption exceeded the capacity of the pipe lines, the consequence being that the pressure in the town mains was reduced to such an extent as to deprive the more remote districts of water. By storing the inflow during the night the available day pressure was materially improved.

In a statement of the medical officer of health, Dr. W. Marshall Philip, which also accompanies the administrative report, the population of Colombo is given as 207,684. Dr. Philip, commenting upon the improved methods of cleansing adopted, observes that the work includes the cleansing both of private premises and public thoroughfares. A great improvement has been effected by the sanitary inspectors and the cleansing gang in making householders clear out the rubbish from their premises and deposit it in sanitary dustbins by the roadside, whence it is removed by the scavengers. Evidence, too, of improvement in the housing conditions is found in the annual statements of work done and the structural improvements effected by the sanitary inspectors.

Little improvement is recorded by the medical officer in regard to the condition of the public markets, which, he says, remain for the most part, as hitherto, a disgrace to the city. Dr. Philip is of opinion that it is necessary that the whole question of public markets should be considered, and a definite policy adopted, the guiding principle of which, he thinks, should be that the municipal council should concentrate its attention upon the larger markets, leaving for the present the provision of small markets in sparsely-populated areas to private enterprise, subject to regulation.

The evils of the conservancy system are pointed out in no uncertain manner by the medical officer. He says: "At the end of the year there were 10,136 buckets in private latrines and 300 buckets in public latrines being nightly conserved, and, as will readily be understood, the practical difficulties incidental to the removal of the waste of such a large population by the primitive method of buckets and hand collection are enormous. The chief respect in which the contractor failed to give satisfaction was, as hitherto, in the matter of the cleansing of the buckets after they had been emptied. In the absence of sewers to carry off liquid waste, this cleansing has to be done by the dry method of wiping with coir-dust—a most unsatisfactory and insanitary method, and one which is to a very large extent neglected in spite of repeated fines being imposed for neglect. The consequence is that we have got scattered throughout the town, for the most part in close proximity to kitchens, many thousands of buckets, the sides of many of which are coated with fœcal matter. Each one of these foul buckets is a standing menace to the health of those living near, especially during the fly season, and it is hopeless to expect that we shall ever be able materially to reduce the amount of enteric fever here so long as this system is in use. Every effort has been made to compel the contractor to pay more attention to the cleansing of buckets, but without much success, the result of enhancing the fines for neglect being that he has recently made an application to cancel his contract on the ground that he cannot keep his men if these fines are imposed. Another source of danger in connection with this dry-earth system is that the people will not, in spite of repeated warnings, and even prosecutions, take the trouble to cover up their dejecta with the coir-dust supplied for that purpose."

Dr. Philip adds: "Anyone who has still doubts as to the advisability of substituting for the dry-earth system the water-carriage system now under construction should visit some of these latrines, especially in the poorer quarters, when the absurdity of their contention will at once become apparent."

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**The Extinction of Fires.**—Two further examples have recently been afforded of the remarkable efficiency of the Grinnell sprinkler as a means of preventing serious fires. An outbreak occurred on November 10th at the flour and provender mills of Messrs. W. Primrose & Sons, Limited, Glasgow. The mill was equipped with an installation of Grinnell sprinklers. In the strut-house eleven of the sprinklers operated in such a manner that the fire was soon extinguished. Messrs. W. Primrose & Sons, Limited, have written to Messrs. Mather & Platt, Limited, stating that owing to the timely action of the sprinklers the only damage done to the strut-house was that caused by water, and a few pounds' damage to wood. They mention in their letter than but for the sprinklers the fire might have been serious, as that part of the mill is so inaccessible that serious damage would have been done before the fire could have been got at.—On December 1st a fire occurred at the Rockcliffe Mills of Messrs. A. Smart & Sons, Limited. It originated in the cotton-cleaning waste department. Messrs. Smart have written Messrs. Mather & Platt to say that the sprinklers prevented a bad fire. There was no need for the firemen to fix a hose when they arrived.—These are only two of the most recent examples which go to prove how well adapted is the Grinnell system for the protection of every class of manufacturing and warehouse property. The Grinnell sprinkler has received official recognition from fire insurance offices all over the world. So highly do insurance people esteem the sprinkler that a reduction of from 25 to 70 per cent is allowed off the premiums on buildings equipped with it.

## STEAM ROAD ROLLER WATER SPRAYERS.

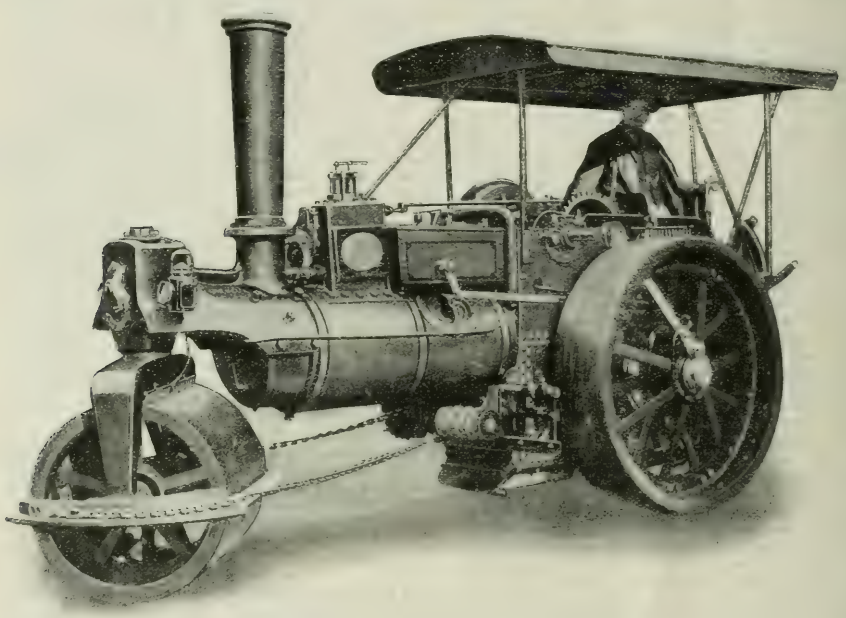
Road surveyors and steam roller owners and contractors, to the number of considerably over 100, have already been supplied by Mr. W. E. Horsman, 127 Pendleroad, Streatham, London, S.W. (licensee for England, Scotland and Wales), with the apparatus invented by Mr. E. Van Putten, M.INST.C.E., the borough engineer of Lewisham, for overcoming the trouble which arises as a result of material adhering to the wheels of rollers during road consolidation work. In addition to rendering unnecessary the use of larger quantities of water than are required for the purpose in view the attachment referred to is claimed to effect a considerable economy by dispensing with the employment of the horse, driver and water cart which it is usual to find in attendance on a steam roller. Water in any quantity desired is forced from the water tank by an ejector through copper tubes and sprayed through perforated pipes over the wheels; it is controlled from the footplate by the driver by taps, arranged in such a way that any one, two or three wheels may be sprayed at a time. The supply can be so regulated that it may come drop by drop, or in sufficient quantity to consolidate a road in hot, dry weather. It is, of course, necessary to fill up the tank of the roller more often than if the water were only used for generating steam, but this may be provided for either by a supplemental tank on the roller, or by having a cart load of water brought on the job and left there.

We are given to understand that in every apparatus now fixed by Mr. Horsman provision is made in order that by a simple contrivance the ejector may be utilised for raising the water from the water tank into the supplementary tank, and a number of the original sprayers have already been converted to this system.

There being no moving parts in the sprayer, there is consequently no wear, and its simplicity is such as will be apparent from the accompanying illustration that it cannot get out of order.

Mr. T. Cauk, the city engineer of Worcester, who is among those who have made a trial of the apparatus, finds that out of forty-one days' working he has been able by the use of the sprayer to dispense with the watering cart for sixteen and a-half days. He says: "This has resulted in a saving in horse hire of £5 15s. 6d.—covering the period from September 19th to November 9th, or less than two months—and reduced the consumption of water by 16,500 gallons, while the work has been better accomplished in consequence of the entire absence of picking up by the roller to which the sprinkler is attached. I would recommend that the other roller have the sprinkler appliance fitted to it, as it results in a distinct economy, as well as superior working."

According to Mr. P. Dodd, the borough engineer of Wandsworth, the saving effected by the sprinkler which he experimented with paid for the attachment in thirty working days, the result being that four other steam rollers were fitted in a similar way.



Steam Roller fitted with Van Putten's Water Sprayer.

**Polls for Railless Traction.**—Polls of the electors of three towns—*viz.*, Brighton, Hove and Ramsbottom—have been taken on the question of promoting Bills in Parliament for the running of railless cars. At Brighton the result of the voting was: For a Bill, 5,576; against, 2,316—majority for, 3,260. At Hove 1,753 were in favour, and 825 against—majority for, 928. At Rambottom the figures were: For, 999; against, 407—majority for, 592.

**Ejector Plant for Ipswich Sanatorium.**—Messrs. Manlove, Alliott & Co., Limited, have just secured a contract for the supply of an ejector plant for Ipswich Sanatorium. The capacity of the plant will be 50 gallons, and although only one ejector is being supplied under the present contract, we understand that sufficient space is to be left in the ejector pit for the installation of another ejector at a future date. The ejector supplied will be of the Alliott & Philp's patent pneumatic automatic type, of which Messrs. Manlove, Alliott & Co., Limited, have supplied a large number to many parts of the world. These ejectors are generally arranged in pairs, and the control gear of the ejectors is so arranged that they work alternately under all conditions, both in regard to their filling and emptying; they are also arranged that neither ejector can fill at the same time as the other. This arrangement consequently attains, with the greatest degree of perfection, the ideal condition of a steady flow of sewage to the ejectors. The inlet and outlet flap valves are arranged with covers on the boxes, fastened down by means of shackles and wire-handled screws. This method of securing the covers enables the valves to be examined quickly and without undoing any bolts which require spanners or loose tools. As stated above, these ejectors are generally arranged in pairs, but they can also be arranged singly, as is the case with the Ipswich Sanatorium contract.

## SOCIETY OF ENGINEERS.

### PRESENTATION OF PREMIUMS.

The opening sessional meeting of the Society of Engineers was held on Monday at the Institution of Electrical Engineers, Victoria Embankment, W.C. The chair was first occupied by the retiring president, Mr. F. G. Bloyd, who presented the following premiums awarded for papers published in the "Journal" during 1911: The president's Gold Medal to Mr. W. R. Baldwin-Wiseman, for his paper on "The Administrative Aspect of Water Conservancy";* the Clarke Premium to Mr. T. J. Gueritte, for his paper on "The Mechanical Installation and Upkeep of Permanent Way on Railways"; the Bessemer Premium to Mr. R. W. A. Brewer, for his paper on "Two-stroke Cycle Engines"; a Society's Premium to Mr. E. Kilburn Scott, for his paper on "Nitrogen Products made with the Aid of Electric Power"; a Society's Premium to Mr. F. G. Wollard, for his paper entitled "Some Notes on Drawing Office Organisation." Mr. Bloyd then vacated the chair in favour of Mr. John Kennedy, the president for 1912, who was received with acclamation. A vote of thanks to the retiring president was proposed and heartily accorded.

The president afterwards delivered his inaugural address, which dealt with Shipbuilding and Marine Engineering.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President*—Mr. Albert D. Greatorex, M.Inst.C.E., Borough Engineer and Surveyor of West Bromwich.

### FORTHCOMING MEETINGS.

The following meetings are reported as fixtures: June 7th and 8th, Scottish meeting at Stirling; Eastern District, June 15th, at East Ham; Eastern District meeting on June 22nd, at Lowestoft.

A West Midland District meeting will be held at Stourbridge, April 13th, the Paris meeting at Whitsun, and the annual meeting will probably be held July 11th, 12th and 13th.

Members desirous of submitting a paper at the forthcoming annual meeting are requested to give early information of their desire.

Premiums not exceeding 30 guineas are awarded by the council for the best papers read by members and associate members during the year.

Thomas Cole,
*Secretary.*

11 Victoria-street,
London, S.W.

## INSTITUTION OF MUNICIPAL ENGINEERS.

*President*—Mr. E. A. Stickland, Assoc.M.Inst.C.E., Borough Surveyor, Windsor.

### MEETING IN LONDON.

A general meeting will be held in the Committee-room No. 4 Southampton-row, London W.C., on Saturday, February 24th, at 6 o'clock, when a paper, "Superannuation and Security of Tenure: the National Association of Local Government Officers and its Bill," by A. Winter Gray, member of council of the institution, will be read.

Mr. L. Hill, secretary of the association, and, it is hoped, some of its prominent members, will be present and take part in the discussion, which will be an open one.

The building, No. 4 Southampton-row, is almost opposite the Holborn Station of the Great Northern and Piccadilly Tube, and within a minute of the British Museum Station of the Central London Railway.

### EXAMINATIONS.

The next examination will be held in May, 1912, at centres to be arranged. The papers set at the November examination may be obtained on loan form, price 1s., post free.

B. Wyand,
*Secretary.*

39 Victoria-street, S.W.

* The Surveyor, April 7 1911

## ROYAL SANITARY INSTITUTE.

### MEETING AT MANCHESTER.

At a meeting of the Royal Sanitary Institute, to be held at Manchester, on Friday, March 8th, discussions will be opened on "The Application of the Housing and Town Planning, &c., Act, to the Development of Suburban Areas now in Process of Transition," by Mr. F. W. Platt, building surveyor, Salford, and on "The Quantity of Water Available from Upland Drainage Areas," by Prof. J. Radcliffe, M.Sc. On the following day visits will be made to places of local interest.

A meeting of the Royal Sanitary Institute will be held at the Poor-Law Offices, Shakespeare-street, Nottingham, to-morrow (Saturday), at 11 a.m., when a discussion will take place on "Local Public Health Administration and the Insurance Act."

Dr. Louis C. Parkes, deputy chairman of the council of the institute, will occupy the chair.

## INSTITUTE OF SANITARY ENGINEERS.

### FORTHCOMING MEETINGS.

A sessional meeting will be held at the Royal United Service Institution, Whitehall, on Monday evening next, when a paper on "Hospitals and Sanatoria" will be read by Messrs. A. Alban H. Scott (Fellow) and F. C. Davies (medical officer, Battersea Tuberculosis Dispensary). Mr. Edward White, J.P., chairman, London County Council, will take the chair at 8 p.m.

A sessional meeting will be held at Caxton Hall, Westminster, on Monday, February 26th, when a lecture on "Sanitary Building Construction" will be given by Prof. Henry Adams, M.Inst.C.E., M.I.Mech.E. Mr. Edwin T. Hall, F.R.I.B.A., F.R.San.I., will take the chair at 8 p.m.

A sessional meeting will be held at Caxton Hall, Westminster, on Monday, March 11th, when a paper on "The Modern Home" will be read by Mr. Percival M. Fraser, A.R.I.B.A. The chair will be taken at 8 p.m.

**Proposed Road Bridge Over the Severn.** [illegible] being made with the view to the Hegineering Committee of the Gloucestershire County Council taking up the question of a road bridge over the Severn. The present proposal is that a road bridge should span the river in connection with the present railway structure between Lydney and Sharpness. At present there is no road bridge over the Severn lower than Gloucester. A strong effort was made a number of years ago to get the county council to build a bridge across the river at Newnham, which would mean a saving of quite 25 miles by road travelling from South Wales to London. The initial cost was first of all put at £25,000, but later the estimated cost of the scheme rose to three times that amount.

**Drainage Works and Sanitary Fittings.**—When a book reaches a third edition its usefulness is proved. In this case* each succeeding edition has been revised, and the text has received additions. This shows that the author is fully alive to the necessity of keeping his work up to date. Mr. Maxwell has long been known as an independent thinker and an increasing worker, so that his writings give what has been proved from trial and experience, and are not mere adaptations from previous books. One of the curses of the time is the publication of screeds from other lands, where the conditions must necessarily differ from those existing here, and these screeds, oft-times expressive, are forced down the throats of a British student public as conveying intelligent information about matters of sewage and other things which the learned man wants to know. Our experience is that, with a few exceptions, all students should avoid text-books that come from other countries, translated or otherwise. Mr. Maxwell deals with English conditions, experience, and practice: the materials mentioned are of English make and type of such as every reader can easily see and examine. Taking the book as a whole, the information given is excellent, the style simple and clear, the statements not involved. *Contractors' Record.*

* "Drainage Work and Sanitary Fittings." By Wm. H. Maxwell. Price 2s. net. London: St. Bride's Press, Limited, 21 Bride-lane, E.C.

## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No.* 1359 *Holborn), subject to later confirmation by letter.*

CLERK OF WORKS.—February 9th.—Corporation of Lewes. 3½ guineas per week.—Mr. Montague S. Blaker, town clerk.

INSPECTOR OF NUISANCES.—February 12th.—Darlaston Urban District Council. £105 per annum.—Mr. J. Corbett, town clerk.

SURVEYOR.—February 12th.—Marsden Urban District Council.—Mr. J. W. Piercey, Cloth Hall-street, Huddersfield.

SURVEYOR'S CLERK.—February 12th.—Deptford Borough Council. £100—£120.—Mr. V. Orchard, town clerk.

FOREMAN.—February 12th.—Corporation of Tenby. 30s. per week.—Mr. B. Morley, borough surveyor.

SURVEYOR.—February 13th.—South Stoneham Rural District Council. £100—£120.—Mr. E. T. Westlake, clerk.

TEMPORARY TRACING CLERK.—February 14th.—Corporation of Coventry. £2 per week.—Mr. J. E. Swindlehurst, city engineer and surveyor.

ASSISTANT SANITARY SURVEYOR.—February 14th.—Easington Rural District Council. £130 per annum.—Mr. J. M. Longden, clerk.

SEWAGE WORKS MANAGER.—February 15th.—Corporation of Halifax. £200 per annum.—Mr. Percy Saunders, town clerk.

DISTRICT MAIN ROAD SURVEYOR.—February 16th.—Derbyshire County Council. £200—£250 per annum.—Mr. N. J. Hughes-Hallett.

SANITARY SURVEYOR.—February 17th.—Bingham Rural District Council. £100 per annum.—Mr. R. H. Beaumont, clerk, Bingham, Notts.

CLERK OF WORKS.—February 22nd.—Oakwell Joint Hospital Board. 50s. per week.—Mr. W. Middlebrook, clerk, Council Offices, Birstall.

ROAD FOREMAN.—February 23rd.—Corporation of Doncaster. £130—£150.—Mr. R. A. H. Tovey, town clerk.

ASSISTANT ENGINEERS.—May 1st.—Indian Public Works and State Railway Departments.—Secretary, Judicial and Public Department, India Office, London, S.W.

## MUNICIPAL COMPETITIONS OPEN.

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LONDON.—February 17th.—Sketch designs for new head offices, for the Port of London Authority.—The Clerk.

YORK.—February 17th.—Designs are invited for a public elementary school by the Education Committee.—Mr. J. H. Mason, secretary, Education Offices, Clifford-street, York.

HARROW-ON-THE-HILL.—March 16th.—Enlargement of public offices, for the urban district council. Cost not to exceed £4,500. Premiums of 30, 20 and 15 guineas are offered.—Mr. J. P. Bennetts, engineer and surveyor.

## MUNICIPAL CONTRACTS OPEN.

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### Buildings.

EDINBURGH.—February 10th.—For the erection of a building for store cattle at the cattle market, for the corporation.—Mr. Thomas Hunter, town clerk.

COVENTRY.—February 10th.—For the construction of concrete foundations for purifiers, for the Gas Committee.—Mr. Fletcher W. Stevenson, engineer.

CORNWALL.—February 10th.—For the erection of a handicraft centre, for the Education Committee.—Mr. F. R. Pascoe, secretary, Education Offices, Truro.

LANCASHIRE.—February 12th.—For the completion of the Whalley Asylum, for the Committee of Visitors.—Mr. H. E. Clare, clerk, County Offices, Preston.

WARRINGTON.—February 12th.—For the erection of boundary wall, iron railings and gates, for the corporation.—Borough Surveyor.

WHALLEY.—February 12th.—For the completion of an asylum, for the Committee of Visitors.—Mr. H. E. Clare, clerk, County Offices, Preston.

RISCA.—February 12th.—For the erection of fifteen houses, for the urban district council.—Mr. A. J. Dardis, surveyor.

BOOTLE.—February 12th.—For the erection of a public convenience, for the corporation.—Mr. J. H. Farmer, town clerk.

PONTYPRIDD.—February 12th.—For the construction of a concrete wall, for the urban district council.—Mr. J. Colenso Jones, clerk.

WEST HAM.—February 12th—19th.—For the erection of a caretaker's residence, and other works, for the corporation.—Mr. W. Jacques, 2 Fen-court, Fenchurch-street, E.C.

LANCASTER.—February 13th.—For the erection of walls and iron railing, for the corporation.—Mr. T. C. Hughes, town clerk.

WANDSWORTH.—February 13th.—For the erection of a public convenience, for the borough council.—Borough Engineer and Surveyor.

MAIDSTONE.—February 13th.—For the erection of an engine-house at sewage works, for the corporation.—Mr. S. L. Monckton, town clerk.

MERTHYR.—February 13th.—For the erection of three schools, for the Education Committee.—Mr. E. Stephens, clerk.

ESSEX.—February 14th.—For the erection of a school, for the Education Committee.—Mr. E. J. Bond, Woodford Green, Essex.

PORTSMOUTH.—February 14th.—For the construction of concrete steps and handrail on the shore of the harbour, for the corporation.—Mr. G. Hammond Etherton, town clerk.

HULL.—February 14th.—For works of arching, fencing, and erecting shelter and convenience.—Mr. A. E. White, city engineer.

BIRKENHEAD.—February 15th.—For the erection of a brick gasholder tank and steel internal framing, boundary wall, weigh-house, entrance gates, two cottages, governor-house, and boiler-house, for the corporation.—Mr. J. Fearnley, town clerk.

HACKNEY.—February 15th.—For the erection of a branch library, for the borough council.—Mr. R. Cooper, architect, 12 Gray's Inn-square, London, W.C.

GILLINGHAM.—February 16th.—For rebuilding offices at the electricity station, for the corporation.—Mr. F. C. Boucher, town clerk.

LANCASHIRE.—February 16th.—For the erection of an elementary school, for the Education Committee.—Mr. Harcourt E. Clare, clerk, County Offices, Preston.

SKIPTON.—February 17th.—For building an engine-house and brick chimney, for the urban district council.—Mr. A. E. W. Aldridge, surveyor.

SHEFFIELD.—February 19th.—For the erection of an infants' and special school, for the Education Committee.—City Architect.

STOCKTON-ON-TEES.—February 19th.—For the erection of school, for the Education Committee.—Mr. J. Tweedy, secretary, 32 Dovecot-street.

LYMM.—February 20th.—For building stable and cart shed, for the urban district council.—Mr. David Mort, surveyor.

DURHAM.—February 20th.—For the erection of a school at Easington Colliery, for the county council.—Mr. A. J. Dawson, clerk, Shire Hall, Durham.

WILTS.—February 21st.—For the erection of a school at Idmiston, for the county council.—Mr. J. G. Powell, county surveyor, Trowbridge.

MONTGOMERY.—February 21st.—For the erection of a school, for the Education Committee.—Mr. L. Phillips, clerk, County Education Offices, Newtown.

HANTS.—February 22nd.—For the erection of a school, for the county council.—Mr. H. Barber, clerk, The Castle, Winchester.

NANTYGLO AND BLAINA.—February 22nd.—For the erection of seventy-four houses at Cwm Celyn, for the urban district council.—Mr. H. J. C. Shepard, clerk.

Newbury.—February 23rd.—For the erection of twelve cottages, for the corporation.—Mr. S. J. L. Vincent, borough surveyor.

West Riding.—February 26th.—For the extension of the county hall, Wakefield, for the county council. Mr. J. V. Edwards, county architect, Wakefield.

Northumberland.—February 26th.—For the erection of an infants' school, for the county council.—Mr. C. Williams, secretary, The Moot-hall, Newcastle-upon-Tyne.

Wandsworth.—February 27th.—For the construction of public conveniences, for the borough council.—Mr. Henry George Hills, town clerk.

Dartford.—February 27th.—For the extension of the electricity works, for the urban district council.—Mr. W. Kay, clerk.

Blackburn.—February 27th.—For extensions of the town hall, for the corporation.—Mr. L. Beard, town clerk.

Somerset.—February 28th.—For the erection of a school, for the Education Committee.—Mr. C. H. Bothamley, secretary, Weston-super-Mare.

Stepney.—March 4th.—For structural alterations at a public library, for the borough council.—Mr. G. W. Clarke, town clerk.

Bangkok.—March 15th.—For the erection of an electric power station, for the municipality.—Mr. F. B. Shaw, engineer-in-charge, Municipal Electric Power Station, Local Sanitary Department, Bangkok.

## Iron and Steel.

Tunbridge Wells.—February 10th.—For the supply of switch gear, for the corporation.—Mr. W. C. Cripps, town clerk.

Burnley.—February 10th.—For the supply of cast-iron water pipes, for the rural district council.—Mr. J. S. Horn, clerk.

Warblington.—February 12th.—For the erection of iron fencing and entrance gates, for the urban district council.—Mr. H. W. Stringfellow, surveyor, Emsworth.

Belfast.—February 12th.—For the supply of an automatic coal-weighing machine and overhead electrical equipment material, for the corporation.—Mr. R. Meyer, town clerk.

Newport (Mon.).—February 15th.—For the supply of unclimbable fencing and gates, for the corporation.—Borough Engineer.

Blackpool.—February 17th.—For the supply of 500 cast-iron standards and about 1,400 lin. yds. of wrought-iron railing.—Mr. J. S. Brodie, borough engineer.

Stockport.—February 20th.—For the supply of fencing and gates, for the corporation. Borough Surveyor.

Rochdale.—February 20th.—For the supply of cast-iron pipes and castings, for the corporation. Mr. W. H. Hickson, town clerk.

Plymouth.—February 22nd.—For the supply of cast-iron pipes, for the corporation.—Mr. F. Howarth, water engineer.

## Roads.

Grimsby.—February 10th.—For road improvement work, for the rural district council.—Mr. J. F. Wintringham, clerk.

Glamorgan.—February 10th.—For the supply of material and haulage, for the county council.—Mr. G. A. Phillips, county surveyor, Bridgend.

Banbury.—February 10th.—For the supply of hand-picked and broken granite and gravel, for the rural district council.—Mr. E. L. Fisher, clerk.

Manchester.—February 10th.—For the supply of pitch and creosote oil, for the corporation.—Mr. Thomas Hudson, town clerk.

Yarmouth.—February 10th.—For paving certain thoroughfares, for the Port Commissioners.—Mr. J. Tolver Waters, clerk.

Hunslet.—February 10th.—For making up part of a street, for the rural district council.—Mr. W. B. Pindar, clerk.

Devonport.—February 10th.—For carting and team labour, for the gas department.—Mr. W. P. Tervet, engineer and manager.

Milford Haven.—February 10th.—For the supply of granite, for the urban district council.—Mr. T. H. Lewis, clerk.

Crick.—February 10th.—For the supply of Hartshill granite, Mancetter, or Mountsorrel stones, for the rural district council.—Mr. W. W. Band, surveyor, Newnham, Daventry.

Glamorgan.—February 10th.—For the supply of materials and haulage, for the county council.—Mr. G. A. Phillips, county surveyor, Town Hall, Bridgend.

Daventry.—February 10th.—For the supply of road materials, for the urban district council.—Mr. J. D. Spearing, clerk.

Horncastle.—February 10th.—For the supply of granite, for the rural district council.—Mr. J. E. Chatterton, clerk.

Wandsworth.—February 12th.—For executing repairs in two roads, for the borough council.—Mr. Henry George Hills, town clerk.

Beverley.—February 12th.—For the supply of stone for macadamising, for the rural district council.—Mr. E. Picker, surveyor.

Leigh.—February 12th.—For the supply of grit setts, flags, kerbstones, macadam, sewerage pipes, castings, pitch, and creosote oil, for the corporation.—Mr. W. H. Cowburn, town clerk.

Hull.—February 12th.—For the widening of Sauer-street, for the corporation.—Mr. A. E. White, city engineer.

Southampton.—February 12th.—For the hire of steam rollers, for the county council.—Mr. H. Barber, clerk.

Ilford.—February 12th.—For making up part of a street, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

Salop.—February 12th.—For the haulage of stone or tarred macadam, for the county council.—Mr. A. T. Davis, county surveyor.

Southampton.—February 12th.—For the hire of surface-tarring machines, for the county council.—Mr. H. Barber, clerk.

Selby.—February 12th.—For the supply of whinstone, for the urban district council.—Mr. Bruce McG. Gray, engineer and surveyor.

Blackburn.—February 12th.—For making up certain streets, for the corporation.—Mr. W. Stubbs, borough engineer.

Reigate.—February 12th.—For the supply of granite flints, Kentish ragstone, tar-macadam, gravel, haulage, team labour, tools, and tar-washing surfaces of roads, for the rural district council.—Mr. Arthur J. Head, surveyor.

Towcester.—February 12th.—For the supply of granite and slag, for the rural district council.—Mr. W. K. Higham, clerk.

Carne.—February 12th.—For the supply of manual and team labour, and materials, for the rural district council.—Mr. Alfred A. Cole, clerk.

Galway.—February 13th.—For work of road improvement and steam rolling, for the county council.—Mr. W. G. Seymour, secretary.

Mountain Ash.—February 13th.—For street works in Station-road, for the urban district council.—The Surveyor.

Woodbridge.—February 13th.—For the supply of road materials, for the rural district council.—Mr. George Cook, district surveyor.

Long Sutton.—February 13th.—For the supply of granite, tar-macadam, and slag screenings, for the urban district council.—Mr. S. S. Mossop, clerk.

Antrim.—February 13th.—For the supply of horse work, broken stones and screenings, for the county council.—County Surveyor, County Courthouse, Belfast.

Morley.—February 13th.—For the supply of road materials, for the corporation.—Mr. W. E. Putman, borough engineer and surveyor.

Blaydon.—February 13th.—For paving certain streets, for the urban district council.—Mr. G. Symon, surveyor.

Thurnscoe.—February 14th.—For the execution of street works, for the urban district council.—Mr. J. Ledger Hawksworth, clerk.

Enfield.—February 14th.—For making up three streets, for the urban district council.—Mr. T. W. Scott, clerk.

New Sarum.—February 14th.—For the supply of work and materials, for the corporation.—Mr. Francis Hodding, town clerk.

Swansea.—February 14th.—For the supply of road materials and haulage, for the rural district council.—Mr. Edward Harris, clerk.

Louth.—February 14th.—For the supply of granite and slag, for the rural district council.—Mr. F. C. Chard, clerk.

Easingwold.—February 14th.—For the supply of whinstone and slag, for the rural district council.—Mr. F. J. H. Robinson, clerk.

Isle of Thanet.—February 15th.—For the supply of broken flints and broken granite, for the rural district council.—Mr. Charles Taylor, clerk.

Banbury.—February 15th.—For the supply of Hartshill stone, for the corporation.—Mr. N. H. Dawson, borough surveyor.

Chelmsford.—February 15th.—For the execution of street improvement works, for the corporation.—Mr. W. Smith, town clerk.

Preston.—February 16th.—For levelling and paving works, for the corporation.—Borough Surveyor.

Kingsbury.—February 16th.—For the supply of road materials, for the urban district council.—Mr. R. C. N. Newport, surveyor.

Headington.—February 17th.—For the supply of granite and chippings, for the rural district council.—Mr. A. Walker, district surveyor, Windmill-road, New Headington, Oxon.

Beds.—February 17th.—For the supply of broken granite, slag, tar-macadam, flints, gravel, and cartage, for the county council.—Mr. W. W. Marks, clerk.

Spennymoor.—February 17th.—For street-making work, for the urban district council.—Mr. F. Badcock, clerk.

Eccles.—February 17th.—For the supply of road and other materials, for the corporation.—Mr. E. Parkes, town clerk.

Wisbech.—February 17th.—For the supply of road materials, for the rural district council.—Mr. A. G. Catling, highway surveyor.

Gosforth.—February 17th.—For the supply of team labour, road materials and steam rolling, for the urban district council.—Mr. R. Sheriton Holmes, clerk.

Lowestoft.—February 17th.—For the supply of about 300,000 Jarrah blocks for street paving, for the corporation.—Mr. Geo. H. Hamby, borough engineer.

Rotherham.—February 17th.—For making up part of May-street, for the corporation.—Mr. E. B. Martin, borough engineer.

Peterborough.—February 19th.—For the supply of granite, slag and gravel, for the rural district council.—Mr. J. W. Buckle, clerk.

Hale.—February 19th.—For making up a road, for the urban district council.—Mr. J. G. Whyatt, clerk.

Heavitree.—February 20th.—For making up certain streets, for the urban district council.—Mr. J. Walter W. Mathew, clerk.

Lymm.—February 20th.—For the supply of materials, including tar-macadam, for the urban district council.—Mr. W. Mullard, clerk.

Skipton.—February 20th.—For the supply of highway materials, for the rural district council.—Mr. A. Rodwell, surveyor.

Goole.—February 21st.—For the supply of road material, for the urban district council.—Mr. C. G. Bradley, engineer and surveyor.

Ely.—February 21st.—For the supply of granite, gravel and tar, for the rural district council.—Mr. E. B. Claxton, clerk.

Spalding.—February 21st.—For the supply of granite, slag and gravel, for the rural district council.—Mr. H. Stanley Maples.

Friern Barnet.—February 22nd.—For works of making up, for the urban district council.—Mr. Edwin Goodship, clerk.

Thakeham.—February 22nd.—For the supply of road materials, tar and cartage, for the rural district council.—Mr. Percy Ayling, clerk.

Flaxton.—February 22nd.—For the supply of road materials, for the rural district council.—Mr. J. Peters, clerk, 4 New-street, York.

South Shields.—February 24th.—For laying *in situ* concrete for footways, for the corporation.—Mr. L. Roseveare, borough engineer and surveyor.

Epsom.—February 26th.—For the supply of road materials and cartage, for the rural district council.—Mr. A. R. Cotton, clerk.

Fylde.—February 26th.—For the supply of a steam road-roller, for the rural district council.—Mr. Fred. H. Brown, clerk.

Diss.—February 27th.—For the supply of granite, for the urban district council.—Mr. Alfred Cooper, surveyor.

Ashton-upon-Mersey.—February 27th.—For making up certain streets, for the urban district council.—Mr. J. W. L. Foulkes, clerk.

Hampton.—February 29th.—For the supply of hand-broken granite, chippings, broken Kentish brown flints, Derbyshire limestone marple, tar-paving material, tar, forage, coal and brooms, for the urban district council.—Mr. Sidney H. Chambers, surveyor.

Brierley.—March 1st.—For paving two streets, for the urban district council.—Mr. B. Halstead, surveyor.

Driffield.—March 2nd.—For the supply of whinstone, broken slag, sea cobbles, sea gravel and tarred chippings, for the rural district council.—Mr. T. Cosser Beaumont, surveyor.

Chertsey.—March 4th.—For the supply of highway materials, for the rural district council.—Mr. H. Beeney, surveyor, High-street, Chobham.

## Sanitary.

Luton.—February 12th.—For scavenging work, for the rural district council.—Mr. W. Austin, clerk.

Fulwood.—February 12th.—For the preparation of sand for irrigation, for the urban district council.—Mr. Arnold Brierley, clerk.

South Shields.—February 12th.—For the erection of nine sewer ventilating shafts, for the rural district council.—Mr. W. R. Ridley, clerk.

Halesowen.—February 12th.—For laying sewer and surface-water drain, for the rural district council.—Mr. George H. Dallow, engineer and surveyor.

Caerphilly.—February 13th.—For the construction of stoneware sewer, &c., for the urban district council. Mr. Alfred O. Harpur, engineer and surveyor.

Blaydon-on-Tyne.—February 13th.—For work of scavenging, for the urban district council.—Mr. H. Dalton, clerk.

Wandsworth.—February 13th.—For the erection of sanitary convenience, for the borough council.—Mr. H. G. Hills, town clerk.

Smallthorne.—February 13th.—For scavenging work, for the urban district council.—Mr. Geo. Phillips, clerk.

Llandaff and Dinas Powis.—February 14th.—For laying surface-water sewers, for the rural district council.—Mr. M. Warren, clerk.

Houghton-le-Spring.—February 14th.—For work of scavenging, for the rural district council.—Mr. Robert B. Marley, clerk.

Swansea.—February 14th.—For the removal of refuse, &c., for the rural district council.—The Clerk.

Northwich.—February 16th.—For alterations to sewage outfall works, for the urban district council.—Mr. W. M. Beckett, 33 Brazenose-street, Manchester.

Chelmsford.—February 16th.—For the removal of refuse, for the rural district council.—Mr. A. S. Duffield, clerk.

Windsor.—February 19th.—For the construction of a main sewer, for the rural district council.—Mr. J. E. Gale, clerk, 3 Sheet-street, Windsor.

Leeds.—February 19th.—For the supply of earthenware drain pipes, sewer ironwork, galvanised dirt boxes, and cement, for the corporation.—Mr. W. T. Lancashire, city engineer.

Scunthorpe.—February 20th—March 5th.—For the construction of sewage disposal works, for the Joint Sewerage Board.—Mr. G. E. Davy, clerk.

Leyton.—February 20th.—For scavenging work, for the urban district council.—Mr. E. H. Essex, surveyor.

Castletown.—February 20th.—For the construction of new sewerage, for the Town Commissioners.—Messrs. G. Kay & Co., 22 Athol-place, Douglas, Isle of Man.

Aylesbury.—February 21st.—For the construction of surface-water sewers, manholes, &c., for the urban district council.—Mr. P. A. Wright, clerk.

Croydon.—February 22nd.—For emptying cesspools, for the rural district council.—Mr. E. J. Gowen, clerk.

Norwich.—February 26th.—For flushing cisterns and water-closet pans, for the corporation.—Mr. A. E. Collins, city engineer.

Hackney.—February 29th.—For the removal of house refuse, for the borough council. The Town Clerk.

TADCASTER.—March 1st.—For carrying out a sewerage scheme, for the rural district council.—Mr. G. A. Bromet, clerk.

TANGIER.—March 4th.—For the construction of a drain, for the Special Committee of Public Works.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

LONG CRENDON (Bucks).—For the construction of 9-in. stoneware pipe sewer, manholes, &c., for the rural district council.—Mr. Edward N. Purcell, clerk.

## Stores.

PENGE.—February 10th.—For the supply of granite macadam, brooms, Kentish flints, Portland cement, disinfectants, drysaltery, artificial stone, tar-paving, and clock winding, for the urban district council.—Mr. Arthur E. Eves, clerk.

STEPNEY.—February 10th.—For the supply of bricks, brooms, cast-iron work, colours, oilman's goods, timber, tools, ballast, wheelwright's materials, uniform clothing, disinfectants, &c.—Mr. Geo. W. Clarke, town clerk.

BATTERSEA.—February 14th.—For the supply of brooms, materials for van covers, harness fittings, paints, tools, ironmongery, granite macadam and chippings, tarred slag macadam, York paving, Thames ballast, iron castings, &c., for the borough council.—Mr. W. Marcus Wilkins, town clerk.

RAWTENSTALL.—February 14th.—For the supply of road metal, earthenware pipes, gullies, timber, pitch, disinfectants, cement, iron castings, flags, setts, local stone, &c., for the corporation.—Mr. James Whalley, town clerk.

STOCKTON-ON-TEES.—February 14th.—For the supply of the several articles of stores required by the corporation.—Mr. Arthur B. Crosby, town clerk.

NORTHAMPTON.—February 17th.—For the supply of broken granite, granite kerb, setts, artificial stone paving, stoneware pipes, Portland cement, ironmongery, tar-paving, tar-macadam, brooms, team labour, &c., for the corporation.—Mr. Herbert Hankinson, town clerk.

BELFAST.—February 19th.—For the supply of stores for the tramway and electricity departments, for the corporation.—Mr. R. Meyer, town clerk.

YORK.—February 19th.—For the supply of Portland cement, stoneware pipes, sludge-press cloth, building and sewage lime, pitch and creosote oil, Yorkshire stone, kerbing, setts, whinstone, and limestone chippings, for the corporation.—Mr. F. W. Spurr, city engineer.

ACTON.—February 20th.—For the supply of brooms, coke, coal, disinfectants, road materials, cement, stoneware pipes, ironmongery, oils, &c., for the urban district council.—Mr. W. Hodson, clerk.

ECCLES.—February 20th.—For the supply of granite setts, flags, kerbs, channel stones, broken rubble, granite macadam, prepared tarred limestone, gravel, castings, pitch, gullies, stoneware pipes, &c., for the corporation.—Mr. Thomas S. Picton, borough engineer.

SHOREDITCH.—February 20th.—For the supply of paving repairs, asphalting, broken granite, plumbers' work, smiths' work, drain pipes, drain rods, timber, sewer ironwork, lime, cement, cartage, ballast, scavenging, paints, gas mantles, printing, &c., for the borough council.—Mr. J. A. D. Milne, town clerk.

GOOLE.—February 21st.—For the supply of road materials, stoneware pipes, Portland cement, tar-macadam, brough gravel, coal, paints, bricks, and disinfectants, for the urban district council.—Mr. C. G. Bradley, engineer and surveyor.

MANSFIELD.—February 23rd.—For the supply of granite, slag, macadam, kerbing, channelling, Portland cement, stoneware pipes, sewer ironwork and castings, ironmongery, &c., for the corporation.—Mr. J. Harrop White, town clerk.

FINSBURY.—February 26th.—For the supply of fodder, blacksmiths' work, castings, granite patent stone, cement, stoneware goods, wood-paving blocks, leather hose, brushes, brooms, tools, &c., for the borough council.—Mr. George Whitehead Preston, town clerk.

WESTMINSTER.—February 26th.—For the supply of ballast and sand, boots, bricks, brooms, asphalte, macadam, granite, and wood carriage and footway repairs, cement, coal, disinfectants, flags, granite, granite setts, harness, gullies, sewerage works, shovels, steam road roller hire, stoneware goods, &c., for the city council.—Mr. John Hunt, town clerk.

SOUTHEND-ON-SEA.—February 26th.—For the supply of stoneware pipes, flints, bricks, timber, ironmongery, paints, cement, team labour, tar paving, tar-macadam, iron castings, road materials, harness, brooms, &c., for the corporation.—Mr. H. J. Worwood, town clerk.

WINCHESTER.—February 27th.—For the supply of broken granite, chippings, brooms, Portland cement, coal, coke, stoneware pipes, and concrete paving slabs, for the corporation.—Mr. Thomas Holt, town clerk.

SOUTH SHIELDS.—March 2nd.—For the supply of Northumberland whinstone, Fifeshire whinstone, Aberdeen and Norwegian granite, slag, Portland cement, flags, disinfectants, sewer boots, sanitary pipes, timber, iron, &c., for the corporation.—Mr. Leslie Roseveare, borough engineer.

GUILDFORD.—March 6th.—For the supply of broken granite, chippings, Durax cubes, cast-iron pipes, brooms, flints, disinfectants, horse hire, cartage, iron castings, oils, pitch, tar, Portland cement, &c., for the corporation.—Mr. A. D. Jenkins, town clerk.

## Miscellaneous.

DARLINGTON.—February 12th.—For the supply of sanitary pipes, gully grates, cement, brooms, shovels, road material and steam labour, whinstone, slag, &c., for the rural district council.—Mr. C. H. Leach, clerk.

BRADFORD.—February 14th.—For the supply of road metal, pitch and oil, gullies, earthenware pipes, timber, cartage, &c., for the corporation.—Mr. W. H. S. Dawson, city engineer.

BANGOR.—February 16th.—For resetting beds of retorts, for the urban district council.—Mr. B. Mitchell, Gasworks, Bangor, co. Down.

COLCHESTER.—February 17th.—For the cleansing of the cattle market, for the corporation.—Mr. H. Goodyear, borough engineer and surveyor.

ACTON.—February 20th.—For the supply of works and goods, for the urban district council.—Mr. W. Hodson, clerk.

MALVERN.—Offers wanted for fire appliances, including two-horse tender, with 50-ft. escape, small manual engine and fire-escape.—Mr. W. Osborne Thorpe, surveyor and chief officer.

# TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BERKSHIRE.—For the erection of a school at Thatcham, for the education committee:—

| | Schedule. | |
|---|---|---|
| G. Elms, Newbury * ... ... ... ... ... | A | £2,670 |
| | B | 988 |
| | | £3,658 |
| | C | 140 |
| H. Baker & Sons, Horsham ... ... ... ... ... | | £2,646 |
| | | 1,022 |
| | | £3,668 |
| | | 123 |
| Bosher and Sons, Cholsey, Berks ... ... ... ... | | £2,656 |
| | | 1,062 |
| | | £3,719 |
| | | 166 |
| Hoskings Brothers, Newbury ... ... ... ... | | £2,769 |
| | | 1,004 |
| | | £3,773 |
| | | 121 |
| A. Cox & Sons, Abingdon ... ... ... ... ... | | £2,872 |
| | | 966 |
| | | £3,838 |
| | | 146 |
| M. Payne & Co., Bracknell ... ... ... ... ... | | £2,813 |
| | | 1,078 |
| | | £3,892 |
| | | 122 |
| Y. J. Lovell & Son, Gerrards Cross ... ... ... | | £2,876 |
| | | 1,051 |
| | | £3,927 |
| | | 121 |
| McCarthy E. Fitt, Reading ... ... ... ... ... | | £2,887 |
| | | 1,078 |
| | | £3,965 |
| | | 134 |
| Collier & Catley, Limited, Reading ... ... ... ... | | £2,900 |
| | | 1,069 |
| | | £3,969 |
| | | 120 |
| Smallbone & Son, Streatley-on-Thames ... ... ... | | £2,959 |
| | | 1,129 |
| | | £4,088 |
| | | 138 |

BOSTON.—The following tenders for granite and slag for the ensuing year have been accepted by the rural district council:—

Granite.—British Macadams, Limited, 400 tons; Lavender & Bateman, 2,140 tons; Enderby and Stoney Stanton, 5,515 tons; Groby Granite Company, 2,994 tons; Ellis & Everard, Limited, 2,561 tons; total, 13,610 tons. The tender of the Holwell Iron Company, Limited, has been accepted for what slag of all sizes was required both for stoned and unstoned roads.

CHELTENHAM. For the construction of concrete filter tank and filter-house, for the corporation.—Mr. J. S. Pickering, borough engineer:—

| | Filter tank. | Filter house. | Total |
|---|---|---|---|
| C. Moss & Co., Loughborough | £1,279 | £1,047 | £2,327 |
| Hobrough & Co., Gloucester | 1,262 | 1,017 | 2,279 |
| J. Wilson & Sons, Birmingham | 1,177 | 1,044 | 2,221 |
| T. Smart, Nottingham | 1,162 | 950 | 2,103 |
| Childs & Withers, Worcester | 1,112 | 958 | 2,070 |
| J. Riley, Cheltenham | 1,031 | 950 | 1,982 |
| A. Braithwaite & Co., Leeds | 1,080 | 892 | 1,973 |
| Collins & Godfrey, Tewkesbury | 1,061 | 904 | 1,965 |
| H. Pittard & Son, Langport | 1,020 | 934 | 1,955 |
| W. T. Nicholls, Gloucester | 1,015 | 913 | 1,929 |
| W. Bowers & Co., Hereford | 1,034 | 890 | 1,925 |
| M. Williams & Co., Cheltenham | 1,010 | 900 | 1,910 |
| A. Hyslop, Manchester | 943 | 949 | 1,892 |
| T. J. Mason, Stourbridge | 903 | 881 | 1,785 |

FARNHAM.—For treating certain roads with tar, for the urban district council.—Mr. R. W. Cass, surveyor:—

Farnham Road Construction Company, 1½d. per yard—£100.

FAVERSHAM.—For the construction of sewage and storm-water tanks, settling tank, percolating filters, &c., for the corporation.—Mr. S. P. Andrews, borough surveyor:—

| | |
|---|---|
| Pethick Brothers, Plymouth | £14,999 |
| O. Wright & Co., South Wigston | 14,902 |
| C. Ford, Esq., Willesden Junction | 14,166 |
| Paramors, Limited, Margate | 13,979 |
| Kemp Brothers, Rainham, Kent | 13,284 |
| T. W. Pedrette, Enfield | 12,971 |
| P. Wilson & Co., Wendling | 12,462 |
| G. Bell & Sons, Limited, Tottenham | 12,372 |
| D. T. Jackson, Barking* | 11,838 |

GREENWICH.—For a heating installation at the Morden-terrace School, for the London County Council:—

| | |
|---|---|
| Stevens & Sons, Southwark-bridge-road | £980 |
| Palowkar & Sons, Queen-street | 960 |
| Hayward Brothers & Eckstein, Limited, Borough | 865 |
| J. Yetton & Co., Limited, Limehouse | 835 |
| Ashwell & Nesbitt, Limited, Bedford-row | 832 |
| Cannon & Hefford, Peckham | 798 |
| Brightside Foundry & Engineering Company, Limited, Victoria-street | 797 |
| G. & E. Bradley, Lever-street | 797 |
| W. G. Cannon & Sons, Limited, London-road† | 795 |

Architect's estimate, £850.

GUILDFORD.—For the erection of twenty cottages, for the corporation.—Mr. C. G. Mason, borough engineer:—

| | 8 houses, Borough Surveyor's Plans. | 12 houses, Mr. Capp's Plans. | Total. |
|---|---|---|---|
| J. L. Aldridge, Camberley | £1,402 | £1,917 | £3,320 |
| G. Greenwood & Son, Halifax | 1,392 | 2,040 | 3,432 |
| Drowley & Co., Woking* | 1,388 | 2,290 | 3,658 |
| W. Bullen, Guildford | 1,699 | *2,032 | *3,731 |
| Turner & Kersley, Blackwater | 1,597 | 2,395 | 3,992 |
| E. Ricks, Woking | 1,712 | 2,345 | 4,057 |
| T. Carn, Guildford | 1,719 | 2,385 | 4,104 |
| C. & S. Allwork, Woking | 2,067 | 2,133 | 4,200 |
| F. Sandell & Son, Worthing | 1,726 | 2,578<br>2,694 | 4,304 |
| W. Sanderson | 1,655 | 2,600 | 4,255 |
| M. Wells & Co, Aldershot | — | — | 4,463 |
| F. A. Renn, Camberley | 1,805 | 2,732 | 4,537 |
| R. Smith, Guildford | 1,839 | 2,784 | 4,623 |
| Playfair & Toole, Southampton | 1,975 | 2,979 | 4,954 |
| W. S. Williams & Co., Colchester | 2,143 | 3,320 | 5,463 |
| Wakeham Brothers, Plymouth | 2,377 | 3,488 | 5,865 |
| Hilyer & Cripps, West Drayton | — | 2,940 | — |

HAINAULT FOREST.—For the renewal of the roofs of the refreshment buildings and Foxburrows cottages at Hainault Forest, for the London County Council:—

| | |
|---|---|
| Hall & Co., Croydon, Limited, Croydon | £408 |
| Roberts, Adlard & Co., Bermondsey-wall | 399 |
| Bingley, Son & Follit, Limited, Millbank Slate Wharf | 350 |
| J. Williams & Co., Rotherhithe-street | 304 |
| J. J. Etridge, junr., Limited, Bethnal-green* | 300 |

HALE.—For the construction of a sewer, for the urban district council:—

| | |
|---|---|
| H. A. Jones, Wrexham | £706 |
| J. Hamilton & Son, Altrincham | 670 |
| J. Randall, Salford | 657 |
| W. F. Meikle, Liverpool | 649 |
| G. Bozson, Ashton-upon-Mersey | 614 |
| W. M. Worthington, Limited, Manchester | 605 |
| W. Watson, Junr., Altrincham | 600 |
| S. Johnson & Son, Manchester | 597 |
| W. Snape & Sons, Eccles | 584 |
| Whittaker Brothers, Fluxton* | 493 |

HASTINGS.—The tender of Tangyes, Limited, to supply and fix gas engines in place of the existing steam plant at Filshaw pumping station for £2,960 has been accepted by the corporation.

HULL.—For the erection of a school, for the education committee:—

| | |
|---|---|
| T. Gostes & Sons, Hull | £8,978 |
| G. H. Panton & Sons, Limited, Hull | 8,460 |
| G. Houlton & Sons, Hull | 8,100 |
| J. H. Wood, Leeds | 8,033 |
| J. H. Fenwick, Hull | 8,000 |
| J. Simpson & Sons, Hull | 7,900 |
| Quibell, Son & Greenwood, Hull | 7,800 |
| F. Bilton, Hull | 7,849 |
| F. Singleton, Hull | 7,770 |
| C. Greenwood, Hull | 7,710 |
| J. T. Levitt, Hull | 7,659 |
| M. Harper, Hull | 7,648 |
| P. T. Kottlewell, Hull* | 7,300 |

KEIGHLEY.—For laying of earthenware pipes, construction of manholes, &c., for the rural district council.—Mr. T. Burton, surveyor:—

| | |
|---|---|
| T. E. Sudgen, Keighley | £351 |
| F. Ratcliffe, Oxenhope | 329 |
| M. Arundel, East Ardsley | 315 |
| McGoun & Simons, Keighley | 312 |
| B. Tomlinson, Keighley | 308 |
| H. V. Robinsons, Limited, Keighley | 306 |
| Ward & Tetley, Bradford | 304 |
| W. Baker, Keighley | 288 |
| J. Brown & Sons, Bingley | 286 |
| J. Barritt, Crosshills, via Keighley | 284 |
| R. Naylor & Sons, Bradford | 279 |
| W. Morley & Sons, Keighley | 271 |
| J. & W. Potter, Bingley | 267 |
| J. Parker, Horsforth, near Leeds | 265 |
| R. Wood, Bingley | 256 |
| T. Atkinson, Eastburn, near Keighley | 249 |
| Pickles Brothers, Oxenhope* | 234 |

LAMBETH.—For supply of five slop vans, for the borough council:—

| | Per van. |
|---|---|
| Stagg & Robson, Limited, Selby | £54 |
| E & H. Hora, Limited, Peckham-road | 50 |
| Belle Isle Company, Limited, Islington | 50 |
| G. Rowe & Son, Limited, Lower Edmonton | 49 |
| East Yorkshire and Crosskills Cart and Wagon Company, Limited, Beverley, Yorks | 48 |
| J. Buckingham, Limited, Birmingham | 48 |
| Eagle Engineering Company, Limited, Warwick | 47 |
| J. T. Whittome & Co., Tavistock | 45 |
| Islington Van Works, King's Cross | 45 |
| Humphries & Sons, Chippenham | 43 |
| Bristol Wagon and Carriage Works Company, Limited, Bristol | 39 |
| J. Smith & Sons, Wolverhampton | 37 |
| Horsfall Destructor Company, Limited† | 37 |

LEWISHAM.—For paving footways with artificial stone:—

| | Per yard super. |
|---|---|
| | *s. d.* |
| Atlas Stone Company, Limited | 4 2 |
| Thames Stone Company, Limited | 4 2 |
| J. Wainwright & Co., Limited | 4 1 |
| Gibson & Co. | 3 10½ |
| W. Pearce† | 3 8 |

LONDON.—For the erection of conveniences at Victoria-embankment Gardens, for the County Council:—

| | |
|---|---|
| F. & H. F. Higgs, Herne-hill | £1,460 |
| Charles Wall, Limited, Lloyd's-avenue | 1,420 |
| Rowley Brothers, Wood-green | 1,381 |
| Holloway Brothers (London), Limited, Lambeth | 1,370 |
| J. & C. Bowyer, Limited, Upper Norwood | 1,348 |
| Featherole Brothers, Norbury | 1,325 |
| W. L. Holloway, Deptford | 1,320 |
| E. Lawrance & Sons, Limited, City-road | 1,288 |
| Wm. Johnson & Co., Limited, Wandsworth-common* | 1,216 |

LONDON.—For the supply of 50 car sets of truss plates, for the County Council:—

| | |
|---|---|
| S. H. Heywood & Co., Limited, Reddish | £1,150 |
| East Ferry-road Engineering Works Company, Limited, Millwall | 760 |
| Brush Electrical Engineering Company, Limited, Loughborough | 700 |
| United Electric Car Company, Limited, Preston | 650 |
| Hurst, Nelson & Co., Limited, Motherwell* | 487 |

Estimate of the chief officer of tramways, £500.

LONDON.—For the supply of (1) about 3,550 tons of track rails and fastenings, and (2) about 1,060 tons of slot rails, and 400 tons of conductor rails required in connection with the construction or reconstruction of further portions of the London County Council's tramways, and for maintenance purposes:—

Track Rails and Fastenings.—Rails of Carbon Steel.

| | |
|---|---|
| Cammell, Laird & Co., Limited, Sheffield | £34,848 |
| Barrow Haematite Steel Company, Limited, Barrow-in-Furness | 28,051 |
| P. & W. MacLellan, Limited, Glasgow (manufactured by the North Eastern Steel Company, Limited, Middlesbrough), alternative tender | 27,260 |
| Bolckow, Vaughan & Co., Limited, Middlesbrough | 26,165 |
| W. Scott, Limited, Leeds | 24,867 |
| P. & W. MacLellan, Limited, Glasgow (manufactured at Phœnix Works, Ruhrort, Germany) | 22,189 |
| Scholey & Co., Limited, Queen Victoria-street (manufactured at Phœnix Works, Ruhrort, Germany) | 21,848 |
| Bolling & Lowe, Laurence Pountney-hill (manufactured at Phœnix Works, Ruhrort, Germany) | 21,848 |

Chief engineer's estimate, £24,612.

Sandberg High Silicon Steel Rails.

| | |
|---|---|
| Cammell, Laird & Co., Limited | £36,623 |
| P. & W. MacLellan, Limited (manufactured by North-Eastern Steel Company, Limited, Middlesbrough), alternative tender | 29,035 |
| Bolckow, Vaughan & Co., Limited | 27,940 |
| W. Scott, Limited† | 26,592 |
| P. & W. MacLellan, Limited | 22,916 |
| Scholey & Co., Limited | 22,563 |
| Bolling & Lowe | 22,563 |

Chief engineer's estimate, £26,768.

Slot Rails and Conductor Tees.

| | |
|---|---|
| Bolling & Lowe, Limited, Laurence Pountney-hill (manufactured at Phœnix Works, Ruhrort, Germany) | £13,992 |
| Steel, Peech & Tozer, Limited, Sheffield | 13,926 |
| P. & W. MacLellan, Limited, Glasgow (manufactured by North-Eastern Steel Company, Limited, Middlesbrough) | 13,405 |
| W. Scott, Limited, Leeds | 12,848 |
| Frodingham Iron and Steel Company, Limited, Scunthorpe† | 12,607 |

Chief engineer's estimate, £12,345.

PERTH.—For laying setts and channelling, for the corporation:—

Taylor Brothers, Perth.

SHAPSHED.—The tenders for scavenging were considered at the recent meeting of the urban district council. In reply to a question, the clerk said that during the last three years the terms of the contract were: First year £166, second year £172, third year £178.—The tenders were as follows:—Briers Brothers,* £170 per year, for three years; Tomlin Brothers, £180 for one year, or £185 per year for three years.

SOUTHWOLD.—For the erection of a mortuary, for the corporation—Mr. B. King, borough surveyor:—

| | |
|---|---|
| F Bennett, Ipswich ... ... ... ... ... ... | £110 |
| I. Thompson, Southwold ... ... ... ... ... | 60 |
| B. H. Carter, Southwold ... ... ... ... | 59 |
| W. B. Miller, Southwold* ... ... ... ... | 54 |

| BROKEN KENT FLINTS. | Per cubic yard. s. d. |
|---|---|
| W. R. Cunis, Limited, London ... ... ... ... | 6 0 |
| C. W. Parker, Bradwell-on-Sea ... ... ... ... | 5 6 |
| S. West, Limited, London... ... ... ... | 5 5 |
| Smeed, Dean & Co, Sittingbourne* ... ... ... | 5 3 |

SPRINGFIELD PARK.—For the erection of oak boundary fencing along Spring-hill, for the London County Council:—

| | |
|---|---|
| W. Bowen, Halstead, near Sevenoaks, Kent ... ... ... | £102 |
| B. Horton & Son, Lewisham-bridge ... ... ... | 101 |
| J. Stenning & Son, Limited, Clement's-lane ... ... | 100 |
| W. Stenning & Son, Redhill, Surrey ... ... ... ... | 99 |
| J. & S. Agate, Limited, Horsham, Sussex † ... ... ... | 88 |

Estimate of the chief officer of the parks department, £101.

WATFORD.—For works of kerbing, channelling, &c., for the rural district council.—Mr. E. Lailey, surveyor:—

| | Mascot Wood Road. | Radlett Roads. |
|---|---|---|
| Jaggard, Bushey ... ... ... ... ... ... | £986 | £1,917 |
| King, Watford ... ... ... ... ... ... | 1,045 | — |
| Brown, Watford ... ... ... | 1,009 * | 1,893 |
| Halsey, Edgware ... ... ... ... ... ... | 1,143 | 1,823 |
| Williams, St. Albans ... ... ... | — | 1,664* |
| Bracey & Clarke, Watford ... ... ... ... | 1,060 | 1,815 |
| Bailey & Sons, Bushey Heath ... ... | 1,202 | 1,903 |
| Pitkin, Watford ... ... ... ... | 1,263 | — |
| Surveyor's estimate ... ... ... | 1,200 | 1,808 |

## MEETINGS.

*Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.*

FEBRUARY.

9.—Institution of Civil Engineers (Students' Meeting). Lecture by Captain H. Lax'l Sankey, R.E., M.INST.C.E., on "Steam Turbines: Some Practical Applications of Theory." 8 p.m.

9.—Institution of Municipal and County Engineers. Special General and Metropolitan District Meetings, Caxton Hall, Westminster, 7.30 p.m.

10.—Royal Sanitary Institute. Sessional Meeting at Nottingham.

12.—Institution of Mechanical Engineers. Graduates' Lecture: "Recent Researches at the National Physical Laboratory," by Dr. R. E. Stanton, Acting Director of the Laboratory. 8 p.m.

12.—Institute of Sanitary Engineers: Messrs. A. Alban H. Scott and E. C. Davies on "Hospitals and Sanatoria." Royal United Service Institution, Whitehall. 8 p.m.

12.—Junior Institution of Engineers. Combined Meeting with the Architectural Association at 18 Tufton-street, Westminster. Paper on "Bridges," by Mr. Paul Waterhouse, M.A., F.R.I.B.A. 7.30 p.m.

13.—Institution of Civil Engineers. Papers to be further discussed: "The Water supply of the Watwatersrand." By D. C. Leitch, M.INST.C.E., "Investigations Relating to the Yield of a Catchment Area in Cape Colony." By E. C. Bartlett, M.INST.C.E. 8 p.m.

16.—Institution of Civil Engineers. Vernon Harcourt Lecture to Students on "Works for the Prevention of Coast Erosion." By W. T. Douglas, M.INST.C.E. 8 p.m.

16.—Edinburgh Architectural Association. Associates' Annual Dinner. 7.30 p.m.

16.—Institution of Mechanical Engineers. Annual General Meeting; Discussion on Annual Report and Note by President on Proposal for Examinations. 8 p.m.

16.—Royal Institution. Sir John H. A. Macdonald on "The Road: Past, Present, and Future." 9 p.m.

17.—Junior Institution of Engineers. Annual Dinner, Hotel Cecil. 7 p.m.

24.—Institution of Municipal Engineers. Council Meeting. 3 p.m.

24.—Institution of Municipal Engineers. General Meeting in London; discussion on "Superannuation and Security of Tenure," the Surveying Association of Local Government Officers and its Pr[illegible]

28.—Institute of Sanitary Engineers. Prof. Henry Adams, M.INST.C.E., M.I.M.E., on "Sanitary Building Construction." Caxton Hall, Westminster. 8 p.m.

MARCH.

11.—Institute of Sanitary Engineers. Mr. Percival M. Frazer, A.M.I.C.E., on "The Modern Home." Caxton Hall, Westminster. 8 p.m.

## APPOINTMENTS OPEN.

### TEMPORARY TRACING CLERK.

The City Engineer of Coventry has a vacancy for a Tracing Clerk. Applicants must be neat and expeditious draughtsmen. Engagement for six months if suitable. Wages £2 per week.

Applications, with copies of three testimonials, to be sent to the undersigned by the 14th February, 1912, endorsed "Tracing Clerk."

J. E. SWINDLEHURST,
City Engineer and Surveyor.

St. Mary's Hall,
Coventry,
February 1, 1912.

AGENTS required in unrepresented districts for the Imperial Accident Insurance Co., Ltd. Est. 1878. Horses Insured against Death from Accident or Disease. Mares for Foaling and Loss of Foals. Farmers' Liability for Accidents to Labourers, Servants, and Workmen's Compensation. Claims paid, £500,000. Address Agency Manager, 17 Pall Mall East, London, S.W.

### DERBYSHIRE COUNTY COUNCIL.

APPOINTMENT OF DISTRICT MAIN ROAD SURVEYOR.

Applications are invited for the post of District Surveyor for the Derby Main Road District. Candidates must be between 25 and 45 years of age, and must have had experience in the direct maintenance of a considerable mileage of macadamised roads.

Salary (which is inclusive of travelling expenses) at the rate of £200 per annum, rising by increments of £10 per annum (subject to the recommendation of the County Surveyor) to £250 per annum. A further allowance of £10 per annum will be made in respect of office. Stationery, books, postages, &c., will be provided by the County Council.

Forms of application, and particulars of duties and terms of engagement, may be obtained from the County Surveyor, at the County Offices, and will be forwarded through the post on receipt of a stamped addressed foolscap envelope.

Applications, endorsed "District Surveyor," must be upon the Form provided, and must reach me not later than 10 a.m. on Friday, the 16th day of February next.

Canvassing in any form will be a disqualification.

Dated this 31st day of January, 1912.

N. J. HUGHES-HALLETT,
Clerk of the Derbyshire County Council.

County Offices, Derby.

### BOROUGH OF DONCASTER.

*URBAN DISTRICT COUNCIL.*

APPOINTMENT OF ROAD FOREMAN.

Applications are invited for the position of Road Foreman and Sewer Inspector.

Applicants must be under 45 years of age, and have held a post involving a practical knowledge of paving with stone setts and wood blocks, and the preparation and laying down of tarred and water-bound macadam, and works connected with highways and sewers, including maintenance, the working and management of steam rollers and scarifiers, and the control of workmen.

Salary £150 per annum, rising £5 yearly to £150 per annum.

List of duties may be obtained on application to the undersigned.

Canvassing [illegible] any candidate will disqualify.

Applications, in candidate's own handwriting, endorsed "Road Foreman," stating age and previous experience, accompanied by copies of not more than three recent testimonials (which will not be returned), to be sent in not later than noon of Friday, the 23rd instant, to the undersigned.

R. A. H. TOVEY,
Town Clerk.

1 Priory-place,
Doncaster.
February, 1912.

### COUNTY BOROUGH OF HALIFAX.

SEWAGE WORKS MANAGER.

The Highways Committee invite applications for the position of Manager of the Sewage Disposal Works, Salterhebble, at a salary of £200 per annum.

List of duties can be obtained on application to Mr. James Lord, M.INST.C.E., Borough Engineer, to whom applications, endorsed "Sewage Works Manager," with copies of not more than three recent testimonials, are to be sent on or before Thursday, the 15th instant.

Canvassing in any form will be a disqualification.

(By order)

PERCY SAUNDERS,
Town Clerk.

Town Hall,
Halifax.
February 1, 1912.

ENGINEERING PUPIL. The Borough Engineer of Bridlington, Mr. J. R. Matthews, A.M.I.C.E., F.G.S., has a vacancy in his office for a Pupil (premium required).—For particulars apply to him, Borough Engineer's Office, Town Hall, Bridlington.

ARTICLED PUPIL. County Surveyor has vacancy in his Office. Apply Box 1,128, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

## PUBLICATIONS FOR SALE.

MINUTES OF PROCEEDINGS, Inst. C.E. Volumes from 1901 to 1911, inclusive, for Sale. £5.—Wood, 11 Park-row, Nottingham.

## TENDERS WANTED.

### BOROUGH OF GUILDFORD.

The Town Council invite Tenders for the Supply of the following Materials, for a period of twelve months ending March 31st, 1913:—

1. Broken Granite, Chippings, and Durax Cubes.
2. Cast-iron Pipes.
3. Brooms and Brushes.
4. Flints.
5. Galvanised Steam Tubes.
6. Disinfectants.
7. Horse Hire and Cartage.
8. Iron Castings.
9. Ironmongery.
10. Oils.
11. Pitch and Tar.
12. Portland Cement and Lias Lime.
13. Steam, House Coal, Coke, Anthracite and Wood.
14. Stone-ware Pipes.
15. Shoeing.
16. Printing and Stationery.

All particulars, Specifications, Schedules and Forms may be obtained on application to the Borough Engineer, Mr. C. G. Mason, ASSOC.M.INST.C.E., Tuns Gate, Guildford.

Tenders, in separate envelopes, sealed and endorsed on the outside "Tender for ——," must be delivered to me, the undersigned, before 12 noon on Wednesday, the 6th day of March, 1912. The Council do not bind themselves to accept the lowest or any Tender.

A. D. JENKINS,
Town Clerk.

Town Clerk's Office,
Bridge-street,
Guildford.
February 5, 1912.

### DRIFFIELD RURAL DISTRICT COUNCIL.

*HIGHWAY DEPARTMENT.*

TENDERS FOR ROAD MATERIAL.

The Highway Committee of the Driffield Rural District Council invite Tenders for the Supply, for the year ending 31st March, 1913, of the following Materials:—

About 7,000 tons Whinstone.
2,500 tons Broken Slag.
600 tons Sea Cobbles.
300 tons Sea Gravel.
150 tons Tarred Chippings.

The Materials to be delivered at the Several Railway Stations and Wharves of the District.

Particulars and Forms of Tender can be obtained on application to the undersigned (for which stamped addressed envelope must be sent), and to whom Tenders, endorsed "Tender for Materials," are to be sent not later than Saturday, the 2nd day of March, 1912.

The Committee do not bind themselves to accept the lowest or any Tender.

T. CASSON BEAUMONT, C.E.,
Surveyor.

Driffield.
February 1, 1912.

### COUNTY BOROUGH OF BLACKPOOL.

TO IRONFOUNDERS AND OTHERS.

The Highway Committee invite Tenders for the Supply and Delivery at about 500 Cast-iron Standards, and about 1,400 lineal yards of Wrought-iron Railing, in strict accordance with a Specification, Drawing, and Form of Tender, which can be obtained from the undersigned on deposit of Half-a-Guinea.

Sealed Tenders, endorsed "Tender for Cast-iron Standards and Wrought-iron Railing," to be delivered not later than 10 a.m. on Saturday, the 17th instant.

The Committee do not bind themselves to accept the lowest or any Tender.

JOHN S. BRODIE, M.INST.C.E.,
Borough Engineer.

Town Hall, Blackpool.
February 6, 1912.

### COUNTY BOROUGH OF NORTHAMPTON.

The Corporation invite Tenders for the Supply of the following Materials for a period of twelve months ending March 31st, 1913:—

1. Broken Granite.
2. Granite Kerb, Setts, &c.
3. Artificial Stone Paving.
4. Stoneware Pipes, Gullies, &c.
5. Portland Cement and Lime.
6. Ironmongery, Wrought-iron, Steel, &c.
7. Tar-paving, Tar-macadam.
8. Blue Bricks, Local Lime, Gravel and Sand.
9. Brooms and Brushes.
10. Coal and Coke.
11. Iron Castings.
12. Timber.
13. Team Labour.

Specifications, Schedules and Forms of Tender may be obtained on application to Mr. Alfred Fidler, M.INST.C.E., Borough Engineer, on and after Monday, February 5th.

Sealed Tenders, endorsed "Yearly Contracts," addressed to the undersigned, to be delivered to this Office on or before 12 o'clock noon on Saturday, the 17th December, 1912.

The Corporation do not bind themselves to accept the lowest or any Tender.

HERBERT HANKINSON.
Town Clerk.

Guildhall,
Northampton.
January 31, 1912.

### BOROUGH OF SOUTHEND-ON-SEA.

GENERAL STORES.

The Corporation of Southend-on-Sea invite Tenders for the Supply of the following Articles for a period of one year from April 1st, 1912:—

No. 1.—Stoneware Pipes, Bends, &c.
No. 2.—Flints, Bricks, Gravel, &c.
No. 3.—Timber.
No. 4.—Ironmongery.
No. 5.—Paints, Oils and Colours.
No. 7.—Cement, Lime and Chalk.
No. 8.—Team Labour.
No. 10.—Tar-paving and Tar-macadam.
No. 11.—Iron Castings.
No. 12.—Granite Kerb and Channel.
No. 13.—Broken Guernsey Granite.
No. 14.—Broken Granite.
No. 15.—Pitch and Creosote Oil.
No. 16.—Harness Supplies and Sundries.
No. 17.—Brooms and Brushes.
No. 18.—Iron and Steel.
No. 19.—Disinfectants.

Forms of Tender may be obtained upon application to Mr. E. J. Elford, M.I.M.E., Borough Surveyor, Southend-on-Sea, on and after the 12th inst.

Tenders, endorsed "Yearly Contracts," to be delivered at my office not later than nine o'clock a.m. on Monday, the 26th inst.

The Corporation will not be bound to accept the lowest or any Tender.

(By order)
H. J. WORWOOD,
Town Clerk.

Town Clerk's Office,
Southend-on-Sea.
February 5, 1912.

### FRIERN BARNET URBAN DISTRICT COUNCIL.

ROAD MAKING.

The above-named Council invite Tenders from experienced Road and Sewer Contractors for Kerbing, Channelling, Making Up, &c., Torrington Park (Eastern Portion).

Forms of Tender and full particulars can be obtained from Mr. E. J. Reynolds, A.M.I.C.E., the Council's Engineer and Surveyor.

Sealed Tenders should be delivered to me on or before noon on the 22nd day of February, 1912.

The Council does not bind itself to accept the lowest or any Tender.

(By order)
EDWIN GOODSHIP,
Clerk to the Council.

Council Offices,
The Priory,
Friern Barnet, N.
February 5, 1912.

# The Surveyor

And Municipal and County Engineer.

Vol. XLI. FEBRUARY 16, 1912. No. 1,048.

## Minutes of Proceedings.

**Fish Life and Tarred Roads.**

The valuable paper read by Mr. W. J. A. Butterfield, M.A., F.I.C., ASSOC.INST.C.E., before the Institution of Municipal and County Engineers last Friday has gone far to make clear the exact position of the highway surveyor as regards his responsibility for any harm which fish may, or might, suffer owing to the pollution of their streams and ponds by water charged with noxious matters derived from the roads. We use the expression "has gone far" in preference to "goes far," because we wish to convey the impression that the position was made clear after the discussion on the paper, a discussion which added valuable opinions and useful statements of experience to the array of facts so carefully presented in the paper itself. Mr. Butterfield's study points fairly definitely to the possible sources of dangerous pollution, and it seems, as a matter of judgment and common sense, that it can only be when several of these act in concert that there can be any likelihood of the pollution being sufficiently copious and sufficiently deadly to cause actual loss of life among the fish in streams adjoining roads which have been tar-washed; or otherwise treated, in order to keep down the dust or to prevent its formation. One of the most encouraging features of the position consists in the fact that the ingredients which are most harmful to fish are precisely those which are the least desirable from the point of view of the road engineer. The kind of tar which is best for the roads is the kind which is least likely to be washed off, and, if it be washed off, the least likely to be dissolved quickly, and, again, if dissolved or disseminated in the water, the least likely to poison the fish. This consideration is, of course, subject to the reservation that we are not contemplating the use on the roads of hard, insoluble pitch by itself. Mr. Butterfield made some "parallel" experiments with agricultural fertilisers, but regards the risk of fish being poisoned by such manures as being negligible in all ordinary circumstances. A careful farmer very naturally takes every reasonable precaution to prevent the valuable materials for which he has to pay good money from being washed off his land into the streams, and before any considerable quantity of the stuff could reach the stream itself there would be an undesirable concentration of it in ditches near the streams and on flat ground at the foot of slopes, so there is a margin of caution. Similarly, the surveyor desires to prevent the loss of material which would be indicated by pollution on a serious scale. This applies to cases of bodily removal of the tar as distinguished from the removal of some of its less desirable constituents, but in all probability the latter process will never kill fish, or will kill them so seldom that it does not matter, the life assurance premium would be so very small. This view is held by Mr. A. Dryland, who, as surveyor of a county in which there are a considerable number of streams, the county of Surrey, is one of those specially interested in the subject.

In the course of the discussion on Mr. Butterfield's paper, Mr. Dryland stated that he had only come across two instances of fish being killed; in one case crude tar was used in very large quantities shortly before a thunderstorm, and in the other case the rain washings from unrolled tar-macadam flowed into a pond. This suggests that it may be desirable to take more care to prevent the pollution of a pond than to protect a stream, for in a stream the natural instinct of the fish is to fall away downstream, or to head upstream, in order to avoid the area of worst pollution. At the same time it must not be overlooked that the trout is, according to Mr. Butterfield's experiments, a fish which is more easily injured by the noxious matters with which he experimented than are most of the other species on his list; and trout streams are specially valued by anglers. The same considerations apply with even greater force in the case of that somewhat rare fish the grayling. Comparatively few streams suit this fish, which is highly valued as giving good sport with the fly; and special care should therefore be taken when roads are being tarred near streams which are known to contain it. We are not surprised to see the grayling at the head of the list of susceptibles, since it is a fish which is far less tenacious of life than most. The position of the tench and carp at the bottom of the list is also suggestive of the general correctness of Mr. Butterfield's experiments; but, as bearing upon the question of the value of the experiments as a guide to what happens in the ponds and streams, it may be remarked that the best way to stock a pond with tench from waters some miles away is to carry them in damp grass, and not in bait cans or similar vessels filled with water. The fact that Mr. Taylor, county surveyor of Hampshire, where fishing rights are

highly valued, knows of no authentic case of fish being killed by the use of tar is so much to the good, and even more important is the fact that, with the two exceptions already cited, Mr. R. J. Thomas, county surveyor of Bucks, gives similar testimony covering a period of some eight years. Mr. Thomas has used—that is, has bought—crude tar, but he has heated it thoroughly before putting it on the road. Mr. Thomas is an advocate of the method of vigorous brushing in, which has doubtless advantages from the present standpoint, as well as on other grounds which are not now under consideration. At the same time we do not think that any disadvantage which the tar film may possess in this respect—liability to pollute streams and ponds—is sufficient, having regard to the facts adduced, to discount its importance in those counties where it has been used with success.

In addition to precautions which may be taken to avoid the use of tars containing considerable proportions of noxious matters, there are three other main elements of safety — namely, treatment of the surface, treatment of the ditches and outlets, and the rapid completion of each stretch of road before the weather changes for the worse. The last named is recognised as of importance, but the value in this respect of the latest possible information by telegraph from the Meteorological Office is, we think, underrated. As regards the other two, we briefly outlined both of them in our annual issue of 1911, p. 103, January 27th, where we said: "It seems desirable . . . to take special precautions when considerable stretches of road are being tarred at one time. Sweeping very fine dust on to the freshly tarred surface would seem to be one of those precautions, and partly blocking ditches and small watercourses another." We still hold the same opinion. Fine dust sticks very closely to the fresh tar, and, we believe that it helps to form a layer considerably more effective in shedding rain water and in resisting the pounding of heavy rain than a surface treated with sand alone, or with sand and chips. As regards the partial blocking of the ditches, amounting to the construction of rough filters, this is precisely, we now find, the precaution which has been adopted in Buckinghamshire by Mr. Thomas, who uses rough filters of gravel and sand. Our own idea was that, in addition to any filtering effect, the result of partly blocking ditches and outlets would be that a heavy shower would reach the streams gradually, and that the strength of the solution of noxious material in the stream itself would thereby be reduced. This, we think, cannot be gainsaid. The matter has, we hope, been studied with an earnest attention, which will satisfy the keenest anglers as to the capacity of surveyors to deal with any trouble that may threaten. Mr. H. Percy Boulnois, speaking in the discussion, said that words which were used in the paper were enough in themselves to kill fish. There is many a true word spoken in jest, and we venture to read into this remark the suggestion that there is hardly more likelihood of fish being killed by tar from roads than there is of their being killed by some of the words, noxious words, we regret to record, which have been used in this connection by some of the disciples of the pious Isaac Walton.

* * *

**Building By-Laws at Gateshead.**

A matter that is exciting a considerable amount of feeling locally at Gateshead was recently brought to the test of a Local Government Board inquiry, with the result that the Whitehall authority is called upon to decide upon an issue involving strong predilection, supplemented by economic considerations on the one hand, and legality, supported by the weight of the town council and their professional official on the other. The investigation was held under the Housing and Town Planning Act of 1909, representations having been made to the Local Government Board under sec. 44 of the Act that the erection of working-class dwellings within the borough was unreasonably impeded in consequence of a by-law with respect to the thickness of the walls of domestic buildings. This by-law, which was sanctioned by the Local Government Board in October last, provides that the walls should be 14 in. thick. The complainants produced before the inspector a strong consensus of professional and practical evidence in favour of an 11-in. cavity wall as being dryer and warmer than the 14-in. wall, and at the same time cheaper to the amount of from £5 to £7 per house. It was seriously contended alike by builders and owners of land that these sums, in the nature of unnecessary extras, were an impediment to the building of working-class houses, especially when the dwellings were purchased, as so many are, in the Tyneside district. The financial grievance was, it must be allowed, pressed home with a unanimity and insistence that spoke well for the courage of the complainants, and in the circumstances it was not surprising that Mr. W. Swinburne, town clerk of Gateshead, took up a strong position on behalf of the corporation when he gave figures to prove that the by-law—which, he stated, the town council felt very strongly should be retained—had not interfered with the operations of the builder. The borough surveyor, Mr. N. P. Pattinson, in his evidence stated that the cavity wall required much more careful building than a solid wall. The dampness of houses built with 14-in. walls was due, he said, to bad workmanship; and owing to the increased difficulty of building hollow walls he contended that the workmanship would be worse, and the buildings less stable in consequence. As to the saving in cost in such a house, he calculated it as £3 1s. 4d. If the reply of the corporation that of recent years the number of houses built has more than met the requirements of the increased population remains unshaken, then the main contention of the complainants that building has been unnecessarily impeded by the operation of the by-law fails, and this alone, apart from other considerations, will naturally have great weight with the departmental inspector in deciding whether or not the by-law should be revoked.

* * *

**Twenty-two Years' Work in Leicester.**

The record of work achieved by Mr. E. G. Mawbey, M.Inst.C.E., during his twenty-two years' tenure of the office of borough engineer and surveyor of Leicester, is fairly well known and generally appreciated among municipal engineers. It is doubtful, however, whether even those who are best acquainted with the great Midland town fully appreciate the enormous development that has taken place during that time. Mr. Mawbey recently delivered a lecture on the work of his department before the Leicester and District Workers' Educational Association, and in the course of his remarks referred to the enormous strides which have been made in the growth and civic enterprise of the town. Since Mr. Mawbey took up his appointment in 1889 the population has increased by no fewer than 92,000, and the area of land built upon has doubled, over 20,000 new dwelling-houses having been erected; moreover, the expenditure upon public works has exceeded the enormous figure of £2,000,000.

The town of Leicester, by reason of its situation, presents very great natural difficulties to the production of a satisfactory scheme for dealing with the sewage. These have, however, been overcome by means of pumping and by the construction of a storm-water culvert 8 ft. in diameter and nearly 4 miles long. Over 150 miles of public and private

sewers have been laid, and all the old main sewers have been abolished and replaced with new trunk sewers. Some twenty years ago the low-lying portions of the town were frequently visited by serious floods, and this evil continued until the successful completion of a great floods prevention scheme, which cost about £352,000. The main trunk sewers and the floods prevention works were designed by the late Mr. Joseph Gordon, M.INST.C.E., assisted in the case of the latter by Mr. F. Griffith, M.INST.C.E. The work of the construction of the sewers, however, was carried out by Mr. Mawbey, who also completed the floods prevention scheme, the greater part of which had been executed under the supervision of the designers. In regard to such matters as the provision of refuse destructors, the laying out of public parks, and the establishment of public baths, the Leicester Corporation have always pursued an enlightened policy, and these establishments have been liberally provided. Mention must also be made of the construction of some 20 miles of electric tramways, which, together with power station, cars, and other appurtenances, cost a sum approaching £600,000. Altogether, Mr. Mawbey's record is one of which any engineer might be proud, and we hope that he may continue for many years to preside over the department of which he has been such a successful chief.

* * *

**Sewer Gas and Concrete.** The practice of using concrete in the construction of sewers of considerable diameter is undoubtedly upon the increase, and any information as to the possible disintegrating action of sewer gas on this material is thus well worthy of attention. There can be no doubt that concrete is prejudicially affected under certain conditions by gases generated from sewage, chiefly, it is believed, by hydrogen sulphide. An American contemporary calls attention to this matter in an article written *àpropos* of a report by Messrs. Metcalf and Eddy, consulting engineers of Boston, Mass., on the construction of certain intercepting sewers. The conditions are found to be peculiarly favourable for the generation of hydrogen sulphide gas, and the consequent disintegration in cases where the sewage is mixed with salt water. In such circumstances, if the velocity be low, a precipitation of solids will take place in the sewer, causing a comparatively rapid decomposition. These conditions will exist in part of the sewers in regard to which Messrs. Baker and Eddy are advising, and they accordingly recommend that the portion in question should either be constructed entirely of brickwork, or at least should have a brick lining. They further state, however, that if it should be decided to build the sewer wholly of concrete the section should be increased by a thickness of from 1 in. to 2 in. on account of the possibility of a corrosive action being set up. The concrete should be proportioned, 1 part of Portland cement, 2 parts sand, and 4 parts broken stone, instead of $1:2\frac{1}{2}:4\frac{1}{2}$, which it is proposed to use for that part of the system into which salt water will not be admitted. The precautions recommended are very interesting, particularly in view of the part which reinforced concrete is destined to play in the design of the great sewers of the future.

* * *

**City Improvement in New York.** A recent decision of the authorities of New York to preserve City Hall Park intact and remove from it the present law courts building, is a matter of considerable interest, not only for New York, but for every city that is considering the question of improving its architectural appearance. The decision to place the new law courts elsewhere than in the park will cost the city well over a million sterling, but, large as is the outlay, the money, it is generally thought, will have been well spent. The original scheme contemplated the covering of a large part of City Hall Park by the new building, and the cost would have been only that of the building—say £1,800,000, in place of the present estimate of £3,000,000. The adoption of this plan is regarded as a decisive victory for the advocates of civic improvement, for the original scheme for a further encroachment on the park was abandoned only after an outburst of public indignation, the extent and sincerity of which were beyond all question. The new building, which will be of monumental proportions, will occupy a tract of land to the north of, and immediately adjoining, the municipal building, which is now nearing completion, and the additional sections of land adjoining the new site, which the city will probably acquire, will render it possible to create a civic centre which, in its extent and in the importance and grandeur of its buildings, will, it is suggested by the *Scientific American*, be comparable with similar centres in the leading cities of Europe.

* * *

**Wood-Paving Blocks: The Value of Pure Creosote Oil.** In our issue of July 7, 1911, p. 22, the reader who is interested in the matter of impregnating wood-paving blocks will find criticisms of certain specifications, including those for the coal-tar products used for treating wood-paving blocks in Chicago and New York. An open specification, which would admit creosote oil from competing sources, including England, was also given; that of Colonel J. W. Howard, who, we have now to notice, has recently carried out tests which show that creosote oil, shut out by some of the specifications referred to, is an excellent preservative of pine blocks under the trying climatic conditions of Chicago and under heavy traffic. The blocks in question had been in use for $9\frac{1}{2}$ years, and were not worn out or unserviceable when removed to make way for another kind of pavement. They were of long-leaf, yellow pine, and had been treated with pure creosote oil, having a specific gravity 1·06 to 1·08, the quantity used being 16 lb. to the cubic foot. The loss of oil, in the $9\frac{1}{2}$ years, was only $1\frac{1}{2}$ lb. per cubic foot. The results have been accepted by Mr. A. J. Hammond, chief engineer of the Chicago Bureau of Public Efficiency, as proving that pure creosote oil is better for this purpose than the oils of higher specific gravity which have been recommended without due regard for the facts.

* * *

**The Rating of Tramways.** The case of *The Metropolitan Electric Tramways, Limited*, v. *The Tottenham Urban District Council* raised an important question as to whether the provisions of sec. 211 (1) (6) of the Public Health Act relating to the partial exemption from rating of land used as a *railway* were applicable to the case of a tramway which was run as one connected system with a light railway. This subsection, so far as material, provides that the occupier of any land used as a railway constructed under the powers of any Act of Parliament for public conveyance, shall be assessed in respect of it in the proportion of one-fourth part only of the nett annual value. The Court of Appeal were unanimous in holding that for the purpose of rating there is no essential difference between a railway and a tramway. In the words of Lord Justice Farwell, "when the user of land is considered with regard to the exemption from rating, I think it is immaterial to consider what will be the user of a particular line of rails, except that it is to be for a railway namely, for the purpose for which a railway is used." The decision is of considerable importance to local authorities, both as owners of tramway systems and also in the assessment of privately-conducted undertakings.

# Preliminary Studies in Bridge Design.

By REGINALD RYVES, ASSOC.M.INST.C.E.

*(Second Article.)*

Supposing that the site is necessarily fixed by other conditions, the usual case in old countries, we must study the course of the stream for some way above the site, or, if it is maintained in a certain course, we have only to consider the nature of any attack that may be made on one abutment or the other. We may decide to train the river if necessary, or to maintain the banks by pitching or otherwise. In other cases, if a good fall can be obtained below the bridge, it may be sufficient to make very deep foundations and lower the whole bed under the span, taking the stream through at a high velocity. This may entail some pitching, and careful estimates of the cost of this should be made. It is not enough to say "we shall pitch if necessary." If the odds are two to one against pitching being needed a charge of a third of the cost to the estimate at any rate should be made to that particular design.

If the chief fear is that scour will take place at the foundations, not for short periods and only during floods, but all through the year, this may be lessened by obstructing the stream below the bridge, so that the water will be deeper and will flow more slowly. To allow of this the waterway must be amply sufficient for the flood discharge. Deepening the water by raising the surface level tends to the protection of the foundations by deposits of silt or gravel, and reduces scour of the banks by reducing the velocity. This principle is especially useful on streams which flow through soils which contain few pebbles; but when the quantity of gravelly material at the bottom is considerable, it may be better to make a bridge with shallow foundations at a wide and shallow place, for instance, in a part of a scour, provided that the edge of the scour is not being cut back at a rate sufficient to threaten the bridge.

### DEEP FOUNDATIONS AND SHALLOW FOUNDATIONS.

Engineers sometimes speak as if there were two schools of bridge designers, one school preferring to put down deep foundations beyond the reach of scour, and the other preferring the type of bridge with shallow foundations, with a pitched floor under the arches, and more or less pitching up and down stream. This distinction is all wrong. Given the limits within which the road level may be raised or lowered, and assigning some weight of objection to such raising and lowering as well as any actual cost in approaches, there is a design of bridge which is the best for the particular case, and it is the business of the engineer to find out what that design is. It may happen that either of two distinct types is thoroughly satisfactory, and the costs the same, and if the work is a small one it is not necessarily worth while to pay the fees or costs of estimates required to determine what is the best type. But it usually is worth while. If a simple culvert can be built for £25, it is not worth while paying a £5 fee and £5 for alternative plans, in order to reduce the cost to £17; but when a bridge is going to cost several hundred pounds it is usually well worth having alternative estimates, seeking for what is the best design for the particular case. Still more in thousands. The deepening expedient should not be adopted unless recommended by an engineer of experience. Its efficiency depends a good deal on the relation between ordinary flow and the usual floods, under the conditions to be imposed. If the depth of water is such as to prevent the growth of reeds and similar plants, the effect may be to increase scour. On a wide stream the growth of protecting bushes on the banks may be advantageous, and especially the formation of a marshy berm, while on a narrower stream such a development may narrow the waterway too much.

### BERMS.

If berms are made for a little way above the bridge, the level chosen should be such that they will not be submerged long enough and deeply enough to kill the plants with water, nor left dry long enough for them to be killed by drought. Compare Figs. 5 and 6. The floods will then flow over a resisting bed with slack waters against the banks, and whatever scour does take place will be comparatively easy to make good, for it will not bring a mass of earth and sods sliding down from above. This kind of protection may be compared

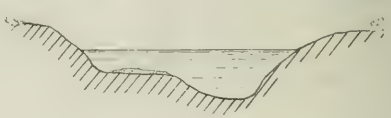

FIG. 5.

as to cost with the method of cutting away the bank at a slope and turfing it; and that of digging away the bank and replacing it with layers of withies (assuming that the climate is suitable); or it may be combined with these, the bank below

FIG. 6.

the berm being made up with withies and the bank above it as a grassed slope. Similar work may be done for a little way below the bridge. In Fig. 7 an attack at B, instead of causing a slide of the bank from D to the bed, only cuts away a piece of the berm.

It is not always worth while to do work other than that on the bridge itself, and if there be any doubt alternative estimates may be compared, thus:—

I. (A) A cheap bridge, (B) work on the banks, (C) occasional work of maintenance; and

II. (*a*) A more costly bridge, which hardly disturbs the course of the stream; (*b*) no other work; (*c*) occasional fairly heavy repairs of damage to the banks, caused by the set of the current.

### STREAMS WITH FLOOD CHANNELS.

Let us now consider the case of a stream which runs in a permanent bed, but has also a well-defined flood channel which, at any given place, may be on one or on both sides. The condition may be natural when, speaking in a geological sense of time, the stream is not old enough to have worn down a bed sufficiently deep and wide to take its flood discharges. If it is not tending to this condition—that is, if the tendency in the part under consideration is towards accumulation rather than removal of material, it will come into class (*c*), which we are not now treating of. In settled countries the condition is often an artificial one. Except in times of flood the stream flows in a defined, but often somewhat shifting, course, while in flood times it overflows its banks and spreads on each side till it reaches the flood banks, which are usually

made roughly parallel to its main course and do not follow the windings of the stream proper. When a road is to be made, or an existing road improved, across such a valley the choice of a place where the fall of the valley is relatively sharp has this advantage, that the velocity of the stream will be greater and the waterway of the bridge smaller. Besides this, the flood banks may usually be placed nearer together at such a place than they are where the valley is flatter, and if approach embankments are not made—to the bridge—the total cost of the work will be less. On the other hand, a wider place, between flood banks, and where the bed of the stream is about half-way from one to the other, has this advantage, that after the bridge is built there will be less likelihood that the current will set against one of the flood banks and breach it. Supposing that the flood banks not only prevent the inundation of the valley outside them, but are also, in times of flood, the actual banks of a flowing stream with very little slack water, it is clear that a bridge which will not obstruct this waterway may be a costly work. In such a case it is worth considering the cost and expediency of making an actual bridge for the stream proper, and designing the rest of the road between the flood banks as "road dams" (to be described later), each approach to the bridge proper being a ford, only slightly raised above the level of the ground. In such a case at least a narrow plank bridge should be provided for foot passengers in countries where there is need for it. They are not required in country districts in India above the bridge and that below it. The latter may usually be judged without calculation if there is a rapid below the bridge, or it may be calculated from the cross-sections, and the longitudinal sections of the bed and the flooded channel. We now calculate, from the areas of bridge opening which come into play at different levels, and from the corresponding differences of levels above and below the bridge, a series of increasing discharges which will all be less than the maximum discharge, and each of which will correspond to a certain amount of pooling above the bridge. As this pooling is over an area which can be measured, we are able to find for each stage how long it will be till the water has pooled up to the next stage. The sum of these periods is the period during which the flood is checked. We may repeat these calculations with different sets of vents until we are satisfied with the result.

If the water actually rose to this highest level the full flood discharge would pass, and there would be no protection; but, although this is allowed for in calculating the areas of the vents as a measure of precaution, the water would not really rise to this level, nor would the discharge reach this rate, because that maximum discharge continues only for a short period, less than that of the whole time of pooling up. If, however, the duration of the period of nearly maximum discharge is not considerably less than that of the period of pooling up to maximum level, it is not worth while to do the work in this way for the protection of the village, and if there is no other reason for following the design foreshadowed thus, the papers can be put on the file and the problem attacked afresh. The calculations will not have been wasted; they have narrowed the issue.

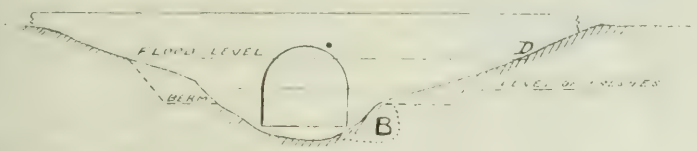


FIG. 7.

and other warm parts of the world where foot passengers do not mind wading.

But, taking the typical case, when the whole width of the flood channel is not occupied by water moving downstream with considerable velocity, or when the flood channel is that between natural slopes admitting of some heading up, let us consider what are typical designs.

### TYPICAL METHODS.

One plan is to provide an ample opening for the normal stream and ample openings in the embankment across the valley. That is to say, we make the whole work in such a way that the flow is scarcely impeded at any time. The opening in the bed of the stream will be such that it will not leave its course any sooner than before on a rising flood, and the other openings will pass the water with no sensible heading up and no important difference in the set of the current. This type, or a reasonable approximation to it, is usually a suitable one when the site is not far below a town or village.

It is not, however, always necessary to build such a bridge, which may be very costly. Heading up may be allowable or even desirable. The case in which it is desirable is when the site is above some other obstruction which is in jeopardy during high floods, or when it is desired to preserve the lands below the bridge from the full effects of a flood. This is a matter for calculation.

### THE BRIDGE AS A CHECK ON FLOODS.

First we measure or estimate the discharge of the stream when in full flood, and decide what new flood level is permissible above the work. We then design (provisional) vents which will just pass the whole flood discharge at this level, and with the effective head, the difference between the level

### POOLING FOR HEAD.

If it has been decided that it will be cheaper to have a relatively small opening with high velocity in time of floods, with local protection against scour, rather than the provision of a bridge with many or large openings, the pooling up necessary to give the high velocity may be allowed for that reason, and the vent or vents in the main stream may be enough to pass all the flood water. In case of choking of the vent, or if there is doubt as to the maximum flood discharge, other vents may be provided at higher levels in the flood channel. In any case there will have to be a vent which will pass the normal flow with a head of water allowable during times of normal flow.

The main principle involved is an important one. On a rocky site we may be able to block the valley by a plain earthen bank, the only work in which is a relatively small culvert or bridge in the bed of the stream. Where the fall of the valley is steep the flooding caused by doing this will be small, and in a wild country may be a matter of no importance. In such a case blocking of the culvert might lead to the bank being overtopped, and this point must receive full consideration. The principle is not only applicable to rocky ground. The vents needed for a sluggish stream in a hard soil, or a stream with banks well protected by vegetation may be of such size that with the additional heading up needed to pass flood waters the velocity below the bridge is not excessive, or the discharge may be into a large pool which harmlessly receives the water.

THE NUMBER AND SIZE OF ARCHES.

It is often the case that an arch which is high enough to take the road, and of so wide a span that the abutments keep the approach banks out of the way of scour, is large enough to pass all floods. In other cases its total area is sufficient, but it is not wide enough, and the area at an allowable water level is not enough. In that case the desired capacity may be gained by making the arch of wider span, by making more arches, or by placing relief vents in the approach embankments. If low arches of small span piercing the embankments will suffice to pass the flood waters, it is a mistake to spend money on increasing the waterway of the main arches with the deeper foundations, unless it is necessary to keep down the water level in times of flood. These arches in the river bed must in most cases have their crown only a little below road level, often high above the flood, while this is not necessarily the economical design for the arches piercing the embankment in the flood channel. In the diagram (Fig. 8), if the

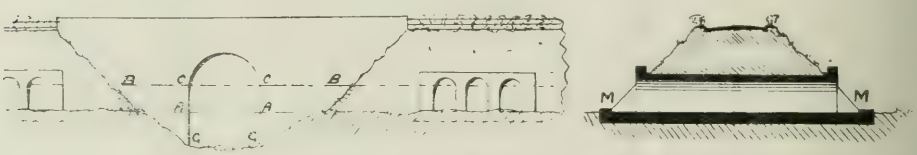


Fig. 8.

area A C C A be not enough to discharge the flood at the level B C C B, then it is usually cheaper to provide two or three of the small spans rather than another large one.

A beginner may ask why it would not do to have small vents instead of the area A A G G, with its massive masonry. This would be somewhat like the case already cited: blocking the valley and providing small vents, though without the high velocity. In a case such as that which we are considering it would usually be uneconomical or undesirable for some or all of the following reasons: First, the culverts at the depth G G would have to have a length somewhat greater than M M on the cross-section, the width of the bank. This would make them more costly than culverts at the higher level, and they would not pass more water than culverts just submerged in the flood channel unless the valley fell away rapidly below the bridge. They would not, however, cost more in many cases than the one large span. Secondly, because they would be a part of the main bridge and their permanence an important matter, they would have to be built more solidly than the relief culverts. Thirdly, being subjected to scour, they would have to have deep foundations, unless a pitched floor were provided; and, lastly, the position and size of their abutments would bring the ends of the embankment nearer the stream and render them more liable to attack. In addition it must be remembered that in many cases the width and height of the largest span are determined by the width and headway necessary to pass floating timber or other flotsam. At the same time there are crossings not unlike that shown on the diagram, for which it is worth while working out alternative designs between the limits, in the one direction of a single large span, and in the other direction of an embankment of full width pierced by culverts. A good deal depends upon the slope at which the sides of the embankment will safely stand, for this determines the lengths of the culverts. It is not difficult to find examples of single high arches in situations where the bank and culverts would be the cheaper form.

When the bed of a stream in a much larger flood channel is only a little below the level of that channel and floods are frequent, it may be a good design to make a fill at about that level, blocking the bed of the stream and placing a number of small vents at the higher level. In such a case, and some which are similar as regards the main idea, it may be worth while to avoid the actual bed altogether to save the cost of making the deeper foundations into solid ground, such as Q (Fig. 9). This is quite an allowable method of making a semi-permanent crossing in a new country, and has, in such a case, the advantage that if a larger span is afterwards made for the stream itself, the original openings may remain, serving as flood openings. The design is sometimes suitable as a permanent one, and may even be the best and most economical, first and last.

*(To be continued.)*

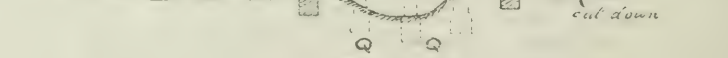


Fig. 9.

**Refuse Destructor Steam for Sewage Pumping.**—Mr. E. H. Crump, Assoc.M.Inst.C.E., surveyor and waterworks engineer to the Hinckley Urban District Council, writes: I should be greatly obliged to you if you would allow me to inquire through the columns of your valuable paper if any of your readers could furnish me with the names of a few authorities who utilise the steam obtained from their refuse destructors for pumping sewage at the sewage outfall works, as my council are at present considering this question, and such information would be most useful to me.

**The Junior Institution of Engineers.**—A handy-size booklet dealing with the objects and aims of this progressive institution has just been issued. In a paragraph dealing with the inception of the institution it is interesting to note that the society came into being at the works of the late well-known firm of Messrs. Maudsley, Sons & Field, London, in 1884. Among the officers, presidents and vice-presidents, the names of many famous men are included in the list that is given. Mention is made also of honorary members, one of whom generally gives a lecture annually. It appears that the institution rooms are kept open on Friday evenings from October to May inclusive in order that the weekly periodicals can be perused and social intercourse promoted, and on the evenings mentioned the opportunity is taken for the informal discussion of various subjects. Some up-to-date information, such as cannot be obtained through ordinary channels, is thus obtained. The particulars as to membership are given in detail in the booklet, copies of which can be obtained free on application to the secretary, 39 Victoria-street, Westminster, London, S.W.

# Institution of Municipal and County Engineers.

## METROPOLITAN DISTRICT MEETING.

Mr. A. D. Greatorex, the president, occupied the chair at the Metropolitan District meeting of the Institution of Municipal and County Engineers, which was held last Friday evening at Caxton Hall, Westminster, for the discussion of a paper by Mr. J. Atkinson Butterfield, M.A., F.I.C., Assoc.Inst.C.E., on "The Relation of Modern Road Surfacings to Fish Life." There was a good attendance of members and others, among those present being Colonel R. E. Crompton, Messrs. C. Aburrow (Johannesburg), W. V. Anderson (Winchester), S. W. J. Barnes (Hanwell), J. Birch (East Ham, W. Nisbet Blair (St. Pancras), past-president, H. Percy Boulnois (Westminster), past-president, W. L. Carr (Ruislip-Northwood), A. A. Catchpole, S. H. Chambers (Hampton), J. W. Cockrill (Great Yarmouth), vice-president, A. P. I. Cotterell (Westminster), J. H. Drew (Horbury), A. Dryland (Surrey), W. Fairley (Westminster), H. H. Foster (Balham), A. M. Fowler (Manchester), past-president, S. G. Gamble (London), A. Gladwell (Eton), S. N. Glass (Ealing), H. E. Goldsmith, F. Grove (Surrey), A. Hale (Howrah, Bengal), D. Halpen, W. Harpur (Cardiff), past-president, T. W. A. Hayward (Battersea), W. Hosken (Hendon), J. Hutchinson (Westminster), P. G. Killick (Finsbury), W. T. Lancashire (Leeds), C. G. Lawson (Southgate), A. J. Marten (Streatham), T. Milne, E. B. B. Newton (Westminster), J. P. Norrington (London), F. W. Pearce (Twickenham), A. H. Quick (Thornton Heath), J. C. Radford (Putney), W. E. Riche, F. Sadler (Acton), H. Savage (Essex), Norman Scorgie (Hackney), hon. district secretary, C. Chambers-Smith (Westminster), G. Surgess (Ealing), R. J. Thomas (Bucks), vice-president, L. Tysoe, C. Vawser (New Barnet), J. A. Webb (Hendon), O. E. Winter (Hampstead), T. W. Wishlade (Lewisham), F. J. Wood (East Sussex), T. Cole (Westminster), secretary, and H. A. Giles (Westminster), assistant secretary.

The minutes of the last Metropolitan District meeting—held at Battersea on October 21st last—were read by Mr. Norman Scorgie and confirmed, and Mr. Butterfield was then called upon by the president for his paper.

### THE RELATION OF MODERN ROAD SURFACINGS TO FISH LIFE.

By W. J. A. Butterfield, M.A., F.I.C., Assoc.Inst.C.E.

Questions have frequently arisen of late in regard to the effect of surface washings from roads on the fish life in the streams, ponds or rivers into which the washings ultimately pass. The materials used in the construction and maintenance of roads and their methods of employment have changed in most districts in recent years, while, where the old methods of maintenance have been retained, various compositions have been applied to the surface of the roads with a view to suppressing dust in dry weather. It has been frequently alleged that the new methods and materials have resulted in pollution of the surface washings of a nature which has been responsible for the death of fish in adjacent waters into which the washings have passed. Opinions as to the fairness of these allegations have been expressed with a partiality and an assurance worthy of firmer foundations. The ascertained facts as to the effects of different road surfacings on the composition of the washings, and of the effects of the latter on fish life, have hitherto been very few. The object of the investigations described in this paper has been to collect more definite data, on which it will be possible for those interested in road construction and maintenance, as well as all who are interested in saving watercourses from pollution, and in preserving fish life in rivers and lakes, to form a judgment which will have a trustworthy basis. It will doubtless be necessary from time to time to enlarge our knowledge in this respect by further investigation in a like direction, but the results reported in this paper should suffice to enable fairly reliable deductions to be drawn in regard to the effect on fish life of the materials which are used for road treatment at the present day.

#### THE WATER-BOUND MACADAM ROAD.

The road surfaces primarily considered are those of the main and secondary country roads, to the exclusion of street paving, such as is employed solely in towns, because only in a few cases will the latter, for obvious reasons, have any very direct bearing on the pollution of fishing streams. The main and secondary country roads were, until about five years ago, with very few exceptions, constructed of water-bound macadam, the stone used varying according to the locality, and the nature and volume of the traffic. The disintegrated stone or earth used as binding material would not, on extraction by water, impart to the latter ingredients differing appreciably from those of water draining from soil in the vicinity. Hence, the materials used on water-bound macadam

Mr. W. J. Atkinson Butterfield.

[Mr. Butterfield received his scientific education at University College, London (1885-87), and Christ Church, Oxford (1887-91). He was engaged at the Beckton gasworks of the Gas, Light and Coke Company, from 1891 to 1896, and since 1897 has been in consulting and analytical practice in Westminster. He is retained as analyst of samples of air by the Factory Department of the Home Office, and as secretary and experimental assistant by the Gas Referees appointed by the Board of Trade. Mr. Butterfield has been called upon to make investigations for and give evidence before the Committee on the Ventilation of the House of Commons (1903) and the Royal Commission on Mines (1909). He has acted as a member of the Judges' Committees in trials of dust-preventing materials and so forth conducted by the Roads Improvement Association. He is the author of a text-book on gas manufacture, which has passed through four editions, and was collaborateur with the late Mr. F. H. Leeds in the writing of a handbook on acetylene. He has from time to time contributed to the proceedings of various technical societies papers relating to gas manufacture and its by-products, photometry, ventilation, &c. Mr. Butterfield is an M.A. of Oxford University, a Fellow and Member of Council of the Institute of Chemistry, an Associate of the Institution of Civil Engineers, and a Past-Member of Council of the Society of Public Analysts.]

roads may be regarded as having in themselves no specially pernicious effect on watercourses into which the surface washings from the roads might pass. The only question which arises in connection with such roads is the effect of refuse (*e.g.*, horse droppings, petrol, lubricating oil) dropped on the roads by passing traffic, and as this question arises with even greater force in the case of roads constructed or surfaced with more impervious materials, it will be discussed after these materials have been considered.

#### DUST-ABATING MATERIALS.

(Sea water, calcium chloride.)

The advent of self-propelled vehicles on the road, which followed the passing of the Motor Car Act in 1896, caused attention to be drawn to the dust-making qualities of different road surfacings. The higher speed at which vehicles of the same weight were able to travel after self-propulsion became permissible was attended by a greater formation of dust and a wider dispersion of that dust through the air. In order to reduce the formation of dust and to make the dust formed less liable to be widely dispersed through the action of passing traffic, various agents have been applied to the road surface. Certain of these agents, which are independent in their

action of the state of humidity of the atmosphere, can be more appropriately dealt with under a subsequent heading, but there are others which depend for the permanence and effectiveness of their action on the variations in the degree of humidity of the atmosphere. First, there is the time-honoured expedient of road watering, which obviously is inapplicable to country roads where supplies of water are not always obtainable at frequent and regular intervals, and where the cost of frequent and regular watering must be prohibitive. The duration of the effect of road watering is determined solely by the rate at which evaporation proceeds, and once the water has been disseminated as vapour in the atmosphere the effect of the watering will have passed away.

In order to obtain a more lasting effect, it was proposed, in the early stages of the dust-abating movement, to use salt water for road watering in place of fresh water. On evaporation, the former leaves a residue of sodium chloride (common salt) and other salts, the bulk of which are hygroscopic. That is to say, these salts absorb moisture from the air when it is relatively humid and give up moisture to the air when it is relatively dry. In the semi-liquid state which they attain, unless exposed to a dry atmosphere for a sufficiently long time, these salts permeate the more porous particles of disintegrated road material, thus rendering them comparatively heavy and hindering their subdivision into finer particles. The relatively large and heavy particles which then constitute the dust are less easily raised by passing traffic, and if raised, settle more readily. Hence the dust nuisance is appreciably abated by the employment of such hygroscopic salts. The first solution of salts thus employed for dust-abating purposes—*viz.*, sea water (which, for reasons which it is alien to the purpose of this paper to discuss, was generally discarded after trial)—has no appreciable significance in regard to its effect on fish life, because the majority of our fresh-water fish are not forthwith seriously perturbed by a transference from fresh water to sea water, or to a mixture of fresh and sea water. Many, indeed, of those which are most highly esteemed by the angler are migrants. More effective than sea water, in that its action is more lasting and its subsidiary effects less objectionable, is a solution of calcium chloride, a salt which chemically closely resembles sodium chloride, which is the chief saline constituent of sea water. This salt, when dissolved in water in the proportion of one part of calcium chloride to 1,000 parts of water, has no effect on fish (gudgeon). Since the rate of extraction of calcium chloride from road surfaces to which it has been applied is extremely unlikely to produce a solution of it of as high a degree of concentration as that named (see the reports of the Judges' Committee of the Roads Improvement Association on the Official Tests of the Dust-laying Qualities of Calcium Chloride, 1909-10), it may be inferred that calcium chloride may be applied to roads for dust abatement without risk of ill-effects on fish life in the streams and ponds of the district.

### BITUMINOUS OR TARRED SURFACINGS.

The application of tar and bituminous materials to country roads was initiated with a view simply to abating dust. Among the early materials of an oily or bituminous character which were tried were preparations of petroleum and blast-furnace tar, but the application of these materials has since passed into relative insignificance compared with the use of coal tar, and latterly of certain natural bitumens and asphaltes. Originally the intention underlying the employment of coal tar, other tars, and oil-, &c., was to bind the particles constituting the road surface together by a semi-plastic and essentially non-brittle material, and, in the event of the particles being torn asunder, to have their pores so filled by a heavy liquid or semi-solid that they would remain in suspension in the air only for a very brief time. The employment of these materials with this object resulted, however, in the discovery that they serve another purpose, which is of far greater ultimate importance *viz.*, that of prolonging the life of the road surface and thereby, *ceteris paribus*, reducing the charges for road maintenance.

It may now quite properly be said that tar and similar materials are applied to road surfaces primarily with the object of maintaining the road, and that the advantage of dust abatement which they afford is only incidental to their employment for maintenance. The surfacing of roads with tar and similar materials, if properly carried out, results in the outer layer or skin of the roads being rendered waterproof, and, so long as this skin remains intact, water cannot penetrate to the underlying road material. The extent to which the tar which is applied for the coating or painting of road surfaces penetrates below the surface depends on a number of factors, among which may be named the nature of the road material, its degree of consolidation, and the viscosity of the tar on application. To whatever extent the penetration of the tar may vary according to the varying conditions of its use, it is only the surface layer or skin of the coating of tar which can affect water which falls or stands upon it, because so long as the coating is sound the water is prevented from penetrating the surface layer. On this account the quantity of tar applied to a road surface is less material in regard to the pollution of watercourses than is the extent of surface covered by the tar. The ultimate dispersion of the whole quantity of tar by attrition will in any case be spread over so long a period that it is unnecessary to regard it as having any serious bearing on the pollution of watercourses.

The question therefore to be considered is to what extent water impinging with the force of the heaviest rainfall on a tarred surface, or water standing on such a surface (from which it may happen not to drain away quickly) may become polluted by such contact with the tarred surface. The effect of impingement of heavy rain is difficult to estimate; it is conceivable that in warm weather the drops of rain may momentarily pit the surface and so secure a larger area of contact than would otherwise be the case. But, on the other hand, such pitting of the surface can only occur when the rainfall is exceptionally heavy, and in that case the water will drain off from the surface more quickly, and the time of contact will be correspondingly short.

Probably the most serious risks of pollution of water occur during a drizzle or long-continued rainfall, which at no time is heavy, as in that case the water will remain for a comparatively long period in contact with the tarred surface before draining from it into watercourses. These considerations apply to normal conditions. Cases may, however, occur in which a heavy storm, with a rush of flood water following very shortly after tar has been applied to a road, will be attended by the actual lifting away and removal of the tar itself while it is still soft and not consolidated with the road material. In that case the tar may be carried bodily into watercourses, and the question of the extent to which it will pollute the water therein has to be considered. The degree of pollution will be determined by the proportion of the tar so carried into the watercourse to the total volume of water therein, and by the extent to which the tar and water are agitated together by the natural movement of the water. Such removal of the tar *en bloc* into watercourses can occur only in rare instances, but the probable effects of its occurrence on fish life will be considered later. Tar only has been spoken of in this paragraph, but the same considerations apply equally to bituminous surfacing materials in general.

### PITCH AND ASPHALTE MACADAM.

A few words may be said as to the possible effect of pitch or asphalte-macadam roads or pitch-grouted roads as distinguished from water-bound macadam roads surfaced with tar or bituminous material. If the pitch-macadam or pitch-grouted road is properly constructed, water will not penetrate beyond the depth of surface inequalities; and for the present purpose it is sufficient to regard only the surface layer of such roads, and to bear in mind the difference in composition between the pitch, pitch-grouting or asphalte, and the tar or more fluid bitumen which is used for the surface treatment of water-bound macadam roads. The quantity of pitch used in constructing a pitch-bound road is not material for the case under consideration; it is only the area of surface, including the inequalities, exposed, which comes into question in respect of the possible pollution of washings from the road. The possibility of pitch-bound macadam being carried bodily into watercourses is so remote that it need not be further considered.

### THE NATURE AND COMPOSITION OF TAR AND PITCH.

(Coal tar, oil tar or water-gas tar, blast-furnace tar, producer tar.)

The nature and composition of tar and pitch need only be considered in so far as they have any bearing on the question of the possible pollution of water which has been in contact with the tar or pitch; but since the effect of these materials on water varies

very greatly with their nature and composition, it is necessary to indicate broadly the differences in tars and pitches ordinarily produced in this country.

Coal tar is a by-product of the carbonisation of coal on gasworks and in coke ovens. Its nature and composition vary widely according to the heat to which the coal has been raised in the course of carbonisation, and according to the disposition and size of the carbonising chamber or retort. The specific gravity may range from 1·12 to 1·29, being greater the higher the temperature to which the tarry vapours have been exposed, and the longer their exposure thereto in the carbonising plant. In all cases the crude tar, as produced, contains a certain amount of water or aqueous liquor, containing more or less ammonia and salts of ammonia; a small proportion of light oils; a larger proportion of middle or creosote oils, frequently containing a considerable quantity of naphthalene; a rather smaller proportion of heavy oils, from which anthracene may be extracted; and a large proportion of pitch, which consists mostly of bituminous matter, but contains a varying proportion of uncombined carbon. The extent to which these ingredients vary may be roughly indicated:—

Crude coal tar may contain from about 1 to 30 per cent or more of water or ammoniacal liquor. The percentage of water depends on the efficiency of the plant used for the separation of the tar and liquor at the gasworks, but is largely influenced by the nature of the tar. Tar produced at high heat of carbonisation, and with a considerable free space in the retorts, will contain a large proportion of water which the separating plant will ordinarily abstract with great difficulty, owing to the water and tar being in an emulsified condition. The water may in all cases be removed from the tar by distillation or boiling, but in the case of tars produced at high heats, and containing a large proportion of water, its removal by boiling or distillation becomes troublesome owing to the frothing and violent bumping which ensue when such tars are boiled. It can only be properly carried out under skilled supervision in the special stills which are provided in tar works. The composition of the liquor will be referred to subsequently.

The light oils in coal tar comprise the oily constituents which distil over with the water and up to a temperature of 170 deg. Cent. They vary in amount, according to the source and character of the coal tar, from 1 per cent to about 5 per cent. They have a lower specific gravity than water, and as their components are practically insoluble in water, they float on the surface of the latter, and are chiefly responsible for the surface film which is generally formed when crude tar is mixed with water.

The proportion of middle or creosote oils, distilling between 170-270 deg. Cent., varies according to the source and character of the coal tar, from about 9 per cent to 25 per cent. They have a higher specific gravity than water, and ordinarily hold in solution considerable quantities of phenols or tar acids and naphthalene. The proportion of crude tar acids naturally present in the oils may vary from about 1 per cent to 25 per cent by volume of the oil, being usually greater when the tar vapours have not been exposed to a high temperature in the carbonising plant. The amount of naphthalene generally present in the middle oils is greater than they can hold in solution at ordinary temperatures, and consequently these oils contain more or less naphthalene in a solid state. In many cases they are a pasty or almost solid mass, owing to the large proportion of naphthalene they contain, and the oil proper can only be obtained by expression. The proportion of naphthalene is larger the higher the temperature to which the tarry vapours have been exposed, and the longer their exposure thereto in the carbonising plant.

The amount of heavy oils distilling above 270 deg. Cent. varies from about 2 per cent to 15 per cent of the tar, according to the source and character of the latter, and the temperature at which its distillation has been stopped. These oils are generally pasty at ordinary temperatures, owing to anthracene and allied bodies being deposited from them on cooling.

The proportion of pitch, which is the residue remaining in the still after the greater part of the volatile oils have been driven off, varies according to the source and character of the tar and the temperature at which the distillation of the tar has been stopped from 50 per cent to 85 per cent of the tar. The pitch is a solid, more or less plastic, or more or less brittle, according to the amounts of heavy oils which have been allowed to remain in it as determined by the temperature at which the distillation of the tar has been stopped. The main constituent of the pitch is bituminous matter of a complex nature, but there is in the pitch also a certain proportion of "free" carbon which varies, according to the conditions of formation of the tar, from 10 per cent to 35 per cent of the pitch, being greater the higher the temperature to which the tarry vapours have been exposed, and the longer their exposure thereto in the carbonising plant.

Oil tar proper, or the tar, frequently termed either "oil tar" or water-gas tar, which is derived from carburetted water-gas plant, has a specific gravity generally rather higher than that of water, though occasionally samples are found of a lower specific gravity. The carburetted water-gas tar in its crude state consists of an emulsion of tar and water in which the proportion of water is often very high. Separation of the water is frequently attended with considerable difficulty. The water contains little or no ammonia. The proportion of light oils in the crude tar varies from 5 per cent to 25 per cent, of middle oils from 10 per cent to 35 per cent, of heavy oils from 10 per cent to 20 per cent, and of pitch from 30 per cent to 60 per cent. The wide variations in composition are due to differences in the temperatures at which the carburetting and superheating chambers of the gas-making plant have been worked, and to differences in the ratio of oil used to water gas made, and in the nature of the oil used. The light oils are physically, if not chemically, very similar to the light oils of coal tar. The middle oils, however, cannot properly be regarded as creosote oil, because they yield only at the most 1 per cent to 2 per cent of tar acids. They frequently also are almost free from naphthalene, but this depends on the mode in which the carburetted water-gas plant has been operated. The heavy oils contain less anthracene than the corresponding oils from coal tar. There is less free carbon in the pitch than in coal-tar pitch, the amount seldom exceeding 10 per cent. The oils, particularly the light oils, have a very penetrating, and, to most people's senses, very offensive smell, which appears to be communicated to milk and uncooked meat or fish which is exposed to it, so that they become tainted thereby. On this account carburetted water-gas tar is now seldom used in a crude or unmixed state for the treatment of roads, but on those of the smaller gas works which possess water-gas plant the tar produced therein is frequently run into the same storage tanks as coal tar, and the mixture is sold as gas tar.

Blast-furnace tar, which is occasionally used for the treatment of roads, is a local production, being obtained from the blast furnaces which use Scotch splint coal as fuel. Its specific gravity is usually about 1·1. It contains in its crude state from 1 per cent to 10 per cent of water, which, however, contains only a small proportion of ammonia as compared with the ammonia in the gas liquor of coal tar. The proportion of light oils is usually lower than in crude coal tar, the proportion of middle oils 20 per cent to 30 per cent, that of heavy oils 5 per cent to 15 per cent, and of residual pitch 50 per cent to 70 per cent. The middle oils contain a high proportion of tar acids—viz., about 30 per cent to 40 per cent of their volume. They are sold as blast-furnace creosote. The middle oils and heavy oils contain very little naphthalene and anthracene, and are more freely fluid than the corresponding oils of coal tar. The pitch contains from 5 per cent to 20 per cent of free carbon.

Producer Tar. Certain types of gas-producer using bituminous coal or slack also yield tar which is sometimes offered for use on roads. It varies considerably in character, but, generally speaking, producer tars are not very suitable for application to roads, and as their production is at present relatively small and somewhat local it has not been thought necessary to investigate specially their effect on fish-life.

### Nature and Composition of Natural Asphaltes, &c.

The natural asphaltes and asphaltums vary so greatly in nature and composition, that it would be out of the question to refer to them in detail in a paper of this character. Generally speaking, however, the bituminous matter contained in natural asphalte rocks, in liquid asphaltums, and in petroleum oil residuum is free from phenols. Water which has been in intimate contact with certain of these natural materials may become highly tainted as to taste and smell and concerned, but the tainting is not caused by all such materials, and, as will appear later, when it occurs is not usually highly detrimental to fish life.

THE METHOD OF INVESTIGATION.

The investigations were carried out on water which had been agitated, or otherwise brought in contact in the manner stated, with the particular tar or road-treating material which was the subject of study at the time, and on aqueous solutions of determined strength of various components of tar, &c. The amount of certain important impurities in the water which had been agitated with tar, &c., were, where possible, determined. By judicious choice of representative tars, and of solutions of particular ingredients of them, it was hoped that light would be thrown on the relative effects of different tars and of their components on fish life in water which had been in contact with, or which contained, them. The preliminary experiments were made with either gudgeon or dace, or both, and when the information thus gained showed that further investigation was desirable, they were extended to other fish. The results with dace and gudgeon will be given in the first instance, and the relative susceptibility of different fish to the toxic action of the more important solutions will be referred to separately. The water or solution used in each case was contained in a glass vessel of 5 or 6 gallons capacity, into which one or more fish were put. The fish were watched, and the time of the first symptoms of their being harmfully affected was noted, as well as the time of death, if death ensued. Individual specimens of the same species were sometimes found to differ considerably one from the other in their resistance to the effects of poison, but the number of experiments made in most cases allowed of conclusions being drawn, which fairly represent the average susceptibility of the species. When fish which ordinarily live in water which is highly aërated were being studied, special means of agitation were adopted to keep the water sufficiently well aërated.

THE EFFECT ON FISH LIFE OF DIFFERENT COMPONENTS OF COAL TAR.

It will be most convenient to deal in the first place with the more important components of coal tar, and afterwards to refer to water which has been in contact with coal tar itself. For this purpose the components of coal tar which require special consideration are: (i.) the water or gas liquor; (ii.) the tar oils and their associated bodies; (iii.) the pitch.

(i.) *The Ammoniacal Liquor and its Ingredients.*—The water or liquor contained in crude oil tar is an aqueous solution of ammonia and a number of compounds of ammonia and of phenols and small proportions of the basic bodies contained in coal tar. The free and combined ammonia present in the liquor, which is known as "gas liquor," or "ammoniacal liquor," may be divided into two groups—*viz.*, (*a*) free ammonia and the compounds of ammonia with carbon dioxide and sulphur, and (*b*) the more stable compounds which ammonia forms with several acid radicles. It will be convenient to refer to the ammonia of the first group as "volatile" ammonia, and that of the second group as "fixed" ammonia. The greater proportion of the ammonia in gas liquor is "volatile," but the ratio of "volatile" to "fixed" ammonia varies with the ammoniacal strength of the liquor and the point in the train of condensing and tar and ammonia extracting apparatus on the gasworks at which the liquor (or the tar containing it) has been collected. The mixed liquor from all points, if of about the standard (10-"ounce") strength, contains about five-sixths of its ammonia in the "volatile," and one-sixth in the "fixed," state. The liquor present in tar varies greatly in strength, but is usually considerably lower than 10-"ounce," and in that case more than one-sixth of its ammonia will be in the "fixed" state. It will appear later that the "volatile" ammonia is of much greater moment than the "fixed" in regard to the pollution of fishing-waters, but as certain of the "fixed" ammonia compounds in gas liquor can be detected with certainty when present in water in extremely small proportion, and as these compounds are unlikely to be derived from any source other than gas liquor, the "fixed" ammonia becomes important as a clue in the detection of pollution of water by gas liquor or crude coal tar.

Gas liquor ordinarily contains about 0·2 per cent of phenols, the amount increasing to a maximum of nearly 0·4 per cent in liquor which has been deposited, or otherwise brought into intimate contact, with tar, and decreasing to a trace in liquor from the last washing plant on the gasworks.*

The "volatile" ammonia consists, as already indicated, of free ammonia, ammonium sulphide, and ammonium carbonate. The "fixed" ammonia consists chiefly of ammonium sulpho-cyanide (thiocyanate), ammonium ferrocyanide, ammonium thiosulphate, ammonium chloride, and ammonium sulphate.

Table I. shows the effects on fish of solutions of these salts of ammonia of different strengths. The strengths of the solutions are stated in parts by weight of the salt in 1,000 parts of water (*i.e.*, in grammes per litre), but in another column the calculated proportion of ammonia contained in the salt is also shown. A result reported by Dr. J. E. Gardiner in evidence in a case of alleged poisoning of fish by gas liquor has been interpolated.*

TABLE I.—Effect on Fish Life of Solutions of Ammonia and its Salts.

| Salt. | Parts of salt per 1000 parts of water. | Equivalent parts of ammonia, free or combined, per 1000 parts of water. | Minutes which elapsed before death. | |
|---|---|---|---|---|
| | | | Gudgeon. | Dace. |
| Ammonia ... ... ... | 1·0 | 1·0 | 1·5 | — |
| ,, ... ... ... | 0·1 | 0·1 | 6 | 2·5 |
| ,, ... ... | 0·02 | 0·02 | 130<br>100<br>100 | 100 |
| ,, ... ... ... | 0·0148* | 0·0148 | 60 | — |
| ,, ... ... ... | 0·01 | 0·01 | 720 | 1800 |
| ,, ... ... | 0·004 | 0·004 | Unaffected | Unaffected |
| Ammonium sulphocyanide | 0·1 | 0·0227 | 360 | Unaffected |
| ,, ,, | 0·01 | 0·0043 | Unaffected | — |
| Ammonium sulphate ... | 1·0 | 0·257 | 60 | 60 |
| ,, ,, | 0·1 | 0·026 | Unaffected | Unaffected |
| Ammonium sulphide .. | 1·0 | 0·5 | 105 | + |
| ,, ,, | 0·1 | 0·05 | Unaffected | Unaffected |
| Ammonium carbonate .. | 1·0 | 0·354 | 180 | — |
| Ammonium chloride ... | 1·0 | 0·318 | 360 | — |
| Ammonium ferrocyanide | 0·1 | 0·024 | Unaffected | — |
| Ammonium thiosulphate | 0·1 | 0·023 | Unaffected | ‡ |
| | Vols. of 10 ounce liquor per 1000 vols. of water § | | | |
| Gas liquor ... ... ... | 1·00 | 0·0217 (exclusive of fixed ammonia. | 105 | 100 |
| ,, ... .. .. | 0·92 | 0·0200 | 110 | 105 |
| ,, ... ... . | 0·10 | 0·0022 | Unaffected | — |

* Experiment reported by Dr. Gardiner.
† Tench died in 260 minutes.
‡ Tench unaffected.
§ 10 ounce strength by direct titration, and therefore exclusive of the fixed ammonia present.

It will be seen that free or real ammonia is very deadly to fish, and next to it come in order the sulphocyanide, the sulphate, the sulphide, and the carbonate. The sulphocyanide and sulphate are not present in large proportion in gas liquor, the effect of which will, however, vary slightly according to its composition, which depends on the point in the train of condensing and ammonia extracting plant on the gasworks from which it has been obtained. The results for a typical sample of liquor are shown in Table I., and indicate that it is nearly as deadly to fish as is water containing the equivalent amount of ammonia wholly in the free state. But in addition to ammonia and its salts, gas liquor contains, as already stated, a certain amount of phenols, solutions of which, if above a certain strength, are deadly to fish. The precise effect of solutions of phenol of different strength will be dealt with shortly. The presence of phenol in gas liquor may, however, account for it being considerably more deadly to fish than are solutions of carbonate and sulphide of ammonia of the same ammoniacal strength. Other salts of ammonia are only of minor importance, though it should be noted that the sulphate, which is largely used as a fertiliser, is more deadly than most of the other fixed salts of ammonia. This point will be referred to subsequently, when the effect of fertilisers in general is considered.

(ii.) *The Tar Oils and their Associated Bodies.* The tar oils have to be considered from two points of view *viz.*, as oils which, by forming films or otherwise, may interfere with the proper aëration of water, and as solvents or carriers of other substances which are directly poisonous or harmful to fish. The lighter oily constituents of coal tar—*viz.*, the oils distilling below about 170 deg. Cent.—have generally a lower specific gravity than water, and therefore if, in a free state, they enter watercourses, they will spread over the surface and form a film which will cover a very large area of water.

* Cf. F. W. Skirrow, *Journal of the Society of Chemical Industry*, 1908, p. 68.

* See the *Journal of Gas Lighting*, Vol. cxvi., p. 627.

It is difficult to judge the precise harmfulness of such a film in preventing the proper aëration of water, but evidently running water in which the surface is continually broken will be less affected than still water. Even with such water, however, if oil is present in substantial quantity, its effect in soothing troubled waters has to be borne in mind. An attempt to ascertain experimentally if a film of the light oils from coal tar was directly harmful to fish was made by pouring 1 part of crude light oil on to 1,000 parts of water, and putting gudgeon in the latter. The gudgeon died in three hours (see Table II.).

There is evidence that mineral oils are nearly as good solvents of oxygen as water, so that the aëration of water does not appear to be inhibited by a film of mineral oil. Experiments were made on gudgeon with gasoline and a heavy automobile mineral lubricating oil, applied to water in the same proportion (1 to 1,000) and in the same way as the crude light oil. The gudgeon were unaffected by the film either of gasoline or lubricating oil. In regard to the crude light oils of coal tar, however, it may be pointed out that they act as solvents of phenol and other toxic ingredients of tar, and are not simply neutral oils. The film-forming power of coal tar depends chiefly on the proportion of light oils in it, and it appears that the film of crude light tar oils is rather more deleterious to fish life than the film of mineral fuel and lubricating oils.

The middle oils of coal tar are heavier than water, and will not ordinarily cause an appreciable film on the surface. They contain in solution or admixture, as already stated, more or less naphthalene, which is a solid which is practically insoluble in water. A

TABLE II.—EFFECT ON FISH LIFE OF COAL-TAR OILS AND THEIR CHIEF ASSOCIATED BODIES.

| Substance. | Parts of substance per 1,000 parts of water. | Minutes which elapsed before death. | |
|---|---|---|---|
| | | Gudgeon. | Dace. |
| Phenol .. .. .. | 0·240 | 15 | 5 |
| .. ... ... ... | 0·100 | 60 | 60 |
| .. ... ... .. .. .. | 0·0125 | * | * |
| ... .. .. .. | 0·010 | Unaffected | — |
| No. 5 carbolic acid .. .. .. | 0·240 | 70 | 70 |
| .. .. ... ... .. | 0·010 | 2,160 | — |
| Soluble creosote, 2 per cent tar acids ... .. .. | 0·100 | 90 | .. |
| Creosote oil, 14 per cent tar acids | 0·250 | 180 | |
| .. .. 2 .. .. .. | 1·000 | 240 | |
| Crude light oil .. .. | 1·000 | 180 | |
| Crude heavy oil ... ... | 1·000 | 240 | — |
| Aniline ... .. .. ... .. | 1·000 | 40 | — |
| .. .. ... .. | 0·100 | 180 | 180 |
| Toluidine (ortho-) ... ... | 0·100 | 180 | |
| Pyridine ... ... ... | 0·100 | Unaffected | Unaffected |
| Naphthalene ... ... .. | >1·000 | Unaffected | Unaffected |

* Parts of tar acids, reckoned as phenol, determined by bromine.
† Dace much affected, and gudgeon slightly affected, in six hours, when they were returned to fresh water and both recovered.

quantity of clean naphthalene was suspended in a muslin bag in water, and neither gudgeon nor dace in the water were affected by it in the least. The middle oils contain also varying quantities of tar acids, or crude phenols, and also various basic bodies. The middle oils obtained when tar is distilled in a tar distillery are sold either in the crude state for the creosoting or pickling of timber, &c., or the tar acids are extracted from them by washing with caustic alkali, and are worked up into carbolic acid and other phenolic preparations. Caustic alkali completely extracts the phenols, but they are extracted to a certain small extent by water, in which they are slightly soluble at ordinary temperatures. A certain proportion of phenols may thus be extracted from the crude middle oils of coal tar by agitating water with them. The effect on fish of water which has been in contact with the middle oils of coal tar depends mainly on the amount of tar acids in the oil, but since the oil itself is not appreciably soluble in the water unless specially emulsified (as in commercial "soluble creosote") the effect is largely influenced by the extent to which the tar acids are extracted by the water on mere contact or agitation with the oil.

The heavy oils of coal tar do not contain phenols or other bodies which are known to have any directly poisonous action, or which are appreciably soluble in water.

The effects on gudgeon of water which has been mixed as far as possible with various tar oils in the proportions stated are shown in Table II.

Experiments were also made with various pure substances which are contained in, or may be extracted from, the tar oils. The most important of these is phenol (carbolic acid). Pure phenol was dissolved in water in known proportions and the effects of the solution on fish observed. The results are included in Table II. Similar experiments were made with Calvert's "No. 5 carbolic acid," which consists chiefly of cresols (the next higher members to phenol of the phenol series), and with certain basic bodies derived from coal tar—*viz.*, aniline, toluidine, and pyridine. The results of these experiments are also shown in Table II.

The import of the results given in Table II. and their bearing on the question of the effects on fish life of washings from tarred road surfaces, will be discussed in connection with the results obtained with water which has been in contact with tar.

(iii.) *The Pitch.*—Coal tar pitch consists of substances which are relatively inert, and, hence, it is not surprising that it was found that water in which small lumps of pitch were suspended in a muslin bag proved to have no effect on gudgeon and dace.

### THE EFFECT ON FISH LIFE OF WATER WHICH HAS BEEN IN CONTACT WITH COAL TAR.

A number of experiments were made in order to obtain direct evidence of the effects on fish life of water which has been in contact with coal tar. The experiments may be conveniently arranged in four series as follows: (1) Tar and water in definite proportions were agitated very vigorously for fifteen minutes at a known temperature, and fish were kept in the extract thus obtained and the effects observed; (2) tar was placed in the bottom of a vessel, a false perforated bottom was put over it, the vessel was filled with water, and fish were put in the water and the effects observed; (3) the whole inside surface of the vessel was painted with tar, which was allowed a certain time to set, and the vessel was then filled with water, in which fish were put and the effects observed; (4) a large tray was painted with tar, which was then sanded; a spray of water was allowed to fall on the tarred and sanded tray in imitation of rainfall; the washings were collected and their effect on fish observed. Approximate determinations of the strength of the extracts and washings in phenolic constituents were made for purposes of control by means of bromine water.

The majority of the experiments were made on four samples of coal tar, each chosen as typical of a different grade. The composition and general characteristics of these samples of tar are shown in Table III., in which are included the similar particulars in regard to the sample of "freed" carburetted water-gas tar, and the sample of blast-furnace tar, on which experiments, referred to later, were made.

In the first series of experiments a number of trials were made of agitating tar with different proportions of water at different temperatures. It was found that the phenolic strength of the extract depended on several factors, of which the most influential were the viscosity of the tar at the temperature of agitation, the proportion of tar acids in the tar, and the vigour with which the tar and water were agitated. The effect of temperature seemed to depend mainly on the consequent alteration in the viscosity of the tar. Within a fairly wide range the phenolic strength was not very greatly affected by the proportion of water to tar, and the extracts of which the effects are reported below were mostly obtained by agitating 1 part of tar with 200 parts of water. A number of experiments were made, however, on extracts obtained by agitating 1 part of tar with 20 parts of water, and on these extracts diluted by addition of water. Tar which had been extracted by agitation with one lot of water, on agitation with a fresh supply of water yielded to the second extract an appreciably lower amount of phenolic constituents than to the first. The effects on gudgeon and dace of extracts of tar prepared by vigorous agitation of water and tar in the proportions and at the temperatures stated are shown in Table IV.

There are a number of small discrepancies in the table, which may be readily accounted for by uncontrollable differences in the vigour and temperature of agitation, and the variations in the power of resistance of different specimens of the same species of fish. The outstanding feature of the results is, however, that the extracts of crude tars are more deadly to fish than extracts of "freed" tars of corresponding phenolic strength. There is a general agreement in the results with extracts of "freed" tars and solutions of phenol (see Table II.) of the same strength, though the extracts of tar seem slightly more deadly than would be expected from their phenolic strength alone. There is probably some other constituent of the tar

extracts which is distinctly harmful to fish life, but until further investigations of the composition of the tar extracts have been made, conjectures as to the nature of this constituent are of little value.

In the second series of experiments, 1 volume of tar was put in the bottom of a vessel and 20 volumes of water added. Fish were put in the water at once, being protected from contact with the tar by a perforated screen placed above it. Two tars—viz., C and D—were tried in this manner with dace and gudgeon. With C the fish died in less than eighteen hours, but with D they lived for twenty-four hours, when they were removed from the water. Carp remained alive in the water in contact with tar C, and though much affected towards the end of the eighteen hours, recovered when put in fresh water.

now in about 240 minutes, while the trout, gudgeon and roach, though affected, remained alive for five hours, but all died in less than seventeen hours. The same tarred surface was sprayed a second time, and gudgeon placed in the washings remained alive for over seven hours. A similar experiment was made with tar D, and trout, grayling, pike, perch, dace, gudgeon and tench were put in the washings. The trout died in 130 minutes, the perch in 275 minutes, the pike in 345 minutes, the grayling in 495 minutes, the dace in about 720 minutes, while the tench remained alive for over twenty-four hours, and the gudgeon for over forty-eight hours, when it was restored to fresh water and recovered. A portion of these washings was diluted with twenty times its volume of clean water, and trout, roach and gudgeon were put in

TABLE III.—PARTICULARS OF TARS USED.

| Distinctive letter ... | A. | B. | C. | D. | E. | F. |
|---|---|---|---|---|---|---|
| Description of tar .. | Crude coal tar (light). | Crude coal tar (heavy). | "Freed" coal tar (medium light). | "Freed" coal tar (medium heavy). | "Freed" carburetted water-gas tar | Scotch blast furnace tar. |
| Specific gravity at 15·5 deg. C. (60 deg. Fahr.) ... | 1·160 | 1·274 | 1·185 | 1·208 | 1·085 | 1·155 |
| Water: per cent by weight .. | 5·5 | 6·2 | 0·1 | 0·1 | 0·3 | 1·9 |
| Ammonia: grains per gallon of tar... | 72 | 58 | Nil | Nil | Nil | 1·6 |
| Light oils, distilling below 170 deg. C.* ... | 3·0 | 2·0 | 0·6 | 0·2 | 1·7 | 0·5 |
| Middle oils, distilling between 170–270 deg. C.* } per cent by weight of the dehydrated tar | 22·0 | 9·0 | 23·4 | 16·1 | 31·4 | 23·5 |
| Heavy oils, distilling between 270–300 deg. C.* } per cent by weight of the dehydrated tar | 5·2 | 1·7 | 8·8 | 6·8 | 13·3 | 7·7 |
| Pitch ... } per cent by weight of the dehydrated tar | 68·6 | 85·3 | 66·8 | 76·8 | 53·1 | 67·8 |
| Crude tar acids; per cent by volume of the middle oils .. | 14·0 | <1·0 | 10·0 | 5·0 | <1·0 | 35·0 |
| Crude tar acids; per cent by volume of the tar ... | 3·2 | — | 2·5 | 0·9 | — | 8·6 |
| Free carbon, per cent by weight of the dehydrated tar | 8·5 | 27·7 | 15·6 | 15·8 | trace | 7·0 |
| Viscosity at 76 deg. Fahr. Time required to flow through an orifice through which refined rape oil in the same conditions flowed in two minutes: Minutes ... | 2¼ | 660 | 10 | 60 | | 43½ |

* The temperatures during distillation were observed on a thermometer, the bulb of which was opposite the side tube of the fractionating flask.

In the third series the first experiment was made with tar C, which was painted on the whole of the inside of the vessel and allowed ten days to harden. Water was then poured into the vessel and gudgeon and dace placed in it. The gudgeon died in seventeen hours, the dace in thirty hours. In the second experiment the inside of the vessel was painted with tar D, which was allowed five days to harden. The vessel was then filled with water. A perforated sheet was placed over the bottom, and trout, grayling, gudgeon and dace were placed in. The grayling was affected in less than one hour, and the gudgeon appeared to be slightly affected in less than two hours. The trout and dace were not affected in 2½ hours. Water was then allowed to play into the vessel in a jet at the rate of about 1 litre in 2½ minutes (equal about 5 gallons an hour)—the surplus being removed by a constant level overflow—and all the fish then remained alive for forty-eight hours (when they were removed), the trout and dace not having shown any

the diluted washings. They remained unaffected for six hours, when they were removed.

THE EFFECT ON FISH LIFE OF WATER WHICH HAS BEEN IN CONTACT WITH CARBURETTED WATER-GAS TAR AND BLAST-FURNACE TAR.

Experiments were made on a "freed" or "dehydrated" carburetted water-gas tar, and a Scotch blast-furnace tar, of which particulars are given in columns E and F of Table III.

The carburetted water-gas tar, when mixed with water in the proportion of 0·1 part of tar to 1,000 parts of water, gave a film on the surface of the water, but did not affect gudgeon. The tar, when agitated vigorously for fifteen minutes with water in the proportions and at the temperatures stated, gave the results shown in Table V.

The bromine method for the estimation of phenol when applied to extracts of water-gas tar proved quite unreliable, doubtless owing to the presence of unsatu-

TABLE IV.—EFFECT ON GUDGEON AND DACE OF AQUEOUS EXTRACTS OF COAL TAR, OBTAINED BY VIGOROUS AGITATION FOR FIFTEEN MINUTES.

| Tar used (see Table III.). | Volumes of water agitated with one volume of tar. | Temperature of water during extraction Fahr. | Phenolic bodies reckoned as phenols in the extract. Grammes per litre. | Minutes which elapsed before death. | |
|---|---|---|---|---|---|
| | | | | Gudgeon. | Dace. |
| A (crude light) ... | 200 | 70 | about 0·14 | 15 | 14 |
| B (crude heavy) .. | 200 | 70 | ,, 0·06 | 80 | 40 |
| C ("freed" light) .. | 200 | 70 | ,, 0·21 | 30 | 20 |
| C ,, ,, ... | 200 | 70 | ,, 0·17 | 30 | 36 |
| C ,, ,, ... | 200 diluted to 400 | 70 | ,, 0·09 | 120 | 31 |
| C ,, ,, ... | 20 ,, 200 | 70 | ,, 0·02 | 720 | 360 |
| C ,, ,, ... | 20 ,, 200 | 46 | ,, 0·01 | 1,140 | 360 |
| D "freed" heavy ... | 200 | 70 | — | 155 | 45 |

sign of being affected throughout the experiment. The rate of flow of the water was such, relatively to the capacity of the vessel at the level to which it was filled, that the water would be wholly renewed in forty-five minutes. Subsequently two carp, a perch, two roach, two trout and a number of gudgeon were kept for six days in the same tarred vessel in the same conditions, and remained unaffected throughout.

In the fourth series of experiments a [illegible] was painted with tar, and sand sprinkled on the tarred surface. After a lapse of eighteen hours water was sprayed on the tar in imitation of rainfall, and the washings were collected. The rate of sprinkling was equivalent to a rainfall of 1 in. in two hours eight minutes. One experiment was made with tar C, and trout, perch, gudgeon, roach and minnows were placed in the washings. The perch died in 180 minutes, the min-

rated hydrocarbons in the tar. Qualitative tests did not show the presence of phenols in the extract. The tar, however, being practically free from tar acids, would clearly yield very little, if any, phenol to a water extract, and the toxic ingredient in the extract is evidently not phenol. The extract retained a strong smell and taste of the tar.

Experiments were made with the blast-furnace tar F by agitating it vigorously with water for fifteen minutes in the proportion and at the temperature given in Table V. The extracts were all coloured deep red and smelled and tasted of the tar. An estimation by means of bromine of the phenolic bodies in the extract made with 200 volumes of water to 1 of tar showed a strength of 0·16 part of phenolic bodies reckoned as phenol per 1,000 parts of extract. This is a lower phenolic strength of the extract than might

have been expected from the large proportion of tar acids in the tar, but the latter is highly viscous, and does not therefore readily commingle with the water during agitation.

The middle or creosote oils from blast-furnace tar are known commercially as "blast-furnace creosote," and this oil has been used in the preparation of certain compositions sold as dust-abaters. An experiment

TABLE V.—EFFECTS ON FISH LIFE OF AQUEOUS EXTRACTS OF CARBURETTED WATER-GAS TAR AND BLAST-FURNACE TAR.

| Tar used (see Table III.). | Vols. of water agitated with one vol. of tar. | Temp. of water during extraction. Deg. Fahr. | Minutes which elapsed before death. | |
|---|---|---|---|---|
| | | | Gudgeon. | Dace. |
| Carburetted water-gas tar (E) .. | 30 | | 120 | — |
| " " | 200 | 70 | 230 | 105 |
| Blast-furnace tar (F) | 20 | — | 20 | — |
| " " " | 20, diluted to 1,000 | — | 240 | — |
| " " " | 200 | 70 | 25 | 15 |

was made on a mixture of 0·1 part of blast-furnace creosote with 1,000 parts of water. Gudgeon put in this water died in 210 minutes.

THE EFFECT ON FISH LIFE OF WATER WHICH HAS BEEN IN CONTACT WITH ASPHALTES, ETC.

The results of experiments made with three well-known types of bituminous materials, two of natural origin, and one prepared from petroleum residues, may be briefly mentioned.

A sample of the Neuchatel natural rock asphalte containing 7·2 per cent of bituminous matter was broken to lumps about the size of a pea and suspended in a muslin bag in water. Gudgeon placed in this water were unaffected.

A liquid asphaltum from Trinidad containing over 99 per cent of extractable bituminous matter was agitated vigorously with twenty times its volume of water, and gudgeon placed in the aqueous extract were unaffected. This extract smelled very strongly of the asphaltum.

"Roadoleum A," which is prepared from American petroleum, was put in a vessel which was filled with water. Gudgeon remained unaffected in the water.

THE EFFECT ON FISH LIFE OF WATER WHICH HAS BEEN IN CONTACT WITH AGRICULTURAL FERTILISERS.

(Nitrate of Soda, Sulphate of Ammonia, Lime, Stable Manure, &c.) [Weed Killer.]

Experiments were made on the effect on fish life of solutions of two of the best known artificial fertilisers—*viz.*, sodium nitrate and ammonium sulphate; as well as of solution of lime ("lime water"), the natural drainage from heaps of stable manure, and extracts prepared by agitating water with fresh and old stable manure. The results are shown in Table VI.

The preparations of stable manure were all deep brown and opaque. Probably the greater part of the ammonia estimated on distillation of them was formed

TABLE VI.—EFFECT ON FISH LIFE OF SOLUTIONS OR EXTRACTS OF FERTILISERS.

| Substance. | Strength; parts per 1,000 parts of water. | Minutes which elapsed before death. | | |
|---|---|---|---|---|
| | | Gudgeon. | Dace. | Minnow. |
| Sodium nitrate .. | 1 | Unaffected | Unaffected | — |
| Ammonium sulphate | 1 | 60 | 60 | — |
| " " | 0·1 | Unaffected | Unaffected | — |
| Lime . ... ... | 1 | 20 | 45 | — |
| " . | 0·1 | Unaffected | Unaffected | — |
| Stable manure, natural drainage from | Diluted till the yield of ammonium on distillation was equal to 0·2 part | 1,440 | 240 | 145 |
| Stable manure, fresh; artificial extract | 0·2 part | — | — | 150 |
| Stable manure, old; artificial extract | 0·2 part | — | — | about 150 |

from other nitrogenous bodies during distillation, and no easy method of determining the ammonia present as such in the extracts suggested itself.

The investigation of these materials was undertaken because it appeared possible that the surface drainage from agricultural land which had been recently treated with the fertilisers named might affect fish life in streams into which it passed, and that injury to fish life really due to fertilisers might be attributed to tarred roads in the vicinity. The effects of the extracts of stable manures were specially studied because the waterproofing of the road surface by means of tar and similar materials seemed likely to cause more concentrated extracts of horse droppings than formerly to be washed from the road surface into streams.

It appears from the results that there is somewhat greater risk of injury to fish life from the use of sulphate of ammonia than from the use of nitrate of soda, though the fact that the former fertiliser has been applied in enormous quantities for years past without definite cases of injury to fish having arisen, indicates that the solution extracted from the treated soil is naturally diluted to an extent which brings its strength below that which has been found by these experiments to be harmful. The same remark applies to the effect of extracts of stable manure. The dilution which naturally occurs before the extracts pass into fishing waters is so great that no injury to fish arises from them. The fact, however, that both artificial and natural manures may, in solutions or extracts of strength comparable with the strength of solutions or extracts of tar and tar products prepared in a similar manner, as described earlier in this paper, cause injury to fish has an important bearing on the results which may be anticipated from tarred surfaces, &c., when exposed in natural conditions. It is clear that the concentration obtained artificially is in all cases much greater than would ever occur naturally, and consequently the results with the artificial preparations greatly exaggerate those which can ensue in natural conditions.

Cases of poisoning might arise from the use of arsenical weed-killers in the vicinity of fishing streams, and it therefore seemed desirable to observe the effect on fish of a dilute solution of arsenic trioxide (white arsenic). A solution of 0·1 part of arsenic trioxide in 1,000 parts of water had no effect on gudgeon for several hours, but later the fish were affected and died in forty-eight hours.

RELATIVE SUSCEPTIBILITY OF DIFFERENT SPECIES OF FISH TO AMMONIA AND TAR POISONING.

It is difficult to determine exactly the relative susceptibility of different species of fish to poisoning owing to differences in the powers of resistance of individual specimens, and to the different natural conditions in which different species of fish thrive best. With trout and other fish which prefer fast-running streams, thorough aëration of the water is

TABLE VII.—RELATIVE SUSCEPTIBILITY OF FISH TO AMMONIA AND TAR OR PHENOL POISONING.

| Order. | Ammonia poisoning. | | Phenolic or coal-tar extract poisoning. | |
|---|---|---|---|---|
| | Affected. | Died. | Affected. | Died. |
| 1 | { Perch | { Perch | Grayling | } Perch |
| 2 | { Pike | { Trout | } Perch | } Trout |
| 3 | Pope | Pike | } Trout | Minnow |
| 4 | Trout | { Dace | Pike | Pike |
| 5 | Dace | } Pope | Pope | Grayling |
| 6 | } Gudgeon | Tench | Minnow | Pope |
| 7 | } Tench | Gudgeon | Roach | Roach |
| 8 | Carp | Carp | Gudgeon | Dace |
| 9 | | — | Dace | Gudgeon |
| 10 | — | — | Tench | Tench |
| 11 | — | — | Carp | Carp |

essential, and it has proved somewhat difficult to imitate natural aëration with the limited quantities of water or solutions on which the experiments have been made. But making allowance for the cases of experiments in which the aëration is known to have been somewhat imperfect, and taking the results of a fairly large number of experiments on the fish named, it may be predicted that in cases of ammonia poisoning, or of poisoning by extracts of free coal tar or solutions of phenol, the fish would be affected and would die in the order indicated in Table VII.

The conclusions in regard to ammonia are based on fewer experiments than those in regard to tar or phenol, and consequently the order in which the species are ranged is less well established in the case of ammonia. "Affected" is used to indicate that the fish has begun to behave in an abnormal manner—in the case of ammonia poisoning, the first untoward symptoms are commonly sudden convulsive movements, with violent dashing through the water; and in the case of phenol poisoning the fish gradually turns on its back without paroxysms. Death fre-

quently occurs quite suddenly from ammonia poisoning, but generally slowly from phenol poisoning.

THE PRACTICAL BEARING OF THE EXPERIMENTAL RESULTS.

The results of the more important experiments have now been recorded, with as much detail as has seemed necessary to provide the data on which trustworthy conclusions may be based.

The author will briefly indicate some of the conclusions which he draws from the results of the investigation:—

(1) That ammonia and many of its salts are very highly toxic to fish, and gas liquor is nearly as toxic as clean water containing the same proportion of free ammonia.

(2) That it follows that the use on roads of coal tar containing gas liquor (*i.e.*, crude tar) is attended by appreciably greater risk of injury to fish life than is the use of coal tar which has been "freed" from gas liquor.

(3) That of the oils contained in coal tar the "light oils" are the most harmful to fish life, and since the light oils are to a large extent removed from coal tar by the procedure which is followed for the removal of gas liquor, an additional reason is afforded for preferring "freed" to crude coal tar.

(4) That the phenols are highly toxic to fish, though less so than ammonia.

(5) That tars in which phenols and allied bodies ("tar acids") are present in high proportion may render water which has been in intimate contact with the tar toxic to fish in degree approximately corresponding with the amount of phenoloid bodies acquired by the water from the tar.

(6) That, other things being equal, water acquires a smaller proportion of phenoloid bodies from a thick, highly viscous tar than from a thin, freely fluid tar.

(7) That, taking into consideration (5) and (6), and the fact that light, thin coal tars generally contain a larger proportion of tar acids than heavy, thick coal tars, the use on roads of light, thin coal tars is attended by appreciably greater risk of injury to fish life than the use of heavy, thick coal tars.

(8) That the risk of injury to fish life from the use of "freed" coal tar on roads is negligible, provided the tar contains less than 3 per cent by volume of crude tar acids, and the area of the tarred surface is not greater than one-twentieth of the total area of ground draining into a watercourse.

(9) That naphthalene and coal-tar pitch are not distinctly harmful to fish life.

(10) That the use on roads of a "freed" carburetted water-gas tar is attended by less risk of injury to fish life than the use of a "freed" coal tar. (The use of "crude" carburetted water-gas tar is, however, inadmissible, owing to the large proportion of light oil in it.)

(11) That the use on roads of blast-furnace tar, or of preparations containing much blast-furnace creosote, is attended by considerably greater risk of injury to fish life than the use of a "freed" coal tar.

(12) That some important natural asphaltes and asphaltums and petroleum preparations are not distinctly harmful to fish life.

(13) That the use of salt water, or of calcium chloride for dust abating is not attended with risk of injury to fish life.

(14) That there is a remote risk of injury to fish life from washings from accumulations of horse droppings or stable manure, and that the use of sulphate of ammonia as a fertiliser is attended by appreciably greater risk of injury to fish life than the use of nitrate of soda. All the risks referred to in this paragraph are, however, in all ordinary circumstances so remote that they are negligible.

SUGGESTED PROVISIONS FOR SAFEGUARDING THE SURVEYOR IN THE USE OF TAR.

The conclusions set out above disregard all considerations other than the effect of the tar roads &c. on fish life. It is not the purpose of this paper to deal with the other considerations which enter into the choice of road-surfacing materials by the surveyor. But, bearing in mind this limitation, the surveyor may, in the author's opinion, safeguard himself in the use of tar on roads in all ordinary cases if he uses only coal tar or a mixture of coal tar and carburetted water-gas tar, which, in either case (1) Is of not lower specific gravity at 15 deg. Cent. than 1.18. (2) contains not more than 1 per cent of water or gas liquor, the ammonia in which is equal to not more than 5 grains per gallon of tar; (3) contains not more than 1 per cent of light oils; and (4) contains not more than 3 per cent by volume of crude tar acids.

If cases occur where the washings from tarred roads will not be diluted to at least twenty times their volume before, or immediately on, entry to fishing waters, the maximum limit of water or liquor in the tar should be reduced to 0·2 per cent, of ammonia to 1 grain per gallon of tar, and of light oils to 0·8 per cent (or 1 per cent of distillate below 170 deg. Cent., inclusive of water). As an extreme precaution in certain cases a tar prepared from pitch and "dead" tar oils (*i.e.*, middle and heavy, tar oils from which the phenols have been extracted) might be used, and when the market value of carbolic acid, &c., is high, the cost of such a prepared tar should not be very much greater than that of an ordinary good "freed" coal tar.

It has not appeared to the author desirable to include in this paper analytical details. He hopes to find shortly a fitting opportunity to present a paper on the detection and estimation of small quantities of phenols in water.

The author desires to record his thanks to Mr. F. L. Bassett, B.Sc., A.I.C., for help and valuable suggestions in connection with the investigations.

## DISCUSSION OF MR. ATKINSON BUTTERFIELD'S PAPER.

Mr. R. J. Thomas (Bucks), in proposing a hearty vote of thanks to Mr. Butterfield, said his paper was really a most excellent one, and would be of infinite assistance to every road surveyor who was compelled by modern traffic to utilise something more than water for binding his roads. These experiments appeared to him to be most interesting, but he did not know whether Mr. Butterfield could say whether they were entirely conclusive. They were, he took it, more in general form than in absolute proportion, because from what little he knew of fish they found very few alike either in temperament or the way in which they took the hook. The whole point lay in the question of cost to road authorities—he meant the purchase of distilled tar. That was what it amounted to. In his own county they had been able to afford nothing but crude tar. They had used that for eight years, doing about 100 miles annually, and so far they had had no claim against them. He attributed that to two reasons. One was that they took good care to screen their tar and to boil it at an intense heat; afterwards, in applying it to the road their object was not to leave a film or skin on the top, but to drive it as deeply as they possibly could into the interstices of the road. By doing that he had found no great risk of tar in any great quantity escaping into the gutters. The only occasion on which it appeared to him there was any danger of pollution in this extraordinary climate of ours was when a heavy thunderstorm occurred before the tar had a chance of getting into the road. But he had found by concentrating the outlets on the roadside next to the stream, and having in each of those outlets a filter of three grades of gravel, reduced finally to fine, sharp sand, that they obtained an effluent which apparently did no harm at all. They had two or three celebrated fisheries, apart from the Thames, in the county, and the owners suggested some time ago, as complaints had been made in other parts, that they should do all they could to minimise the possibility of any pollution, and they had fallen in with their wishes. The small filter-beds he had referred to—which were 6 ft. by 5 ft. by 3 ft. 6 in.—had satisfied the owners of fisheries. He had to buy his tar from twenty different gasworks throughout the county. None of the companies were in a position to lay down plant to purify their tar, but unless they bought from them it would mean their paying something like three times the price for distilled tar imported from Midland towns or reducing the area of the roads they treated by two-thirds, which they did not want to do. Would the author of the paper express an opinion as to the point of minimising the danger by making their men understand that the tar had to be in the heart of the road, and not in a film on the surface, for it seemed to him that if a tar had to do any good the waterproofing had to be done down below. It was important to key the granite together and hold it up, and it was then far more capable of doing its work than if they simply smeared the surface over without attempting to secure a deep penetration? They found they had a penetration

of from 2½ in. to 3 in. on some of their roads. This was all done by hand, with, of course, portable boilers. The tar was brushed in by three pairs of men. The first two had bass brooms; the second pair, heavier bass brooms; and the third pair were young men who had to brush as strongly as they could. His instructions were to leave as little as possible on the surface.

Mr. W. Harpur (Cardiff) said he had pleasure in seconding the vote of thanks to Mr. Butterfield for his valuable paper—which would prove very helpful indeed to the members. He had no intention of speaking on the merits of the paper, because he had not had an opportunity of reading it, and also because it hardly applied to a town like Cardiff. Besides, nothing but distilled tar was used there, and all the water found its way into the sewers, and ultimately into the Bristol Channel, so there was no risk whatever in his case of injury to fish life from the use of tarred surfaces. He thought the paper was one which practically confined itself to the use of tar on country roads where the water from the surfaces went directly into the streams, and was not treated in any way on sewage purification works. For that reason he thought those present who had country roads under their control would be best able to deal with the question.

Colonel R. E. Crompton (Road Board) said that in common with a great many of those there that evening, he had sat at the feet of Mr. Butterfield for his knowledge, and would be surprised if he had said anything in his paper not of extreme use to them. He was in the position of suffering from this fish scare perhaps more than any other person in the country. It almost meant an extra clerk in his office to attend to correspondence calling upon him to say something authoritative to contradict the scare the fishermen had got that tarred roads were going to destroy fisheries all over the country. He really thought that the number of fish actually killed was so exceedingly small that he doubted whether they had been killed by tar at all. Really, the evidence that there had been any change in the number of dead fish found was so extremely small that it was not going too far to say that it was very exceptional that fish had ever been killed by tar. Of course, keen fishermen thought otherwise. He agreed with Mr. Thomas that Mr. Butterfield had put the case very clearly. There should not be any possibility of any quantity of the tar water or ammoniacal liquor being washed off the roads. Mr. Thomas had adopted the ingenious device of intercepting the liquor on its way to the watercourses, and had had no complaints, although he had had experts watching him and asking him to take all precautions. Although he thought it was only a scare, and that there was nothing to fear, provided reasonable precautions were taken, he did not suggest for a moment that they should relax their efforts to avoid pollution. Why, if these tars were so injurious, did they see tar so largely used in the upper reaches of the Thames? A paragraph in the paper said: "In the third series, the first experiment was made with tar C, which was painted on the whole of the inside of the vessel." At first sight it did not give very good results, but further down it did. As a fisherman himself, he submitted that they could not handle fish in and out of tanks without making them a little sick—particularly gudgeon and dace. With eels it might be different.

Mr. Thomas: You would not get them in. (Laughter.)

Colonel Crompton, continuing said a similar experiment was made with C tar, and a certain number of trout died. But he really believed if they looked at the main cause they would find that the fish were sick before being put in, or it might have been due to want of aeration.

Mr. A. Gladwell (Eton) said he was in agreement as to the valuable nature of the information imparted by the paper. He had noticed Mr. Thomas's work in tar-surfacing on the occasions when he had travelled over his roads, and had heard with some surprise the results he obtained from the system he had described of well brushing the tar into the road structure, and allowing it to soak into the roads, instead of putting on other surfacing in the way of chippings and so forth. With the exceptions of extreme variation of the weather, the work certainly did stand very well indeed—better than he anticipated it would. So far as he was himself concerned, he leaned rather to the theory and practice of the incorporation of the tar in the material during construction. He believed there was a large quantity of tar put on the surfaces of roads which could be much better used if incorporated in the structure, his view being that the penetration of the tar was not really so great as was sometimes imagined. He did not see how it could be, because it was a question, more or less, of capillary attraction. He should say the intention of the paper was rather to reassure those who were nervous as to the inimical results which accrued from the use of the tar on roads, and, so far as he was concerned as a highway surveyor, he thought he could sum it up in this way: "If the fish don't like the tar they must do the other thing." The tar had to be put on the roads, and what they had to do was to eliminate any possibility of polluting matters getting into the streams. As time went on the fish would probably get accustomed to the tar, and the only fish they would be able to catch in a few years would be those impregnated with tar. The others would have died. (Laughter.)

Mr. W. V. Anderson (Winchester) associated himself with the vote of thanks to Mr. Butterfield for his able paper. He only wished they were all as comfortable as Colonel Crompton about using different tars on the roads. He would like to ask Mr. Thomas whether the small filters he had referred to were in urban districts or only on the roadsides of country areas. In Winchester they had a system in which there were 18-in. pipes, which were sometimes running full bore; and nothing but large filters would be of use under such circumstances.

Mr. H. Percy Boulnois (Westminster) said that, like many others present, he had not really had time to study the paper, which he greatly regretted, because it contained a great deal of very valuable information. But even if he had, he was not a chemist or a gas engineer, and in order to discuss the paper properly one required to have some intimate knowledge of tar and its compounds. Mr. Butterfield, in his paper, spoke of chemical compounds of which he (the speaker) had never heard. Totnidine was one. Pyridine one could understand a little better; but all through the paper the words alone were sufficient to kill the fish—(laughter)—although in other ways it was most practical. The experiments as to the effect on fish life of water which had been in contact with coal tar were clearly within the range of practical politics, and almost any surveyor could carry out these for himself without all the beautiful paraphernalia which Mr. Butterfield possessed. The results were set forth in a table, the headings of which showed the volumes of water agitated with one volume of tar, and the temperature of the water during extraction (which was practically the same all through); then there were the minutes that elapsed before the fish died. One thing that struck him about this table was that it took 1 volume of crude light tar to 200 volumes of water to kill fish in fifteen minutes, while it took, with 1 volume of crude heavy tar mixed with 200 volumes of water eighty minutes to kill fish. The chances of life of fish that had been taken out of their native element and put into a tank were much diminished. But apart from this, he thought it would be gross carelessness on the part of any surveyor in tarring a road to allow 1 volume of tar to escape with 200 volumes of water. He would either have to leave his gulleys unprotected, or there must be some other means by which tar got into the streams in such volume. Fish, too, he believed went in shoals; and they frequented certain parts of streams and rivers where they could best get food. One question he should like to ask was whether a tar which complied with the specification of the Road Board would be inimical to fish, and if dangerous, to what extent. Engineers rushed in where angels feared to tread, and it was as well for them to be pulled up occasionally by papers of this kind.

Mr. T. Milne (Gas Light and Coke Company) joined in thanking Mr. Butterfield for his paper. He said he must confess he was present as one who was interested in tar and ammonia; and on first looking through the paper he was a good deal discouraged. But later he saw it was stated that the conditions under which these experiments were carried out were more or less unnatural. He could hardly suppose that fish, if they found themselves in uncomfortable surroundings, would not get into other less uncomfortable. But under Mr. Butterfield's kind attentions they could not remove themselves if they wished to. If road surveyors would use water-freed tar, and of a gravity of not less than 1·2, they would have no trouble whatever. He thought Mr. Butterfield showed where the chief trouble arose: it came from the ammoniacal liquor in crude tar. If they freed their tar from water, they took out the ammoniacal liquor and the light oils which created the film of which Mr. Butterfield

spoke. He said the film was even worse than the liquor. There was another point about sulphate of ammonia, which was one of the most efficient fertilisers they had. If they got it into water it would injure fish, but when they put it into the land it became fixed, so that they could not get it into the water.

Mr. A. Dryland (Surrey) added his thanks to those of other speakers for the great care Mr. Butterfield had taken in preparing his paper. Like Mr. Boulnois, he was not a chemist, and could only speak from what he knew of the practical use of tar on roads. He agreed largely with Colonel Crompton that the fears expressed in regard to fish life had very little justification, provided reasonable precautions were taken; and more particularly did he think precautions ought to be taken where there was a surface-water drainage system going direct into streams. In the summer time the water from many of the country roads never reached the streams at all. On the chalk hills, for instance, it was absorbed into the soil; and in these cases there need be no fear of fish life, whether crude or freed tar was used. Of course, he knew tar would kill fish. He had known instances in which it had done so; but they had been extremely exceptional cases, and never ought to have occurred at all. In his own experience with tar-surfacing in large areas he had never yet had instances of fish being killed, except in two cases under extraordinary circumstances. One was a case in which crude tar was used in enormous quantities, so much so that it ran down the channels; a heavy thunderstorm came on, and washed the tar into a stream. Another case was where some tar-macadam was laid in the winter time. It was prepared to be laid, was spread on the road, and left unrolled for some days within a few yards of a fish pond, into which the washings were carried. But in the general sense of washings from tarred roads going into streams, he had had no complaints, nor had he any information of any authentic instances of fish being killed. There was very little crude tar used nowadays for roads; and surveyors all tried to use freed tar. At the same time, there were cases where there was no danger where crude tar could be employed. Though the experiments before them were extremely interesting, he agreed with other speakers that they did not reproduce quite the same conditions as occurred in streams. He thought it was quite understandable that, with tar in a vessel in which dangerous products had been mixed for a long period, and fish exposed to them, the fish would die; but he did not think that these conditions would obtain in a running stream. If fish did not like their surroundings, they would get away from the tarry matter altogether. The paper, however, showed them they must use care wherever there was danger of tar getting into streams. They must, and did, take precautions, so that no evil effects occurred. There was not the slightest need for it, and he thought there was not the least danger to the fish life of the country.

Mr. F. J. Wood (East Sussex) said he also desired to associate himself with the vote of thanks to Mr. Butterfield for his excellent paper. The matter, however, affected him very little, inasmuch as he made a practice of using nothing but heavy distilled tar for his roads. He had not used a tar of less specific gravity than 42 deg. Twaddel—that was, about 1·21; and in no case had it contained any water or gas liquor, or ammonia compounds. As regards fish life, in his part of the county they had very few rivers; but it was a most important thing in counties where rivers and fisheries existed that the material used in the treatment of the surfaces of the roads should, as far as possible, be free from constituents which might be harmful to fish life. He had one question. In Table IV. he saw that D freed heavy tar was used in the proportion of 1 volume to 200 volumes of water. Did that tar contain any phenolic bodies, because in Table II., where they had phenols, 0·1 part in 1,000 parts of water, gudgeon died in sixty minutes; whereas in the other table the gudgeon with the heavy freed tar died in 135 minutes?

Mr. Thomas stated at this point that the filters he had described were solely for use in country roads. With 18-in. pipes, if there were enough tar to kill fish, something ought to be done.

The vote of thanks was carried.

The President remarked that the paper would, he was sure, form a most valuable addition to the "Proceedings" of the institution. He tendered his personal thanks to Mr. Butterfield for acceding to his request that he should read the paper.

Mr. Butterfield, in reply, said he wished to thank those who had spoken for their very kind remarks, and all present for the way in which they had received the paper. He fully admitted that parts of it were, as one speaker had put it, academical, but he thought that from time to time cases would arise which would show that even the academical portions of the paper had some real practical application. It might not be obvious at the moment what that practical application might be, but the scheme of investigation was carried out consistently with the view of demonstrating what ingredients of road materials were in extreme conditions likely to be harmful to fish, and what ingredients were likely to be innocuous. Broadly, the investigations showed the worst results obtainable with the particular ingredients stated. In all practical conditions those results would be modified in that the fish would not be so liable to premature death. There were several reasons why those modifications would occur. One was that road washings seldom reached streams without some sort of filtration and purification by passage through or over sand or in contact with vegetable matter or organic matter, any one of which conditions was destructive of the harmful ingredients in the tar. Here the harmful ingredients were used in conditions in which their effect was not minimised in any way. In regard to Mr. Thomas' remarks, he had said very few fish were alike in temperament or the way in which they took the hook. That he realised early in these experiments, and accordingly where doubtful or inconclusive results were obtained he deleted them. He thought on the whole the results might be regarded as a fair average. As to the question of the effect of keeping the fish in unnatural conditions, there, again, he realised that the resistance of the fish in natural conditions would be greater, and they might add something on to the time that would accrue before death in those cases. But the results between one condition and the other were comparable, and on that he thought they had some definite information. On the question of road authorities and the use of crude tar, if it had been safe in all cases to use that on the roads, it would never have occurred to him to make these experiments, but Colonel Crompton and others had testified that there was a very wide outcry against the use of tar at all in some cases—there was a great deal of prejudice against it—and he wanted to find what real basis it had. He knew more now than when he started the work, and he had come to the conclusion that tar, if reasonably free from ammonia and light oils, as tar complying with the Road Board specification was, was in all ordinary conditions absolutely safe, but occasionally the surveyor had perhaps been harassed by complaints from local anglers or owners of fishery rights, and was asked by his council to put down material which it was absolutely certain would do no harm to the fishing streams. The washing from the road might pass with very little filtration, or possibilities of oxidation, into the fishing waters. In that case the surveyor asked for something that would safeguard him still more, and he had indicated what he thought would safeguard him absolutely even under extreme conditions. Filtration, which Mr. Thomas had suggested, undoubtedly reduced very greatly the risk of pollution of the streams from the use of crude tar, as did also the obtaining of considerable penetration of the surface of the road. He tried to emphasise in the paper that it was a surface exposed to the rain which mattered, and not the quantity of tarred material put on the road. It was a question of the proportion of water falling on the surface of the tar and of its impingement on the tar. In these experiments, where the tar was agitated with water, they had an extreme condition which would never be realised in practice. He was much indebted to Colonel Crompton for his remarks, and he thought what he had said about the complaints, whether justified or not, which rolled in was sufficient reason for dealing with the matter in the paper. He agreed that if reasonable precautions were taken in the tarring of roads no deaths of fish were likely to arise; the fish might die from quite other reasons. In regard to the possible sickliness of the fish used in the experiment from handling or being kept in unnatural conditions, he had found no difficulty in keeping trout apparently quite healthy for months at a time, provided the water was well aërated, and endeavoured to imitate those conditions in making his experiments. He doubted whether many would agree with Mr. Gladwell that if the fish did not like tar they must do the other thing, and that the tarring must be continued and the fish exterminated. At any rate, he thought if that policy

were pursued it would be a rather costly one to the county and municipal authorities concerned. He was sorry to hear Mr. Anderson was not comfortable in regard to the use of tar at all, and he would suggest with great diffidence, knowing the conditions in which he was working, that he really should ascertain whether there were not other circumstances which might have been responsible for any fish which had been lost in the neighbourhood of his tarred roads. He knew something of the nature of the tar which was used on Mr. Anderson's roads, and it was almost inconceivable that any harm resulted from it. The county surveyor of Hampshire, Mr. Taylor, spoke to him on the previous day, and told him he regretted he would be unable to attend that meeting, but that he might say for him that 100 miles of roads in his county had been tarred last summer, and he knew of no authentic case of fish being killed by the use of that tar. He could not speak as an angler, but he thought the fishing rights in Hampshire were more valuable than in any other county, and Mr. Taylor's testimony apparently was only controverted by some unfortunate accidents, of which Mr. Anderson had had experience. It might interest them to know that the tar used in Hampshire throughout last summer substantially ranged in composition between the tars spoken of as tars C and D. It was all freed tar. He did not think Mr. Boulnois need be frightened at the terrible words. These were definite bases, whereas other ingredients were acids, and it was important to know whether it was the basic bodies or the acid bodies which were more harmful to fish. Ammonia, as a basic body, had proved very harmful indeed. He thought he had answered Mr. Boulnois' question as to the Road Board Specification. It was substantially what he said was safe under all ordinary conditions. Mr. Milne's remarks he had also incidentally dealt with. The conditions given were unnatural, and the effects would be minimised in practice. In regard to sulphate of ammonia, that, if applied to the soil as a manure only, would not in ordinary circumstances be washed into the streams. It would be converted into nitrates by organisms in the soil, and the effect of these organisms had to be taken into account in considering the possible effect of considerable ammoniacal liquor in crude tar when that got into streams. If it were not that the washings might go direct into the stream without passing through sand or soil, they need not fear the use of crude tar at all, but unless they could be sure of giving the nitrifying ingredients a chance the ammonia salts were, without doubt, very deadly. Mr. Dryland's remarks, he thought, bore out the contention that there was greater risk in the use of crude tar than freed tar, and his case, in which tarmacadam was left unrolled and the washing passed into a fishpond, illustrated what he had said, that it was the surface exposed that mattered. In unrolled material they had the largest surface exposed that they possibly could have. Where washings passed into a pond and not into a running stream concentration might go on when the dry weather came, and it was those conditions which were most likely to be harmful to fish. In regard to the question of Mr. Wood as to the estimation of the phenolic bodies in the extract of tar D with 200 volumes of water, the amount was so small that it could not be estimated with certainty. He did not say that the phenolic constituents of the extract were the only poisonous ingredients; they were, however, the most easy to detect. The proportions of phenol were obtained by the direct weighing of the phenol put into the water and checked by estimation. It was easy to estimate the phenol in clean water, but in an extract by no means clean he knew of no way of estimating it.

Mr. Thomas said he would like to ask Mr. Butterfield what he thought was the probable result of the enormous quantity of lubricating oil now scattered over the roads by self-propelled traffic, in the matter of pollution. They had a large mileage of roadway tarred, and anything in the shape of oil gravitated to the gutter, and thence into the streams. Did that to any extent accentuate fish poisoning? The oil would create a thick film on the surface of the water, and that would be likely to affect fish life by interfering with the process of aeration.

Mr. Butterfield said he had dealt with the point to some extent in his paper, showing the effect of films of motor lubricating oil, and gas-line or petrol. The effects were less marked than with oils derived from tar, but the film did kill in time. The waterproofing of the roads by tar or asphalte made it more liable for the oil to get into the streams than if the roads were water-bound.

## ALTERATIONS TO MEMORANDUM OF ASSOCIATION: SPECIAL GENERAL MEETING.

The special general meeting which, in accordance with arrangement, was held during the evening, unanimously confirmed the resolutions with regard to the alterations in the Memorandum of Association which were passed at the special general meeting held at the institution office on January 13th [The Surveyor, January 19th, p. 76].

A vote of thanks to the council for their services in connection with the matter was proposed by Mr. C. Vawser, and carried with acclamation.

In acknowledgment, the President said he desired to take the opportunity of bringing before them and all members of the institution a most deserving object, which, to his mind, and to others, did not receive the support it deserved. That was

### THE ORPHAN FUND.

He had alluded to the matter in his presidential address, and while it was not necessary that they should give subscriptions covering the period which had elapsed since then, if all subscribed in accordance with their means, it would make the fund a great deal larger and enable the committee to deal with deserving cases as they arose. If they knew of what benefit the fund had been to many members of their institution, one and all of them would give it their support. Mr. Nisbet Blair had reminded him that at a committee meeting that day it was reported that, although they had a larger membership in the institution, there had been no corresponding increase of subscriptions. In his view, everyone connected with the institution should give as large a subscription as he could afford, and he hoped they would take his words to heart and support this deserving object.

## NOMINATIONS FOR COUNCIL, 1912-13.

At last Saturday's meeting of the council of the institution the following nominations for election as ordinary members of council for 1912-13 were ordered to be placed on the ballot list: Messrs. J. Patten Barber (Islington), A. W. Bradley (Bury), J. A. Brodie (Liverpool), J. S. Brodie (Blackpool), R. Brown (Southall-Norwood), A. H. Campbell (Edinburgh), G. F. Carter (Croydon), S. H. Chambers (Hampton), A. E. Collins (Norwich), A. T. Davis (Salop), E. J. Elford (Southend), A. Gladwell (Eton), W. Harpur (Cardiff), E. P. Hooley (Notts), C. J. Jenkin (Finchley), W. M. Jones (Chester), W. T. Lancashire (Leeds), H. P. Maybury (Kent), E. B. B. Newton (Paddington), P. H. Palmer (Hastings), A. E. Prescott (Eastbourne), N. Scorgie (Hackney), H. E. Stilgoe (Birmingham), W. Stubbs (Blackburn), J. Walker Smith (Edinburgh), H. T. Wakelam (Middlesex), H. G. Whyatt (Grimsby), C. F. Wike (Sheffield), E. Willis (Chiswick), and J. Willmot (Warwickshire).

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**Drainage Works and Sanitary Fittings.**—When a book reaches a third edition its usefulness is proved. In this case* each succeeding edition has been revised, and the text has received additions. This shows that the author is fully alive to the necessity of keeping his work up to date. Mr. Maxwell has long been known as an independent thinker and an increasing worker, so that his writings give what has been proved from trial and experience, and are not mere adaptations from previous books. One of the curses of the time is the publication of screeds from other lands, where the conditions must necessarily differ from those existing here, and these screeds, oft-times expressive, are forced down the throats of a British student public as conveying intelligent information about matters of sewage and other things which the learned man wants to know. Our experience is that, with a few exceptions, all students should avoid text-books that come from other countries, translated or otherwise. Mr. Maxwell deals with English conditions, experience, and practice—the materials mentioned are of English make and typical, such as every reader can easily see and examine. Taking the book as a whole, the information given is excellent, the style simple and clear, the statements not [illegible] *Builder's Record*

* "Drainage Work and Sanitary Fittings." By Wm. H. Maxwell. Price 2s. net. London: St. Bride's Press, Limited, 21 Bride-lane, E.C.

# Municipal Work in Canada.

(*From a* Surveyor *Canadian Correspondent.*)

**[We give hereafter the first instalment of a series of notes which, it is hoped, will in future appear at regular intervals. They will be specially written for The Surveyor by a qualified Canadian correspondent.—Ed. Surveyor.]**

There is a feeling of optimism practically throughout Canada. We are looking for a year of unsurpassed industrial expansion, which means, particularly in the West, new towns and new municipalities, with their attendant wants. The past twelve months has seen a wonderful growth in nearly all our towns and cities, and with this has arisen municipal needs and everything that these stand for; but a still greater progress within the next few months is anticipated. The expenditure on plant, sewerage and water systems, paving and other works has been enormous, for as the towns grow they are not content with the makeshifts which serve when the population is small. Returns from the West indicate that great buildings, for municipal and business purposes, are being planned. The more go-ahead centres have already under way extensive schemes of public improvements, and further big programmes are in contemplation. In the more settled districts there is, of course, not so much work to be done, but even there many improvements are being, and will this year be, carried out. Take Montreal as an instance. Here a big filtration plant is being installed and a new aqueduct constructed at a cost of hundreds of thousands of dollars. An underground conduit system, planned by the council, will also be constructed, the object being to put underground all electric wires.

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Englishmen—(this term includes Scotsmen and Irishmen)—are very prominent as civic officials in Canada. Many of the best positions in the West are held by those born in Great Britain, this remark applying particularly in connection with civic engineering appointments. At a recent conference of sanitary experts it was surprising to note the large number of Englishmen who held positions under town councils, and who are finding in the Dominion opportunities which are lacking at home. While there is considerable prejudice against the remittance men, those who "make good" are able to secure ample and profitable employment. There is less class distinction, and a good deal more independence than is customary in Great Britain, but probably this is not to be regretted.

British firms who tender for council work are not always treated fairly, particularly in the matter of time allowed to put in bids and the acceptance of the lowest tender. There has just occurred in Toronto a very bad instance of the way firms are sometimes dealt with. The council advertised for tenders in Canada, England, and the United States for the construction of a subway—a very large job—and when specifications reached England, Captain Yates, representing Perry & Co., at once took steamer to New York and hurried to Toronto. He asked for an extension of time in order to tender, but this was refused, and Captain Yates expressed his disappointment at the want of consideration shown his firm. The publicity given to this contract in England was of a singularly unfortunate character. Advertisements were inserted in two technical papers, but they only allowed ten days for the estimates to be made and tenders submitted—barely time, in fact, for letters to reach this country. If the work was worth advertising, and if British firms were really intended to compete, sufficient time ought to have been given for bids to be sent, and a little more money spent in making the project known. As it was, a firm was put to a lot of trouble and expense, and all to no purpose.

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Owing in a great measure to the efforts of Earl Grey, the late Governor-General, the city councils have taken a big interest in town planning. Many conferences have been held, and plans discussed, a leading part being taken in the movement by Dr. Guerin, the Mayor of Montreal. It has also the warm support of many leading civic officials and architects throughout the Dominion. The first real move in the matter has been taken by the Canadian Northern Railway Company, which, as a part of a big scheme for getting an entrance into Montreal by means of an electric railway and tunnel through Mount Royal, has planned an extensive model city on land outside the city limits. This is to be laid out by an English landscape architect, and promises to be an ideal suburb, with its own municipality and officers.

Fortunately for the credit of Canada, municipal life is fairly free from the taint of corruption. Here and there one comes across flagrant cases of "pull" and "graft," and Montreal for some time had a pretty bad reputation. Hundreds of thousands of dollars were voted for public works for which the public got very little value; the highest tenders were accepted by the aldermen in spite of vigorous protests; officials who attempted to do good work were harried, and aldermen unblushingly derided those who protested against the waste of the ratepayers' money. The scandal became so glaring that the Provincial Government appointed a judge to inquire into the council's affairs, with the result that he found some of the aldermen had taken bribes to favour certain contractors, that middlemen had secured immense sums on paving and other jobs, and that jobbery of a rank kind had been going on. At the election which followed, most of those implicated by the judge's report were unceremoniously kicked out; but some, thinking that the public memory is short, are again attempting to get back into office, and are advocating the abolition of a board of control which now supervises all official work, and which has done great service in putting affairs on a clean and efficient basis. It has done away with aldermanic influence in getting men jobs, and has seen that the taxpayers get what they pay for irrespective of the wire-pulling which formerly existed, and under which the various wards of the city intrigued to get the lion's share of the various appropriations for improvements.

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The Board of Control is an institution peculiar to the North American Continent. It has some excellent points, but it probably would not suit British ideas. It works well in many Canadian cities. The controllers are elected by public vote, and serve for a term of years. They are, as a rule, not experts, but good business men, accustomed to deal with a large staff, and are, like the aldermen, paid salaries. The controllers are really the heads of departments, which they supervise, and concerning which they report to the council. Recommendations, schemes, departmental duties, and the like are studied and investigated, and in certain cases decided on; but generally matters are reported to the council for decision. Occasionally councils disagree with the views of the controllers, but in Montreal, and I think in Toronto, it requires a two-thirds vote before the recommendations of the controllers can be overruled. In practice this works out very well, and those cities which have adopted the system are well satisfied with the results.

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Throughout Canada efforts are being made to improve the roads—and they badly need it. Ontario, as the most settled province, has the best highways in the Dominion, thanks largely to the "good roads movement" which, in the last few years, has been carried on in many municipalities. Extensive schemes for new and better roads have been put into effect by the Provincial Government, backed up in some instances by private enterprise. The system adopted in some rural districts is not calculated to ensure efficiency in the matter of roads. Each farmer or proprietor is responsible for repairing a certain amount of road, with the result that whereas some men carry out their obligation in a satisfactory manner, others do it in a slip-shod fashion, and others, again, altogether neglect it. The outcome may be imagined. In the West many farmers have the option of paying taxes or doing work making roads to the equivalent amount. Most farmers do the work, and on the whole this system, if properly supervised, is fairly satisfactory. The Quebec Government has just decided on an extensive scheme of new roads, for which £2,000,000 will be borrowed. The Government will provide the sinking fund and pay half the interest on the loan, the other half being found by the various municipalities. It is the biggest thing of the kind attempted in the province.

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The architects of the Province of Quebec, as represented by the Provincial Association, are endeavouring to secure an alteration in the scale of fees. Under their charter members are paid on a sliding scale,

ranging from 5 to 3 per cent. but the association want a flat rate of 5 per cent, which they contend is a more equitable plan. In the absence of an agreement, members of the association can only charge scale rates, which are fixed by law, and representations have been made to the Provincial Government asking that an Order in Council be made changing the rates. The American Association charges 6 per cent on all work. Quebec architects suffer from competition by men who, without calling themselves architects, do professional work at a lower cost than the regular tariff; and although efforts have been made to stop this, so far they have met with little success. Here quantity surveyors are unknown, builders having to get out their own quantities. Some of the smaller men, however, who do architectural work charge 2 or 3 per cent for taking out quantities, and another 3 per cent for fees, the total charge to the clients being more than that paid to regular practising architects. Such small men call themselves constructional engineers, or similar titles, as they are not allowed to use the word architect unless they are members of the association.

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Experiments are being conducted at Athuntsic by the Quebec Board of Health with a non-submerged filter for water-testing purposes, and to ascertain whether it is suitable to Canadian conditions. This type of filter owes its origin to Drs. Miquel and Mouchet, of the City Bacteriological Laboratory of Paris, and M. L. Janet, of the Paris Water Department. It differs from the ordinary submerged sand filter in that the sand layers are not kept flooded with water, the unfiltered water being allowed to sprinkle down over the sand and to percolate through the layers without any interruption in the form of a regulated outlet valve. The sand and gravel bed consists of some 4 ft. of sand, with about 2 ft. of graded gravel at the bottom, the water being distributed from overhead at a predetermined rate through two spray jets for every square foot of filter space. The filter is described as having considerable merit in the case of water highly polluted with organic matter, a vital part of the operation consisting in the beneficial results accruing from the aëration of the water as it is thrown on the filter-beds. One reason for the installation is the desire to compare results obtained in Europe with those secured in Canada. It is also desired to determine the cost data in regard to initial capital investment and operating expenses of filtering 1,000,000 gallons of water. The results will be available for the use of all Canadian municipalities seeking information in the matter of installing water supply systems. Besides the filter, an ultra-violet ray machine is in course of erection, and this method of water purification will also be given thorough tests.

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Montreal has just lost, by retirement, a veteran civic servant in the person of Mr. William D. Robb (a Scotsman by birth), the city treasurer. He had the unique distinction of having held office under twenty-one mayors. Advanced age compelled his retirement, his age being seventy-five. Mr. Robb once attributed his long fortitude in office to his custom of resting his figure-haunted brain by writing poetry. He has contributed verses to many periodicals.

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**Sewage Disposal at Crompton.**—The extensions to the Crompton (Lancs.) Urban District Council's sewage works at Newhey, which have cost £15,000, were formally opened recently.

**London Fire Inquests.**—The history, working and results of the City of London fire inquests was the subject of an address by Dr. F. J. Waldo, the City of London coroner, to the members of the Farringdon Ward Club on Wednesday night. The result of these fire inquests, said Dr. Waldo, might be fairly inferred from the steady decrease of fires. During the past five years there has been an average annual decrease of thirty-eight fires, as compared with the five years immediately preceding the passing of the Act in 1888. Again, in the year 1902, 47 per cent of fires were reported as of unknown origin, as against 25 per cent in 1905. The proportion of serious fires had also considerably decreased, whereas the figures for the rest of London showed a steady increase, both in frequency and in seriousness. On the whole, the balance of testimony was strongly in favour of the extension of the principle of fire inquests to the whole of the United Kingdom, and of restoring to the office of coroner one of his most valuable and practical public functions.

## SOME RECENT PUBLICATIONS.*

Die Strassenreinigung in den Deutschen Städten (Street Cleaning in German Towns), with Special Reference to the Street Cleaning of Dresden. By Dr.-Ing. Franz Niedner, City Engineer. Price 4 marks. Leipzig: W. Engelmann.

This book of 100 pages contains much interesting and valuable information with regard to the subject, and includes sixty-six illustrations, principally of various appliances used in different towns in connection with street cleaning. These alone make it worthy of perusal by the surveyors to local authorities. The matter is divided up into five sections—*viz.*, the actual cleaning, dust prevention, cleaning in winter, providing safe foothold, and organisation of the administration. In addition to these there are five tables giving the replies from the city surveyors of 100 towns to questions upon street cleaning matters.

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The January issue of "Garden Cities and Town Planning" includes a useful article on the Housing and Town Planning Act of 1909, by Mr. G. L. Pepler, F.S.I. The subject is treated under headings such as "What a Council Can Do" and "What Must be Done at Once," and contains a summary of thirteen "Possibilities Opened Up by the Act." One of the most important of these is stated as follows: "He (the owner) can arrange to give up good wide widths for traffic routes and bargain with the local authority that, having done this, he shall be allowed to make his residential roads quiet and sequestered, with narrower carriageway widths than the standard by-law roads and possibly grass margins instead of granite kerb, and altogether less costly."

Six lectures on "Railway Economics," delivered during October and November last at the Manchester University by Mr. A. D. Lomas, F.S.I., assistant land and rating surveyor, Lancashire and Yorkshire Railway, have been reprinted from *Railway News* and published in pamphlet form by the Boswell Printing Company, Limited, 91 Temple Chambers, E.C., price 1s.

We have received Part XXXV. of the London County Council's series of interesting pamphlets, "Indication of Houses of Historical Interest in London." The issue before us shows that the latest houses on which the council have affixed memorial tablets are those of Thomas Stothard, the painter and book illustrator, and Samuel Phelps, the tragedian.

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**Roadside Fruit Trees.**—Attention is called in a recent consular report to the thrifty plan followed in the province of Hanover, Germany, of planting the roadsides with fruit trees, the product of which is sold at auction for the benefit of the local government, the revenue thus obtained going a long way toward the upkeep of the roads. Hanover, according to the *Scientific American*, has some 7,000 miles of country highways thus bordered. This year some of the roads yielded a revenue from this source at the rate of £119 a mile. The fruit is protected by law, and during the season of ripening the roads are patrolled by sharp-eyed watchmen on bicycles, so that little, if any, of the fruit is diverted from its proper destination.

**Support for Buildings.**—Mr. J. H. Cockburn, of Rotherham, by special request, gave a lecture before the Sheffield Society of Architects and Surveyors last week upon "The Law of Support for Buildings." After dealing with certain exceptional cases, he stated that the general rule was that a right to lateral support from adjoining property might be acquired for building which had enjoyed that support peaceably and without interruption for twenty years. He explained the circumstances in which the right of support might be acquired, and how it could be hindered, and within what time damages must be claimed. He then dealt with questions of liability where a contractor was employed, and with what had to be done for avoiding damages; and concluded by a short reference to support for party walls and flats. Mr. J. B. Mitchell-Withers, president, occupied the chair. A hearty vote of thanks was accorded on the proposition of Councillor W. C. Fenton, seconded by Mr. E. M. Gibbs, and supported by Messrs. Roberts (on behalf of the Law Students' Society), W. G. Buck, C. B. Flockton, T. Winder, W. S. Purchon, J. E. Whitehead, A. C. Caporn, and the president.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

# Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

## THE MONTHLY PREMIUM.

Mr. W. H. Price, to whom the premium for January was awarded, has selected "Modern Methods of Sewage Purification," by G. B. Kershaw (Griffin & Co.), and a copy of this work has been forwarded to him.

## QUESTIONS.

This week answers are invited to the following questions:—

**223. Reinforced Concrete Bridge.**—Design a reinforced concrete bridge to carry a 36-ft. main road over a river (at right angles), single span 60 ft. between abutments, 36 ft. wide, 20 ft. from mean surface of water to the crown of arch. Banks 5 ft. above mean water level; foundations 15 ft. clay, then hard red sandstone. Allow for usual main road traffic, and show calculations. (A. P., *Liverpool.*)

**227. Refuse Disposal.**—Describe, with illustrations, the most efficient and economical form of refuse destructor for a village of 500 inhabitants. (M.Inst.Mun. and C.E., *Seccondee.*)

**229. Swimming Bath.**—Give sketches showing plan and cross-section of a covered swimming bath, say 70 ft. by 30 ft., with a detail of the roof. What method would you adopt for heating the bath? (M. and C.E.)

**230. Refuse Disposal.**—Describe, with sketches, a device for the mechanical sorting of house refuse.

**231. Discharge of Sewage.**—What is a suitable formula for calculating the discharge of sewage having a variable velocity over a 90° V-notch? (H. E. R., *Barnard Castle.*)

## REPLIES TO QUESTIONS.

**224. Town Planning.**—What are the chief points to be considered in laying out a new town?

The following is a brief summary of the chief points to be considered in laying out a new town:—

(1) Area to be dealt with; probable growth in thirty years; character of town—*e.g.*, industrial, commercial, residential, pleasure or health resort, or combination of two or more of these characteristics.

(2) Plan of area to be dealt with surveyed to 1,2500 scale, showing all natural features—such as woods, trees, river or streams, and contours to every 5 ft.

(3) Whether to be laid out under existing local or Model by-laws, or preferably as a special scheme under the Housing and Town Planning Act, 1909; as this will greatly affect the width of streets, the restriction of number of houses to the acre, the provision of open spaces, location of industrial, residential and other areas, and formal or informal design.

(4) Laying out of different areas, paying due regard to the convenience and amenities of the future population in the location of the civic, commercial, industrial and residential areas and open spaces; the physical and meteorological conditions—such as contours, prevailing winds, aspects, &c.

The civic and commercial areas will generally form the centre of the town, the industrial area comes next to the commercial area, near to goods yard and railway, or to canal or river wharves, or both, and so that prevailing winds will carry away smoke, &c., from the residential and business areas.

The residential areas will generally occupy the outer zone, the detached houses and villa being generally located next to commercial area, and the workmen's dwellings adjacent to factories, main roads, &c. Do not allow it to be laid out in formal block, radial, or ring or informal design. Probably adopt formal—radial and block for central area, and ring for residential area.

In laying out of main arterial and secondary roads with direct lines and of sufficient width, curvature and easy gradients to meet the requirements of quick through or slow local traffic, with by-pass for through traffic round the principal &c.; business streets to have back streets; residential streets as boulevards or avenues, with narrower roads of lighter construction; the provision of squares, circuses or places either for traffic, ornament, or business purposes, and of obtaining fine vistas; the formation of crescents, or garden places for residential purposes.

(6) Water Supply, Sewerage, Storm Water, Sanitary Arrangements.—Water supply is of first importance. Must have a pure and sufficient supply and proper system of distribution.

Sewerage and Sewage Disposal.—Probably separate system, with small foul sewers, and larger surface-water drains if no natural watercourses available for discharge of storm water. Roads should be laid out so as to secure proper falls for sewers, and avoid pumping as far as possible.

Sanitary Arrangements.—Provision of refuse destructor and utilisation of power for pumping, electricity, disinfection, &c. Method of collection of refuse, destructor, gasworks, electricity station, hydraulic power station, all to be placed in industrial area, near to, or with sidings from, goods station. Abattoir and cattle market placed in industrial area, near goods yard. Accident and infectious hospitals, fire station, baths, and drill halls to be provided in suitable positions.

(7) Provision of parks, gardens, recreation grounds, incorporating natural features—such as woods, trees, watercourses, ponds, &c.

(8) Architecture.—Proper treatment of civic buildings—such as town hall, churches, art gallery, libraries, theatres, post office, baths, schools, shops, offices, and dwelling-houses, providing opportunities for the employment of the sculptor and landscape gardener in the public buildings, parks and squares. (W. H. P., *Leeds.*)

[Note.—A further reply to this question is held over until next week.—Ed.]

**226. Sewage Pumping.**—Show calculations arriving at the diameter of a sewage pumping main sufficiently large to meet the requirements of the Local Government Board for a population of 4,500 upon the partially separate system, the velocity through the main being at the rate of 4 ft. per second, the water supply of the district being at the rate of 16 gallons per head, the population being distributed in 1,000 houses scattered over about 4 miles of roads, the pump well being so situated that an overflow, if allowed by the Local Government Board, could be arranged so as to discharge into a brook near to. ("Student.")

As the period of repayment allowed by the Local Government Board on loans for sewerage works is sixty years, provision should be made for the population at that time, which should be estimated from available statistics.

Assuming the population increases at the rate of 2 per cent per annum—

Present population = 4,500,

and by a simple algebraical calculation population 60 years hence $= 4{,}500(1+\frac{2}{100})^{60}$

$= 4{,}500 \times 1{\cdot}02^{60}$

Log. 4,500 = 3·6532

Log. $1{\cdot}02^{60}$ = 60 × ·0086 = ·5074

Log. $4{,}500 \times 1{\cdot}02^{60}$ = 4·1606

Antilog 4·1606 = 14,470 = estimated population

Daily discharge per flow = 14,470 × 16 gallons.

$$\frac{14{,}470 \times 16}{6\frac{1}{4}} = 37{,}049 \text{ cub. ft.}$$

Dry flow, however, will not be constant throughout the day, and for this reason it is usual to assume a maximum of one-half the daily volume in 8 hours.

$$\text{maximum flow} = \frac{37{,}049}{2} = 18{,}520 \text{ cub. ft. in 8 hours.}$$

$$\frac{18{,}520}{8 \times 60 \times 60} = \frac{463}{720} = 64 \text{ cub. ft. per sec.}$$

The Local Government Board permit any quantity

The Surveyor
And Municipal and County Engineer.

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of sewage in excess of six times the dry-weather flow to discharge into a watercourse without previous treatment, and an excess of three times the dry-weather flow to be treated as storm water. In this particular case, as pumping is necessary, it would be advisable, if possible, to provide storm-water beds.

Assuming these are provided, the maximum quantity to be pumped $3 \times 64 = 192$ cub. ft. per sec.

$$Q = av,$$

$$\therefore a = \frac{Q}{v} = \frac{192}{4}$$ (the velocity being 4 ft. per second)

$$\therefore \text{area of pipe section} = \frac{192}{4} = 48 \text{ sq. ft.}$$

$$69{\cdot}12 \text{ sq. in.}$$

$$\therefore \text{diameter} = \sqrt{\frac{69{\cdot}12}{7854}} = 10 \text{ in., say.}$$

Say a 10-in. cast iron main.

If no storm-water beds be provided and six times the dry-weather flow is required to be pumped (*viz.*, twice the above quantity), the area of pipe section required will be $2 \times 69{\cdot}12 = 138{\cdot}24$ sq. in., and diameter will be, say, 14 in. (*Nowhere Inc.*)

NOTES.

With reference to Question No. 227 we have received a communication from the Horsfall Destructor Company, Limited, as follows :—

If your correspondent will be kind enough to put himself in communication with us we think we can suggest a small destructor which will meet his requirements very well. Before giving particulars of it, however, it will be necessary for us to know for what country the destructor is required, and approximately the nature of the refuse to be destroyed. In these matters it is very desirable to know the exact conditions before proposing any particular kind of furnace, as the refuse varies so much in different localities.

**Scottish Housing.** The Government proposes to appoint a Royal Commission on the Housing of the Population of Scotland (Rural and Urban).

**Hospital Heating.** The Salisbury and District Hospital is being supplied with Shorland double-fronted patent "Manchester" stoves, patent "Manchester" grates, and special extract and inlet ventilators by Messrs. E. H. Shorland & Brother, Limited, of Failsworth, Manchester.

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Aberdare U.D.C.** (February 9th. Mr. S. W. Wheaton). —£20,300 for the provision of an infectious diseases hospital. The surveyor, Mr. Owen Williams, gave evidence as to the present hospital, which was erected in 1873, originally for a small-pox hospital, and he detailed the steps taken to secure another site, and gave particulars of the proposed new building. After further evidence Dr. Wheaton said he did not think that the Local Government Board would sanction such a large expenditure without having full specifications, and the clerk promised to supply them.

**Bristol T.C.** (February 6th. Mr. W. O. E. Meade-King).—£2,020 for the purpose of street improvement.—It was stated that the bulk of the money asked for was for the purchase of land, and the corporation asked for a period of sixty years. The first application was in respect of two houses in West-street, the purchase of which amounted to £1,250. The average width of the roadway there was 50 ft., and it was the intention of the corporation to make it 60 ft. The value of the land thrown into the roadway was £150, and the remaining land £1,100. The second application was in respect of a piece of land in Dean-lane, Bedminster. The total of the purchase money for land was £1,713, which, with the cost of building the wall referred to, amounted to £1,919, and the legal and other charges brought it up to £2,020.

**Crompton (Lancs) U.D.C.** (February 1st. Mr. F. H. Tulloch).—£2,300 for the laying out of Dun Wood and certain adjoining land as a recreation ground. The land, it was stated, consists of more than 20 acres, and the council asked for 30 years for repayment.

**Dukinfield T.C.** (January 31st. Mr. A. W. Brightmore). £3,710 for works of private street improvement in Bates-street, Combermere-street, Grenville-street, Russell-street, and Zetland-street.—The surveyor, Mr. S. Hague, produced the plans, specifications, &c., and explained them to the inspector. The proceedings were brief and formal.

**East Grinstead R.D.C.** (February 9th. Mr. F. O. Stanford). £3,122 for the purpose of sewerage and sewage disposal works for the Groombridge portion of the Withyham parish.—The clerk, Mr. F. S. White, stated that the existing outfall works and pumping station in Groombridge had been in existence for 21 years, and the lease on the land expired in October last. Consequently the present application was brought about. The land they proposed to purchase for the new scheme covered over 2 acres which they had a provisional agreement to purchase freehold for £1,100, that sum including a right of way, the Council to maintain the roadway. There were 148 houses connected with the sewers (including 11 in the Ockfield district). The working expenses of the present scheme for the year ending 30th September, 1911, were £326. It was estimated that the expenses of the proposed system would be £265, or a saving of about £60 a year. The surveyor, Mr. C. Turton, also gave evidence, in the course of which he stated that under the new scheme no pumping would be required, as the whole of the sewage would gravitate to the new works. He estimated the annual cost of upkeep of the works at £65.

**Huddersfield T.C.** (February 8th. Mr. Henry Collin).—£8,771 for the erection of working-class dwellings, and the appropriation of land in Wakefield-road, Mold-green, upon which it is intended to build sixty six tenement houses in four blocks.—The town clerk, Mr. J. H. Field, said that there were in occupation nearly three hundred cellar-dwellings, all of which failed to comply in one or more particulars with the requirements of the Public Health or Housing Acts. Closing orders had been made on several occasions, but the objection had been taken that if the tenants were turned out there would be no other houses for them to go to, and the council had had to refuse their sanction to closing orders. Private enterprise did not seem sufficient to meet the demand for working-class dwellings, and the corporation had thought it their duty to supply the need. Sixty of the houses would be let at a weekly rental of 3s. 6d. (including water rent and borough rate), and the six others at a rental of 8s. each. It was estimated that the income from the houses would nearly balance the expenditure.—There was no opposition.

**Llanelly U.D.C.** (January 31st. Mr. Edward Leonard). —£3,432 to proceed with the erection of municipal dwellings.—Mr. H. W. Spowart (clerk) said it was pro-

posed to borrow £2,957 over a period of 60 years, and £475 over 80 years. The scheme was for the erection of fifteen houses, and was more or less experimental. The population had increased 50 per cent. during the last ten years, and the tinplate industry was in a flourishing state. He believed it was commercially safe to build 200 houses. Mr. J. H. Montgomery produced plans of the proposed houses, to be rented at 5s. 8d. a week. The inspector expressed the opinion that the rental might be reduced a little.

**Mansfield T.C.** (February 13th. Mr. H. R. Hooper).—£25,000 for the purpose of the widening and improvement of Albert-street, Belvedere-street, Church-street, Leeming-street, Newgate-lane, Nottingham-road, Portland-street, Queen-street, Radcliffe-gate, and Stockwell-gate, and £5,500 for works of sewerage for the Southwell-road portion of the borough.—Mr. Jeeves presented the case for the corporation, and outlined the great growth of the town in recent years. The population, he said, had increased by 75 per cent. in the last decade, and was now estimated at 38,954. The corporation had in years past availed themselves of every opportunity of arranging for the widening of streets, here and there, with the result that when the ten widenings were completed Mansfield streets would be in a very good state, and would, comparatively speaking, be broad thoroughfares.

**Saltash T.C.** (February 1st. Mr. M. K. North).—£100 for the provision of a bathing-slip on the foreshore and £150 for the improvement of Alexandra-square.—The clerk (Mr. F. E. Cleverton) said the bathing-slip had already been built and charged to the suspense account. It had cost £112, and consisted of a graduated concrete slip, with a brick shed covered with a galvanised iron roof. Alexandra-square had been the property of the corporation from time immemorial, and they wanted to improve the appearance of it. It was proposed to ring in portions of the square, erect a wall on the east side, plant shrubs, and construct good footpaths of Dean-stone.

**Taunton T.C.** (January 30th. (Mr. T. C. Ekin).—£2,500 for the purposes of the electricity undertaking.—Councillor G. Spiller, chairman of the Electricity Committee, said he was convinced that the loan would tend to the more successful working of the undertaking. There was no opposition to the application.

**Warrington T.C.** (February 8th. Mr. Edgar Dudley).—£6,000 for the purchase of land in Lovely-lane for a recreation ground and site for a public elementary school.—Mr. J. Lyon Whittle, town clerk, said that the council decided to purchase sufficient land in the Lovely-lane neighbourhood in order that a school could be built.—The corporation thought it was desirable to secure the whole of the site, and appropriate the remainder for a recreation ground. There were 7 acres, and the purchase price was £5,875.

**Wellington (Salop) U.D.C.** (February 6th. Mr. Edgar Dudley).—£675 for the widening and improvement of Albert-road. It was stated that the loan was required to purchase land, and that the improvement was greatly needed. The inspector stated that as the loan was required for land the repayments might be extended to a period of sixty years.

**Wigan T.C.** (January 31st. Mr. F. H. Tulloch).—£500 for the purpose of laying out as a recreation ground certain land at the corner of Fleet-street and Carr-lane, Lamberhead Green. The period asked for repayment was twenty years. The land was, it was stated, to be laid out with paths, and it was proposed to provide swings, horizontal bars, &c., for children.

**Worthing T.C.** (February 7th. Mr. F. O. Stanford). £360 for the provision of an underground convenience.—Replying to the inspector, the town clerk stated that the piece of land under which the lavatory was to be built was acquired in connection with street widening under the Tramways Act which the corporation obtained. The surveyor, Mr. F. Roberts, explained the details of the scheme.

### APPLICATIONS FOR LOANS.

**Aberystwyth T.C.**—£11,793 for workmen's dwellings.

**Barnsley T.C.**—£2,900 for new offices.

**Canterbury T.C.**—£6,500 for improvements at the irrigation farm.

**Darlington T.C.** £300 for the provision of spray baths.

**Harrogate T.C.**—£500 for the purchase of mineral rights of new cemetery land.

**Hendon U.D.C.** £1,033 for street improvement works.

**Kettering R.D.C.**—£5,900 for sewage disposal works.

**Monmouthshire C.C.**—£3,000 for the extension of the county buildings.

**Poole T.C.**—£950 for fish market purposes, and £475 for the provision of an open space.

**Rotherham T.C.**—£1,050 for sewerage works at New Kimberworth.

**Seaton (Devon) U.D.C.**—£400 for the extension of the sea wall.

**Southwold T.C.**—£255 for draining and channelling work.

**Wolverhampton T.C.**—£4,740 for the improvement of North-street.

**York T.C.**—£700 for new street works.

### LOANS SANCTIONED.

**Barrow-in-Furness T.C.**—£2,365 for road improvement purposes.

**Bath T.C.**—£8,000 for the installation of a Diesel engine, motor alternator, and booster at the electricity works.

**Bournemouth T.C.**—£7,668 for Overcliff-drive, and £2,327 for sewerage works, and £8,500 for sewer outfalls.

**Burnley T.C.**—£10,568 for the provision of 36 workmen's dwellings.

**Cardiff T.C.**—£10,000 for gas mains extensions.

**Diss U.D.C.**—£8,068 for a water supply scheme.

**Failsworth U.D.C**—£2,460 for additions to the council buildings.

**Flaxton R.D.C.**—£615 for sewerage and sewage disposal works.

**Hadham (Herts) R.D.C.**—£600 for the erection of four cottages at Braughing.

**Hendon U.D.C.**—£19,489 for private street works and sewerage purposes.

**Knaresborough U.D.C.**—£750 for road improvements.

**Nelson T.C.**—£512 for sewerage works.

**Salop C.C.**—£3,023 for building purposes.

**Yarmouth T.C.**—£8,500 for the erection of an art school and an elementary school.

### FORTHCOMING INQUIRIES.

| FEBRUARY. | £ |
|---|---|
| 19.—**Llandaff.** For surface water drainage (Mr. R. H. Bicknell) ... ... ... ... | 447 |
| 19.—**Yeovil.** For the provision of workmen's dwellings (Mr. Edward Leonard) ... | 24,220 |
| 20.—**Birmingham.** For street, refuse, school, and public baths purposes (Mr. W. H. Collin) ... ... ... ... ... | 20,685 |
| 20.—**Colne.** For street widening purposes (Major J. Stewart) ... ... ... ... | 3,300 |
| 20.—**Crewe.** For street widening works (Mr. W. O. E. Meade-King) ... ... ... | 2,476 |
| 20.—**Launceston.** For the provision of workmen's dwellings (Mr. Edward Leonard) ... | 1,250 |
| 21.—**Aberavon.** For street widening works (Mr. R. H. Bicknell) ... ... ... ... | 300 |
| 21.—**Birkenhead.** For street improvement works (Major C. E. Norton) ... ... ... | 1,266 |
| 21.—**Hayfield.** For the purchase of a water undertaking (Mr. F. O. Stanford) ... | 7,600 |
| 21.—**Macclesfield.** For sewage disposal works (Mr. W. O. E. Meade-King) ... ... | 1,485 |
| 22.—**Barnsley.** For sewerage works (Mr. W. O. E. Meade-King) ... ... ... ... | 150 |
| 22.—**Bradford.** For street and recreation ground purposes (Mr. Edgar Dudley) ... ... | 3,332 |
| 22. **Hursley.** For road and bridge widening works (Mr. A. A. G. Malet) ... ... | 400 |
| 22.—**Ilkley.** For building extension and public convenience purposes (Major J. Stewart) | 3,000 |
| 22.—**Macclesfield.** For works of sewerage (Mr. F. O. Stanford) ... ... ... | 750 |
| 22.—**Smethwick.** For the purposes of the depot (Mr. R. H. Bicknell, ... ... ... | 1,750 |
| 22.—**Totnes.** For cemetery purposes (Mr. Edward Le nard) ... ... ... ... | 800 |
| 23.—**Leicester.** For the purchase of property (Mr. Edgar Dudley) ... ... ... | 1,414 |
| 23.—**Meriden.** For sewage disposal works (Mr. F. O. Stanford) ... ... ... ... | 1,280 |
| 23.—**York.** For tar-paving works (Major J. Stewart) ... ... ... ... ... | 7,575 |
| 27.—**Great Yarmouth.** For the purchase of certain lands (Mr. Edgar Dudley) ... | 10,000 |

# Municipal Work in Progress and Projected.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buxton, Clacton £2,250, Colwyn Bay, Montrose £2,145, Surbiton £5,420, Torquay £15,000; housing and town planning—Bridlington, Redruth; roads and materials—Camberwell £9,291, Falmouth, Nuneaton, Wolverhampton £4,740; sewerage and sewage disposal—Darlaston, Eastbourne £8,300, Fareham £10,000; water, gas and electricity—Ayr, Fife, Tunbridge Wells £13,700. —Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

## ADMINISTRATION.

**Devonport T.C.** It has been resolved that the respective committees should consider the advisability of all able-bodied workmen in the employ of the corporation in receipt of a weekly wage under 24s. being granted an increase to that sum, and bring up a report with a view to carrying that scheme into effect.

**South Shields T.C.**—A new set of conditions for street and engineering contracts in connection with the South Shields Corporation has been prepared by the town clerk (Mr. J. M. Hayton) and borough engineer (Mr. L. Roseveare), and submitted to the Town Improvement Committee. Reporting to the committee on the matter, the town clerk stated that an arbitration clause had been inserted permitting a reference of all disputes to an arbitrator in place of the borough engineer; while the sub-letting and fair wages clause had been amended in view of the Local Government Board's memorandum, and on other grounds. The committee recommended the approval of the conditions, and that in place of the fair wages clause other clauses be adopted providing that all contractors and sub-contractors for corporation work shall pay their workmen not less than the trade union rate of wages in each branch of industry, and shall conform to the hours and proper conditions of labour recognised in such industry.

## BUILDINGS.

**Aberdeen T.C.**—The embankment at the beach is to be extended by 100 yds., at a cost of £800.

**Basingstoke T.C.** It has been agreed to purchase, for £1,700, certain premises adjoining the town hall.

**Blackburn T.C.**—It has been agreed to contribute £231, one-half the cost of reconstructing the bridge at Whitebirk, by the county council.

**Buxton U.D.C.**—It has been decided to extend and improve, at a cost of several thousands of pounds, the famous Buxton pump-room, given to that town some years ago by the late Duke of Devonshire. The large volume of warm radio-active mineral water recently discovered will be brought into use.

**Clacton U.D.C.** A concrete groyne is to be constructed near to the jetty, at an estimated cost of £2,250.

**Colwyn Bay U.D.C.**—The council have under consideration schemes for the provision of workmen's dwellings and an extensive public abattoir.

**Croydon T.C.**—The tender of Messrs. James Smith & Sons, of Norwood, at £2,235, has been accepted for additions to the premises of the Surrey-street waterworks.

**Guildford R.D.C.**—It has been decided to ask the Road Board to give a grant towards the four bridges between Cart Bridge and Old Woking, which it is proposed to take over and reconstruct.

**Louth T.C.**—Intimation has been received from the Local Government Board of consent to a loan for a steam disinfector on condition that the site of the isolation hospital is extended, and that a boarded fence is erected round the disinfector. Application is to be made for an additional loan of £100 for these purposes.

**Montrose T.C.**—Plans for a public slaughter-house, to cost £2,145, have been approved.

**Salop C.C.**—The clerk has been authorised to enter into a contract with the Cressage Bridge Trustees and the Severn Valley Coal Syndicate, Limited, for the purchase of the Cressage Bridge and its appurtenances for the sum of £1,000, provided one-third of the purchase money is raised by subscription.

**Surbiton U.D.C.**—At their last meeting the council had before them the Fire Brigade Committee's estimate of the cost of a new station, the scheme providing also for the adoption of motor engines. The proposals are as follow: New fire station building, £3,000; two motor fire engines, £1,600; fencing, £70; alterations to fire alarms, £50; estimated value of site, £500; extras, fees and contingencies, £200; total, £5,420.

**Wimbledon T.C.**—The tender of Messrs. C. P. Roberts & Co., Limited, at £1,846, has been accepted for the extension of the administrative block at the hospital.

**Torquay T.C.**—Medical baths and a large swimming bath are to be provided at an estimated cost of £15,000.

## HOUSING AND TOWN PLANNING.

**Bridlington T.C.**—It has been decided to proceed with the scheme for the erection of workmen's dwellings.

**Clydebank T.C.**—The master of works has been instructed to prepare plans with a view to the promotion of a town planning scheme.

**Dunfermline T.C.** — A deputation, including the burgh engineer, Mr. R. W. Maxwell, has been appointed to visit Barrow-in-Furness, Birmingham, and Liverpool, where town planning has been carried out, with a view of determining upon a scheme for the Rosyth area.

**Redruth U.D.C.**—A scheme has been submitted to the Local Government Board for the erection of forty-eight houses of three different types—eight with seven rooms, twenty-four with six rooms, and sixteen with four rooms. The council are advised that such houses could be built, complete in all respects for £185, £150 and £135 respectively, the average working out at £151 a house. These estimates are based on the known cost of such houses actually built elsewhere. It is assumed that money could be borrowed at 3½ per cent; the sinking fund will depend on the period for repayment. The estimated annual cost works out at £383, and the receipts at £368, leaving a balance of £15 for contingencies.

**Wrexham R.D.C.**—The Town Planning Committee have been considering a plan prepared by the engineer, Mr. J. Price Evans, and the medical officer of health, as an example of what might be done in laying out the Gresford area.

## REFUSE COLLECTION AND DISPOSAL.

**Hetton (Durham) U.D.C.**—It has been agreed to accept the tender of the Lambton and Hetton Coal Company for the scavenging of the whole of the district, with the exception of the Coal Bank-terrace area. There are 3,000 houses in the district, and the amount was £1,199, which, it was stated, was an increase of £49 over last year. The tender of the coal company was the only one received.

## ROADS AND MATERIALS.

**Blackburn T.C.**—It has been agreed to purchase, for £1,100, property at the Old Toll Bar, Whalley New-road, for the purpose of street improvements.

**Camberwell B.C.**—The widening of Red Post-hill, between North Dulwich Station and Beckwith-road, is to be carried out according to the plan prepared by the borough engineer, Mr. W. Oxtoby.— The Works Committee recommend that Peckham Rye (west side), from Nigel-road to Barry-road, be paved with specially dressed granite setts laid to a close joint, in accordance with the report of the borough engineer, at an estimated cost of £9,291, and that an application be made to the London County Council to grant a loan for twenty years for the work.

**Chiswick U.D.C.**—The council have accepted the tender of Messrs. E. Catchpole & Sons, Plough-bridge, Rotherhithe, S.E., for the supply of distilled tar for road treatment during the forthcoming summer. This makes the fifth successive year that this material has been used by this authority.

**Colwyn Bay U.D.C.**—In view of the proposed extension of the tramway from Colwyn Bay to Old Colwyn, a special committee of the council has been deputed

to confer with property owners concerned with regard to purchasing land for widening the road.

**Exeter T.C.**—A scheme is being considered for widening Commercial-road, and constructing a boat-house and conveniences, at an estimated cost of £2,500.

**Falmouth T.C.**—The road at Green Bank is to be widened at a cost of £1,000.

**Guildford R.D.C.**—A piece of land having been offered for the purpose, the widening of the narrow portion of Hartmore-lane, leading from Shackleford to Godalming, has been agreed to, the cost being estimated by the surveyor, Mr. J. Anstee, at £60.

**Hackney B.C.**—In November last the London County Council decided to undertake the widening of Dalston-lane and Graham-road, at an estimated cost of £30,300. The Improvements Committee now report that it is desirable that the widening should be extended so as to include three forecourts at the junction of Greenwood-road and Graham-road. There is sufficient provision to cover the expenditure in the estimate of £30,300 approved on November 21, 1911.

**Keighley T.C.**—A highway improvement at Hainworth, estimated to cost £320, has been approved.

**Kesteven C.C.**—Application is to be made to the Road Board for grants towards improvements for main roads in the ensuing year, for improvements at dangerous corners and narrow places, and strengthening main roads, &c., and for tar-spraying.

**Kettering R.D.C.**—Plans and estimates prepared by the surveyor, Mr. W. Hadley Darby, have been approved for the widening and improvement of Church-street, Burton Latimer, at an estimated cost of £320, also for the construction of new footpaths, with kerb and channel, at Rushton, at a cost of £70.

**Leamington T.C.**—The surveyor, Mr. W. De Normanville, has been instructed to prepare an estimate for remaking the Kenilworth-road with Rocmac.

**Nuneaton T.C.**—A scheme for improving Ansley-road and Tunnel-road has been approved, and it has been decided to apply to the Road Board for a grant in aid of the cost of the work, which is estimated at £1,000.

**Scarborough T.C.**—A grant of £600 has been received from the Road Board towards the cost of widening Burniston-road.

**Southwold T.C.**—The High-street is to be drained and channelled, at a cost of £255.

**Walsall T.C.** The cost of dealing with the abnormal fall of snow in the last month was £467, equal to a ½d. rate.

**West Hartlepool T.C.**—The sand problem at Seaton Carew was discussed at the last meeting of the council. It was stated that, despite sand-boards, &c., the material carried by the gale piled up into huge drifts in the streets, impeding the tram service, and invaded houses, shops and hotels, causing endless trouble and annoyance. A recommendation by the Works Committee before the council was that it should be referred to the borough engineer, Mr. N. F. Dennis, to consider and report upon what better provision could be made to obstruct the blowing of sand from the beach. Alderman Suggett stated that the accumulation of sand as the result of the gale three weeks ago cost £20 to remove. The borough engineer had suggested that he should be allowed to visit one or two towns with a view to seeing what was being done in those places to minimise the evil. Councillor Vitty submitted that previous experience had taught them that the planting of bents below the new promenade would prevent the sand drifting, but Councillor Charlton pointed out that during abnormal spring tides the sea came right up to the wall and would wash away the bents. In the end the committee's recommendation was, with slight modification, adopted.

**Westhoughton (Lancs) U.D.C.**—A number of new streets have been recommended by the Town Planning Sub-Committee, and it has been further suggested that the proposed new trunk roads should be not less than 64ft. wide, and that the secondary new roads should be not less than 50 ft. wide; also, that not more than twenty houses should be built on each side of land.

**Westminster B.C.** A portion of the Victoria garden is to be granted for £300 for the purpose of rounding off the corner at the junction of Buckingham Palace-road and Pimlico-road.

**Wolverhampton T.C.**—A scheme for the improvement of Northampton is to be carried out, at an estimated cost of £4,710.

## SEWERAGE AND SEWAGE DISPOSAL.

**Bowland (Yorks) R.D.C.**—Mr. Johnson, engineer, reporting on a proposed sewage disposal works for Bolton-by-Bowland and Holden, stated that the total population was 300; but he proposed to allow for 400, in order to accommodate a school. The site was three-quarters of an acre in extent, but, as the subsoil was unsuitable for land filtration, he had designed works to treat the sewage by tanks and bacterial filters. The sludge from the settling and storm tanks would have to be pumped, as there was not sufficient fall on the land to allow it to flow by gravitation. The pumping, however, would only have to be carried on for about three hours a week. He estimated the total cost of the works at £2,250. The surveyor (Mr. A. Burrow) stated that if they had broad irrigation the cost of the works would be substantially reduced. A resolution was passed in favour of broad irrigation, the clerk being instructed to communicate the council's views to Mr. Johnson.

**Darlaston U.D.C.**—A new scheme of sewage disposal, as submitted by Messrs. Dodd & Dodd, has been approved.

**Eastbourne T.C.**—A sewer is to be laid down from St. Anthony's estate to the Archery, at an estimated cost of £8,300.

**Fareham R.D.C.**—Drainage works by gravitation are to be carried out at Lee, at an estimated cost of £10,000.

**Monaghan U.D.C.**—A resolution was passed by the council last week not to proceed with the sewerage scheme, in spite of a letter from the solicitor stating that if the scheme were dropped the council would be compelled to carry out the drainage in a more expensive way.

## WATER, GAS, AND ELECTRICITY.

**Ayr T.C.**—Mr. John Young, water engineer, in a special report, advises the duplication of the fireclay conduit and cast-iron pipe from Loch Finlas to Knockjarder, at a probable cost of £33,000. The duplication of the main should be combined with the raising of the level of Loch Finlas, the source of supply, by 2 ft., which would increase the storage from 340,000,000 gallons to about 438,000,000. The probable cost of raising the level of the loch would be £500. The existing main pipe from Loch Doon to Knockjarder is, the report states, badly encrusted, and the incrustation has diminished the carrying capacity of the pipe by about 750,000 gallons per day. A considerable improvement in its delivery—probably about 500,000 gallons per day—could be effected by scraping the main from end to end at a cost of about £1,317. It has been agreed to proceed at once with the scraping of the existing main pipe, and to delay meantime the question of laying a duplicate pipe.

**Banbridge (Co. Down) T.C.**—It has been decided to engage the services of an expert to advise regarding the question of the electric lighting of the town.

**Calstock (Cornwall) R.D.C.**—Owing to the unsatisfactory state of the water supply, the surveyor, Mr. W. Cradick, has been instructed to prepare plans and estimates for an additional reservoir at Gunnislake, with a capacity of 20,000 gallons; relaying water mains; piping water at Dimson Farm; a new reservoir at Drakewalls, capacity 10,000 gallons; piping water at Drakewalls; piping part and fencing part of South Leat to Drakewalls; and piping supply at Chilsworthy.

**Fife C.C.**—Mr. J. D. Parker, of Glasgow, has been requested by the Dunfermline District Committee to give his opinion upon two alternative schemes of water supply for Aberdour, prepared by the master of works, one of which is estimated to cost £3,595, and the other £5,083. The master of works recommended the adoption of the latter in consequence of the fact that it would provide a head pressure sufficient to supply any of the houses in the neighbourhood of Aberdour, and new fields of supply, where water was needed, would be opened up, and a greater margin would be left for supplying the Rosyth area.

**Macroom (Co. Cork) U.D.C.**—Consideration is being given to an improvement of the water supply, a scheme for this purpose having been prepared by Mr. Coughlan.

**Pembroke (Co. Dublin) U.D.C.** A proposal has been agreed to for the extension of the electricity plant, at an estimated cost of £6,000.

**Tunbridge Wells T.C.**—A scheme for new waterworks, to cost £13,700, has been adopted. The borough will have 1,000,000 gallons of water a day, with a population of 35,000.

## MISCELLANEOUS.

**Bridlington T.C.** A sum of £340 is to be spent in purchasing 2¼ acres of land for cemetery purposes.

**Cheshire C.C.**—Colonel Cornwall-Legh, moving the adoption of the minutes of the Main Roads Committee at the meeting last week, mentioned that the deadlock with the Road Board as to whether any money received from them was to be regarded as a loan or not, had now been ended. The Road Board had at first proposed that any sum of money they gave the county for the purpose of the roads was to be repaid to them if the new method of dealing with the roads proved successful. The committee objected to that proposal on principle, in view of the fact that the money came from the taxation of motorists, and the result of the scheme would be that unless the experiment proved all wrong the whole expense of keeping up the roads for the new kind of traffic—which was paying for it—would fall entirely eventually upon the county ratepayers. As a matter of practice, also, they foresaw endless trouble with the Road Board as to whether this or that portion of the road was durable or not. However, the Road Board had agreed to give them 50 per cent towards the extra cost of the tar-macadam for the roads. That money was a grant, and not a loan, and if the county council did not like the arrangement they need not continue it.

**Newcastle-upon-Tyne T.C.**—The tender of Messrs. Dennis Bros., Limited, has been accepted for a new motor fire engine of 50-horse power, with a speed of 30 miles per hour, at a cost of £750.

## PERSONAL.

Mr. Leonard Garbutt, for three years pupil assistant to the city surveyor of Ripon (Mr. T. P. Frank), has died, we regret to state, in his twenty-second year.

Mr. B. J. Wormleighton, of the Goole surveyor's department, has been appointed surveyor of highways and inspector of nuisances to the Loftus Urban District Council.

Mr. W. L. B. Hall, believed to be the inventor of the modern type of tramway lines, has just passed away at the age of seventy-one. Mr. Hall received nothing for his invention.

Mr. L. Serraillier, manager, and Mr. R. W. Vawdrey, chief engineer, of the Indented Bar and Concrete Engineering Company, Limited, have been appointed directors of that company.

Mr. L. Marlow Heath has resigned his position as assistant surveyor to the Urmston Urban District Council, having obtained an appointment in the Land Valuation Department of the Inland Revenue.

Mr. Edwin O. Sachs, chairman of the British Fire Prevention Committee, will act as assessor of the designs submitted for a new fire station for Surbiton, at a fee of 10 guineas, plus one-fifth per cent of the cost of the building.

Mr. Charles Mason, ASSOC.M.INST.C.E., of Beeston, formerly surveyor to the Metropolitan Vestry of St. Martin-in-the-Fields, has been appointed a Justice of the Peace for the county of Notts. Mr. Mason is a member of the County Highways Committee.

Mr. James Runnalls has become the general manager of the Ashburton Elvan Stone Quarries, Ashburton, Devon, the proprietor of which is Mr. Edwin Tucker. The stone obtained from these quarries is described as belonging to the highest class of basalt, and being in every way fitted for the purpose of road macadam.

Mr. Thomas Miller Rickman, who was president of the Architectural Association in 1854-55 and president of the Surveyors' Institution in 1899, died, we regret to state, on the 10th inst., at the age of eighty-four. He was an associate of the Royal Institute of British Architects, and was formerly in practice in Montague-street, Russell-square.

Dr. W. Cawthorne Unwin, F.R.S., LL.D., president of the Institution of Civil Engineers, and Mr. Edward B. Ellington, M.INST.C.E., president of the Institution of Mechanical Engineers, will be among the guests at the seventeenth annual dinner of the Association of Engineers-in-Charge, which will take place at the Holborn Restaurant on Saturday, March 23rd.

Messrs. Ewart S. Andrews, B.SC., London; H. Percy Boulnois, M.INST.C.E., F.R.SAN.I., London; David Donaldson, London; William E. J. Fett, Hull; James A. Malcolm, London; L. R. Nicol, Padstow, Cornwall; George S. Roberts, London; and J. Vaughan Stewart, Lebu, Chile, have been elected members of the Concrete Institute. Mr. Wilfrid Lever, of Ashton-under-Lyne, has been admitted as a student of the same body.

Mr. R. O. Wynne-Roberts, M.INST.C.E., F.R.SAN.I., who, as announced in these columns, left England recently, has, following visits to Montreal, Ottawa, Toronto, Chicago, St. Paul, Winnipeg, and other cities, been called in by the authorities of Regina, Canada, to advise them with regard to their water supply. Having submitted a comprehensive report, he has now been asked, and has consented, to remain in order to carry out the work, which, providing for an ultimate supply of 10,000,000 gallons daily, is expected to cost about £300,000. Regina is a city that is growing at an extraordinary rate. There were only 2,250 people there in 1901 and 6,200 in 1906, but last year the population had reached the figure of 32,200. According to Mr. Wynne-Roberts, there are splendid opportunities for investments and speculations in the town, the value of land and properties increasing every year.


## FOR OTHER ADVERTISEMENTS

See End of Paper.

ESSEX COUNTY COUNCIL.

*HIGHWAYS COMMITTEE.*

ACKINGFORD BRIDGE RECONSTRUCTION.

Tenders are invited from Contractors licensed to execute Ferro-concrete construction on the Hennebique system for Building a New Bridge over the Cripsey Brook, in the Parish of Chipping Ongar, known as "Ackingford" Bridge.

Drawings may be seen and Specification obtained on and after Monday, February 19th, 1912, upon application to the County Surveyor of Essex, Chelmsford.

The Council do not bind themselves to accept the lowest or any Tender.

Tenders, sealed and endorsed "Ackingford Bridge," to be delivered to this Office not later than Saturday, March 2nd, 1912.

PERCY J. SHELDON, M.INST.C.E.,
County Surveyor.

Chelmsford.
February, 14th, 1912.

On the West Side of Kingsway, between Kemble and Keeley Streets—a leasehold frontage of 60 feet with a freehold site in rear.

THE METROPOLITAN ELECTRIC SUPPLY CO., Ltd., being the owners of the freehold site above mentioned, and being in a position to offer a County Council building agreement and lease of the leasehold site mentioned above, hereby invite Tenders for the purchase of their interests in both properties.

PARTICULARS.

The leasehold site has a frontage of 60ft. to Kingsway, and a depth of 69ft. 10in., and comprises 4,193 sq. ft.

It is midway between Kemble and Keeley Streets, and joins the freehold site in the rear, forming an access thereto.

The freehold site has a frontage to Kemble-street of 119 ft. 2 in., and to Keeley-street of 145 ft. 5 in., and comprises 20,905.2 sq. ft.

Copies of the Form of Building Agreement and Lease and of the Conveyance of the Freehold Site and Plans can be seen at the Offices of Company, and Forms of Tender with Conditions of Sale can be obtained there on payment of the sum of one guinea per copy.

Tenders must be sent in on or before the 1st day of April, 1912, addressed to the Secretary,

Metropolitan Electric Supply Co., Ltd.,
16 Stratford-place, W.
January, 1912.

FOR SALE.—Horse Brooms (Baker's) in good condition. To be sold cheap.—Arnold's, Paddock Wood, Kent.

BOROUGH SURVEYOR, East Yorks, requires Assistant. Age 22 to 26. Salary £60. State age and experience to Box 1,151, Office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

## BERKSHIRE COUNTY COUNCIL.
### ROLLER GANG FOREMAN.

Wanted, Competent Man as Working Foreman of Steam Roller Gang. Wages 30s. per week, rising to 35s. per week, and sleeping accommodation in van provided.

Only those need apply who have had experience in the maintenance of roads and the laying of Tarmacadam, surface tarring, and kerbing. Apply, by letter only, giving age, experience, and references, to the County Surveyor, The Forbury, Reading, Berks. Applications must be received not later than February 27th.

February 14th, 1912.

## ESSEX COUNTY COUNCIL.

*HIGHWAYS COMMITTEE.*

### TOWN BRIDGE, HALSTEAD.

Tenders are invited from Contractors for the execution of the necessary works involved in widening the above bridge over the River Colne at Halstead.

Drawings may be seen and copies of Specification, Quantities, &c., obtained at the County Surveyor's Office on and after Monday, the 19th inst.

Sealed Tenders, endorsed Halstead Bridge, are to be delivered at this Office not later than Saturday, 2nd March, 1912.

PERCY J. SHELDON, M.INST.C.E.,
County Surveyor.

County Surveyor's Office,
Chelmsford.
February 13th, 1912.

## CANNOCK URBAN DISTRICT COUNCIL.
### TENDERS FOR SUPPLIES.

The Cannock Urban District Council invite Tenders for the supply of the following Materials for the twelve months ending March 31st, 1913.

Granite Roadstone and Chippings.
Granite Roadstone and Chippings (Tarred).
Kerbs and Setts.
Cold Blast Furnace Slag.

Forms of Tenders and particulars may be obtained on application to Mr. Robert Blanchard, Engineer and Surveyor, Council Offices, Cannock.

Sealed Tenders, endorsed "Tenders for ....," as the case may be, to be delivered to me, the undersigned, together with the necessary samples, not later than noon on Friday, the 1st day of March, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

C. A LOXTON,
Clerk to the Council.

Council Offices,
Cannock.
February 12th, 1912.

## BOROUGH OF SOUTHEND-ON-SEA.
### TO ROAD CONTRACTORS.

The Corporation invite tenders for the Making-up of the following Streets, viz:—

Fairmead-avenue (sec. 1).
Westminster-drive (sec. 1).
Silverdale-avenue (sec. 3).
Whitegate-road.
Back-passage, Pembury-road.

Plans, Sections, and Specifications may be seen, and Bill of Quantities and Form of Tender obtained, on and after Friday next, the 16th instant, on deposit of cheque for £1 1s. in respect of each street (which will be returned upon the receipt of a *bona-fide* Tender and the return of all documents), upon application to Mr. E. J. Elford, M.I.M.E., Borough Engineer and Surveyor.

Sealed Tenders, endorsed "Private Street Works," together with the name of the street, to be delivered at my Office by first post on Thursday, the 22nd of February, 1912.

No Tender will be considered unless made on the prescribed form.

The Corporation will not be bound to accept the lowest or any Tender.

(By order),
H. J. WORWOOD,
Town Clerk.

Town Clerk's Office,
Southend-on-Sea.
**February 14th, 1912.**

## CORPORATION OF CHEPPING WYCOMBE.
### FLINTS.

The Corporation is prepared to receive Tenders for the supply of Flints for year ending March 31st, 1913.

Particulars and Forms of Tender may be had on application to the undersigned, to whom Tenders, endorsed "Flints," must be delivered by noon on Monday, the 4th day of March, 1912.

T. J. RUSHBROOKE,
Borough Surveyor.

77 Easton-street,
High Wycombe.
February 14th, 1912.

## BOROUGH OF CHEPPING WYCOMBE.

The Corporation is prepared to receive Tender for the following Stores:—

Cast Iron Pipes.
Surface Boxes.
Manhole and Inspection Chamber Covers.
Stop and Bib Cocks.
Tubes and Fittings.

Form of Tender may be obtained at the Office of the undersigned, to whom Tenders must be delivered by noon on Monday, the 4th day of March, 1912.

T. J. RUSHBROOKE,
Waterworks Engineer.

77 Easton-street,
High Wycombe.
February 14th, 1912.

## WILLESDEN DISTRICT COUNCIL.
### ANNUAL CONTRACTS.

The Willesden District Council are prepared to receive Tenders from persons willing to enter into contracts to execute the following Works or to supply the following Materials for certain periods, commencing April 1st, 1912, viz :—

1. Jobbing Works in construction of Sewer, &c.
2. Jobbing Works, Mason and Pavior.
3. Supply of Artificial Slab Paving.
4. Supply of Tar-Paving and execution of Tar-Paving Works.
5. Supply of Horses, Carts, and Drivers, for cartage of various descriptions.
6. Supply of Gravel, Flints, Burnt Ballast, &c., for repair of roads, &c.
7. Supply of Broken Granite for repair of roads, &c.
8. Supply of Lime, Cement, Stoneware Pipes, &c.
9. Supply of Lamp Columns and Fittings complete.
10. Supply of Oils and Chandlery.
11. Supply of Coal and Coke.
12. Barging of Road Slop, &c., from Fermoy Wharf.
13. Supply of Horse Provender (six months).
14. Supply of Ironmongery and Tools.
15. Supply of Timber.
16. Maintenance of Council's Telephones and Wires.
17. Wood Paving Works.

Specifications and Forms of Tender may be obtained upon receipt of 5s. for each Tender Form, on and after Monday, February 19th, 1912, upon application to Mr. O. Claude Robson, M.INST.C.E., Engineer to the Council, Public Offices, Dyne-road, Kilburn, N.W. The deposit for Tender Form will be returned upon receipt of bona-fide Tender.

Tenders to be delivered to the undersigned not later than 4 p.m. on Tuesday, February 27th, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
STANLEY W. BALL,
Clerk of the Council.

Public Offices, Dyne-road,
Kilburn, N.W.
February 13th, 1912.

## ALSAGER URBAN DISTRICT COUNCIL.
### WATER SUPPLY.

The Council invite Tenders for an Experimental Boring on land near the Oak Farm, Alsager.

Full particulars may be obtained on application to Mr. H. V. Lynam, Surveyor, Alsager.

Sealed Tenders to be delivered to the undersigned, endorsed "Tenders for Boring," not later than noon on Thursday, March 7th, 1912.

JOHN J. NELSON,
Clerk to the Council.

Alsager.
**February 14th, 1912.**

## CORRESPONDENCE.

*"All truth is precious, if not all divine."* Cowper.

### ABSTRACTION OF MOISTURE FROM SLUDGE.

*To the Editor of* The Surveyor.

Sir.—I see that one of your correspondents is requiring some information as to the Schaefer-ter-Meer centrifugal machine for drying sludge. During the early summer of 1910 I visited Hanover for the purpose of inspecting this apparatus, and in addition to witnessing the separate parts being made in the workshops of the "Hannoversche Maschinenbau-Actien-Gesellschaft," I was permitted to view, through the courtesy of the chief engineer, the machines working at Hanover sewage works. From my notes made on the subject perhaps the following will interest your correspondent:—

In the first place, the process is entirely automatic, and each machine requires but 8-horse power to drive it. As the machine rotates wet sludge is introduced from the tank above into a series of chambers situated

Schaefer-ter-Meer Sludge-drying Machine.

into the drum of the machine; these compartments are provided with sieves, and also inlet and outlet valves. The heavy matter in the sludge is projected (by centrifugal force) to the outer portion of the chambers, while the water is forced back, separated, and flows through the sieves into an annular ring and thence away. At this stage more sludge enters the chambers to replace the water removed, until the compartments are quite full of sludge from which the water has been extracted. Then the inner valve is closed, the outer one opened, and the dried matter ejected by centrifugal force against the walls of the outer shell, which break it up into small particles. This residue falls on to a belt conveyor running under the whole series of machines.

When the dried sludge is ejected the outer valve automatically closes, and simultaneously the inner one is opened, and the cycle of events repeated.

One cycle takes a little over two minutes, and anything up to 140 cub. ft. of wet sludge can be treated per hour by one machine. The period of drying, however, can be varied at will. The resultant sludge is said to contain about 60 per cent of moisture, and at Frankfort is passed over retorts and then burnt.

I might add, in conclusion, that the sliding valves are operated by compressed oil, which, by a very ingenious arrangement, is used over and over again.—Yours, &c.,

Stanley Wilkinson, Assoc.M.Inst.C.E.,
Resident Engineer.

Surbiton Sewage Works.
February 10, 1912.

*To the Editor of* The Surveyor.

Sir.—In reply to your correspondent "X." who asks in your issue of February 9th for particulars of Schaefer-ter-Meer centrifugal sludge-drying machine, he will find a very full description in the "Mitteilungen aus der königlichen Versuchs und Prüfungsanstalt für Wasserversorgung und Abwässerbeseitigung zu Berlin," published by August Hirschwald, Berlin, vol. 10, page 174, and more briefly in *Engineering*, October 15, 1909, and in "Sewage Disposal," by Kinnicutt, Winslow and Pratt.—Yours, &c.,

H. Maclean Wilson

Wakefield.
February 13, 1912.

[The sole licensees and makers for Great Britain and the Colonies of the Schaefer-ter-Meer machine are Messrs. Manlove, Alliott & Co., Limited, Bloomsgrove Works, Nottingham. Ed. The Surveyor.]

## WESTERN APPROACH ROAD TO LONDON.

### £1,750,000 SCHEME: ROAD BOARD'S OFFER.

At a conference held at the offices of the Road Board on Wednesday explanations were given as to the manner in which the board propose to assist the construction of a new western approach road to London. The total estimated cost of the scheme is £1,750,000, to which the Road Board is prepared to subscribe £875,000.

In addition to the board, there were represented at the conference the Traffic Branch of the Board of Trade, the London, Middlesex, and Buckingham County Councils, the Borough Councils of Kensington, Hammersmith, and Fulham, and the Urban District Councils of Chiswick, Brentford, Heston and Isleworth.

Sir George Gibb stated that the new road would be 80 ft. wide, and would extend from West Cromwell-road, South Kensington, to Hounslow, *viâ* Hammersmith and Brentford. Plans and estimates for the road had been prepared and were now ready for consideration. The congestion at Hammersmith and Brentford was, he said, notorious, and at present Cromwell-road, one of the finest roads in London, was wasted from having no outlet. The proposed plan was merely a suggestion, and might be varied in detail. The responsibility for settling the plan, as well as the practical execution of the work, must rest with the local authorities, the position of the Road Board being merely that of contributors to the cost. The Brentford Urban District Council had applied for assistance towards the proposed widening of Brentford High-street, at a cost of £347,000, but the board considered that a new road was better as well as cheaper. Of the cost of the proposed road, Sir George said it was estimated that £1,000,000 would be within London and £750,000 in Middlesex.

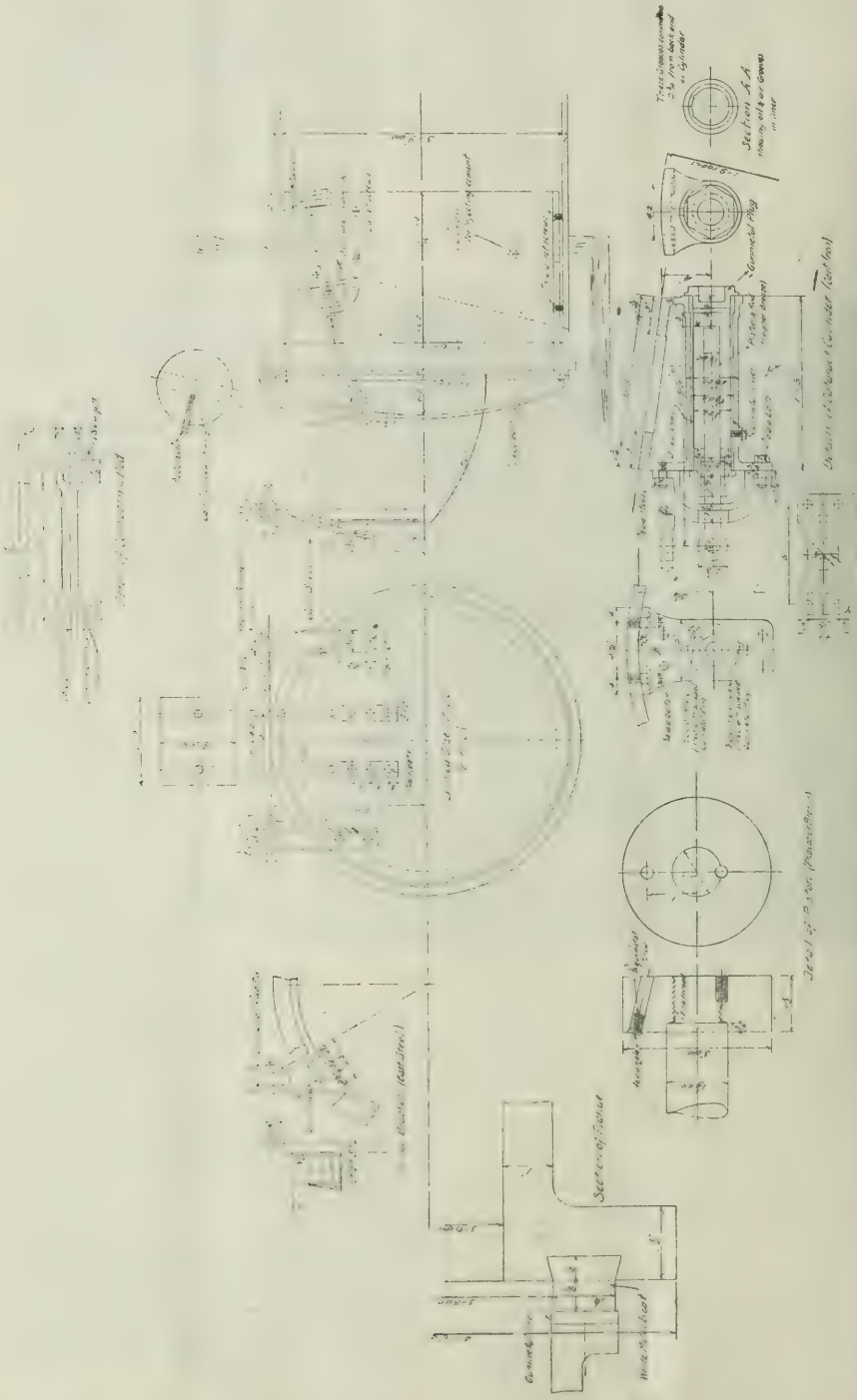
No decision as to the scheme was arrived at by the conference, but it was agreed that the local authorities interested should be asked to appoint delegates to attend a further conference to discuss details.

**The Railless Trolley System.**—Tests of this system are to be made shortly between Woolwich and Eltham.

## FLAP VALVES FOR SEA OUTFALLS.

### ANTI-SLAMMING DEVICE.

Some two years ago Mr. A. E. Collins, M.INST.C.E., the city engineer of Norwich, had occasion to design some flap valves for an outfall somewhat exposed to the stroke of the sea. In constructing them it was found necessary to omit the flanges at the beats of valves. The valves have now been satisfactorily at work for nearly two years. The cataract or dashpot gear was introduced to prevent the slamming of the valves owing to the beat of the sea, and have, we are given to understand, quite answered their purpose.



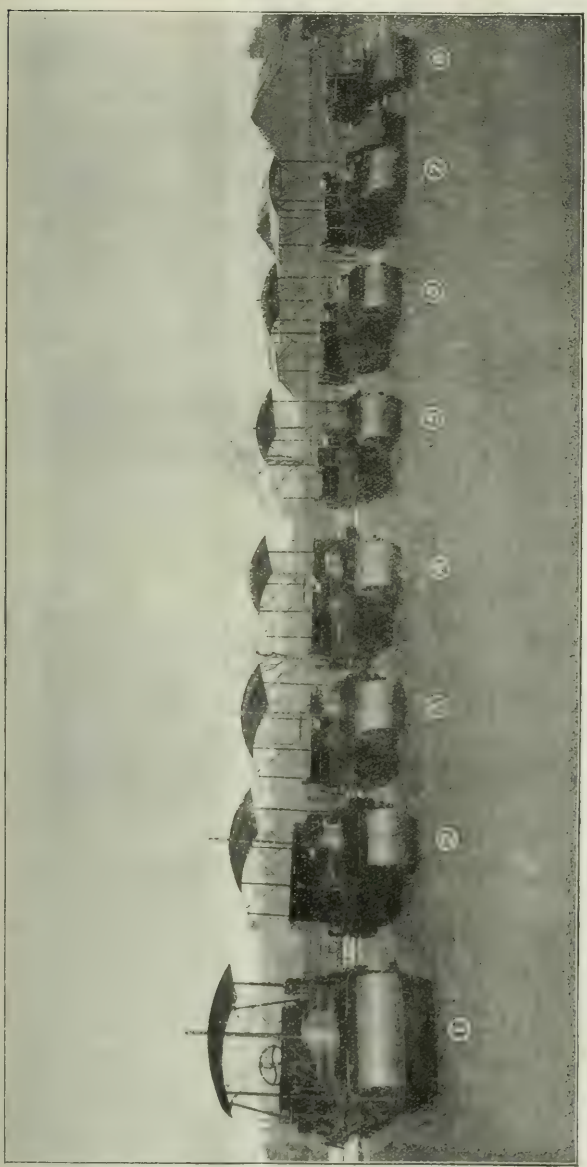
Details of Flap Valve for Sea Outfalls.

The design of the valves is shown by the drawings reproduced herewith.

## MOTOR ROLLERS.

### MESSRS. BARFORD & PERKINS' MACHINES.

The interesting and probably unique photograph reproduced herewith was taken on the eve of the despatch of the eight motor rollers shown to customers in various parts of the world of Messrs. Barford & Perkins, of Peterborough. The rollers illustrated vary in weight from 12 tons to 1½ tons, five of the eight being for road-making purposes.



Eight Types of Barford & Perkins' Motor Rollers.

1.—Motor Road Roller (12 tons); 2.—Motor Road Roller (8 tons); 3.—Motor Road Roller (7 tons); 4.—Motor Road Roller (6 tons); 5.—Motor Road Roller (5 tons); 6.—Motor Gravel Roller (4½ tons); 7.—Motor Grass Roller (3 tons); 8.—Motor Grass Roller (1½ tons).

Some idea of the business which is now being done by Messrs. Barford & Perkins in these machines after some eight years specialising in their production can be obtained when it is stated that the output of motor rollers from their works at the present time averages over three a week. "Entirely satisfactory" seem to be the general verdict of surveyors to local authorities who have adopted the machines, among those from whom the firm have received appreciative letters with regard to their working results being the engineers to the Corporations of West Bromwich, Croydon and Beverley, and the district Councils of Willesden, West Lancashire and Llandudno. Mr. O. Claude Robson, of Willesden, says: "One great advantage in the machine was its absence of complications in driving, this work having been readily acquired in a week by a man hitherto unskilled in the driving of motors." Mr. E. F. Morgan, the borough road surveyor of Croydon, states that his machine has been used for all kinds of works—*viz.*, ordinary road repairs, trench repairs, tar-macadam rolling, and especially during the summer for rolling granite chippings on the surface of roads which have been tarred. It is clean and quiet in working, and is specially useful for residential streets where the noise of a steam roller may be an objection. The fact that the roller can be taken out of the depot at short notice without the delay of getting up steam is, of course, a recommendation, he adds. Mr. J. Gould Smith, the borough surveyor of Beverley, who purchased one of the firm's "E2" size of roller in April, 1910, says that it has been used with good results on new tar-macadam roads, the resurfacing of macadamised roads with tar-macadam, the foundations for new streets and widenings of roads, and ordinary road patching repairs.

Messrs. Barford & Perkins' 8-ton motor roller, which is now being so much used for town and country work, is, it may be of interest to mention, worked at a cost for fuel (paraffin) of 3d. per hour.

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**Public Health Law** (By Sydney G. Turner. St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, E.C. Price 10s. 6d. nett). —A manual for municipal and county engineers and surveyors, town clerks, clerks to district councils, and other officers, and to members of local authorities. The book is designed to be specially useful to officials in the preparation of reports and in the administration of the law, and to members of local authorities in the discharge of their public duties. It is also of value to students preparing for examinations as municipal engineers and in public health law. The subjects treated of from a legal point of view include the meaning of "sewer" and "drain," sewage disposal, sanitary fittings, river pollution, infectious diseases and hospitals, new streets and buildings, private streets, highways, open spaces, markets, slaughter-houses, housing, &c. This is, we believe, the first time these matters have been dealt with each in a separate chapter, which makes the book easy for reference. There are no reprints of Acts *in extenso*, but under each topic are given the Acts and clauses which refer to it. . . . We should say the work ought to occupy a place in every sanitary authority's office. *Local Government Journal.*

## THE ROAD: PAST, PRESENT AND FUTURE.

### ROYAL INSTITUTION LECTURE.

At the Royal Institution, Albemarle-street, W., this (Friday) evening, at 9 o'clock, Sir John H. A. MacDonald, K.C.B., LL.D., F.R.S., member of the Road Board, will deliver a lecture on "The Road: Past, Present and Future." A synopsis of the lecture is appended:

INTRODUCTION.

Road neglect in consequence of the advent of railroads—Want of skill of surveyors—Period of Macadam and Telford—Subsequent deterioration from railroad absorbing the traffic—Revival of road during present century—change permanent.

THE PAST.

Roman roads. No road making after they retired—Horse traffic only—wheeled vehicles later—Roads bad Road speed low—Deep ruts full of mud—Repaired by large stones thrown in Dust clouds—Wagons Post-chaises Coaches Road statutes—Little improvement.

THE PRESENT.

Macadam and Telford Their systems Road user had to do the road rolling Steam rolling Defects of Water binding Contrary to Macadam's principle Produces hollows and ridges Camber often too great Stones too large.

THE FUTURE

Recent experiments Change in Thames Embankment—H.M. Road Board appointed Has administration of motor and petrol taxes Grants in aid of improvements Laboratory researches Importance of keeping out water Resilient surface skin Elimination of mud and dust Durability of surface Economy—Efficiency—Results already obtained—Valuable sanitary improvement

**Tramways in the City of London.** The London County Council have asked the City Corporation to reconsider their decision to oppose the council's proposed application to Parliament for authority to extend the existing tramways in Farringdon-street to a point north of Ludgate-circus.

## TARRED LIMESTONE MACADAM ROADS.

The accompanying views are reproductions of photographs of tarred limestone macadam roads laid by the firm of John Wainwright & Co., Limited, of Shepton Mallet and London. Messrs. Wainwright make a speciality of their material for this class of work, and being the owners of extensive quarries, not only of limestone, but of other stones, the preparation of the material which they supply is carried out from start to finish at their own works.

For many years past firmly established in the matters of tar paving and the supply of road stone, the firm have of late been confronted with the necessity for coping with a greatly-increased demand for their tar-macadam, and are at the present time busily engaged in extending their premises and installing a large drying plant and tar-macadam mixers on their railway sidings.

To surveyors in the neighbourhood of London, in particular, the roads shown in the views illustrating these notes are certainly worthy of inspection. All are highways over which a considerable amount of very heavy motor and other traffic passes, the one at Olympia being subjected to tests of the most trying character during the frequent exhibition periods. The roads, which were laid in 1910, are perhaps not shown to the best advantage in our photographs, which were taken at a time when snow was on the ground and lying about in small drifts; but the perfect character of the surfaces will be apparent, the absence of anything in the nature of holes or roughness being clearly evident. The roads afforded the best kind of foothold for horses during the recent severe weather, and their appearance at the present time, we learn, is all that could be desired.

Messrs. Wainwright & Co., it should be noted, are prepared to carry out the entire work of construction themselves, or supply the mixed material; and surveyors who may be desirous of inspecting their quarries at any time are cordially invited to communicate with the firm either at Shepton Mallet or 173 Maida Vale, W.

Limestone Tar Macadam Road at Chingford Reservoir (the Lea Valley Road).

(Laid in June, 1910.)

**London's New County Hall.**—His Majesty the King will lay the foundation-stone of the new County Hall for London on March 9th.

Tar Macadam Road at Chingford Reservoir (the Lea Valley Road).

(Laid in June, 1910.)

Tar Macadam Road—Approach to Olympia from Hammersmith Road.

(Laid in October, 1910.)

## TESTS OF ROAD STONES.

### RESULTS PUBLISHED BY THE NEW YORK STATE COMMISSION OF HIGHWAYS.

The following table gives the results of tests made by the Commission of Highways of New York State on a large number of specimens of road stone. Nos. 1 to 14 were quarry stones, and Nos. 15 to 21 were field stones. For the abrasion test the stone is broken to 2½ to 1½ size, so that nearly fifty pieces weigh within 5 grains of 5 kilograms. The charge of fifty pieces is placed in a Deval machine, with a cylinder inclined at an angle of 30°, and is revolved for 10,000 revolutions at 2,000 revolutions per hour. The weight of material less than ⅛ in. in diameter is counted as the "loss of weight." The French coefficient is, of course, 40 divided by the percentage loss of weight.

The hardness test is made upon 1-in. cores with a Dorry grinding machine with crushed quartz sand, 500 revolutions at 33⅓ revolutions per minute, and the loss of weight for 1,000 revolutions (proportionate) is taken. One-third of this loss, in grains, subtracted from 20, gives the "hardness."

The toughness test is made with two similar core pieces, cylinders 1 in. in diameter and 1 in. long. They are subjected to blows from a 2-kilogram hammer acting through a 1-kilogram weight. The first drop is 1 centimetre, and each succeeding drop from a centimetre higher than the one before. The number of blows, or the drop in centimetres from which the hammer breaks the core is the "toughness." The "weighted value" is the sum of the French coefficient multiplied by 3, the hardness multiplied by 2, and the toughness multiplied by 1. Different "weightings" could, of course, be used according to the purpose for which the stone is required.

| Group number. | Number of tests represented. | Specific gravity. | Weight, lb. per cubic foot | Water absorbed, lb. per cubic foot. | Abrasion. | | Hardness. | Toughness. | Weighted value. | Group number. | Kind of stone |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Per cent of wear. | French coefficient | | | | | |
| 1 ... | 7 | 2·93 | 183 | 0·21 | 3·9 | 11·2 | 17·8 | 10·0 | 79 | 1 | Anorthosite |
| 2 .. | 8 | 2·64 | 165 | 0·75 | 3·6 | 12·6 | 15·1 | 14·8 | 83 | 2 | Calcareous sandstone |
| 3 .. | 34 | 2·76 | 173 | 0·62 | 4·3 | 10·0 | 14·0 | 8·7 | 67 | 3 | Dolomite |
| 4 ... | 28 | 2·73 | 172 | 0·87 | 3·9 | 11·7 | 16·0 | 10·9 | 77 | 4 | Dolomitic limestone |
| 5 ... | 7 | 2·78 | 174 | 0·30 | 4·5 | 9·6 | 17·3 | 8·0 | 72 | 5 | Gabbro |
| 6 ... | 53 | 2·78 | 174 | 0·28 | 4·6 | 9·8 | 17·3 | 9·3 | 73 | 6 | Gneiss |
| 7 .. | 10 | 2·65 | 166 | 0·31 | 4·0 | 11·7 | 18·0 | 7·3 | 78 | 7 | Granite |
| 8 .. | 130 | 2·71 | 169 | 0·26 | 4·8 | 8·9 | 15·0 | 6·8 | 64 | 8 | Limestone |
| 9 | 20 | 2·67 | 167 | 0·39 | 2·5 | 17·6 | 18·7 | 17·7 | 110 | 9 | Quartzite |
| 10 .. | 42 | 2·58 | 161 | 1·42 | 4·7 | 10·3 | 13·1 | 9·8 | 67 | 10 | Sandstone |
| 11 .. | 35 | 2·68 | 168 | 0·70 | 4·3 | 10·1 | 15·2 | 11·3 | 74 | 11 | Sandy grit |
| 12 | 14 | 2·80 | 175 | 0·16 | 3·3 | 12·3 | 18·1 | 12·0 | 85 | 12 | Syenite |
| 13 . | 20 | 2·93 | 183 | 0·38 | 2·5 | 16·9 | 18·0 | 19·7 | 106 | 13 | Trap |
| 14 .. | 19 | — | — | — | — | — | — | — | — | 14 | Miscellaneous stone |
| 15 ... | 7 | 2·77 | 173 | 0·82 | 4·3 | 9·7 | 15·9 | 9·2 | 70 | 15 | Do'omite |
| 16 .. | 12 | 2·72 | 170 | 1·13 | 4·4 | 10·1 | 14·8 | 8·8 | 69 | 16 | Dolomitic limestone |
| 17 ... | 23 | 2·77 | 173 | 0·31 | 4·3 | 10·6 | 17·1 | 8·4 | 74 | 17 | Gneiss |
| 18 ... | 14 | 2·68 | 168 | 0·27 | 3·0 | 14·0 | 19·5 | 10·7 | 90 | 18 | Granite |
| 19 ... | 7 | 2·73 | 171 | 0·34 | 6·0 | 7·2 | 14·9 | 8·1 | 50 | 19 | Limestone |
| 20 ... | 38 | 2·65 | 159 | 1·67 | 3·7 | 12·2 | 15·5 | 12·1 | 80 | 20 | Sandstone |
| 21 ... | 8 | 2·65 | 166 | 0·77 | 4·1 | 11·4 | 14·7 | 12·2 | 76 | 21 | Sandy grit |

**Society of Engineers: The Status Prize.**—The council of the Society of Engineers may award in 1912 two premiums of books or instruments to the value of £8 8s. and £4 4s., as first and second prizes respectively, for approved essays on the subject of "How to Improve the Status of Engineers and Engineering, with special reference to Consulting Engineers." The council reserve the right to withhold either or both of the premiums if the essays received are not of the required standard of merit. The competition is open to all, but application for detailed particulars should be made to the secretary before entering. The latest date for receiving essays is Friday, May 31st.

**Baltimore's Paving Enterprise.**—The Paving Commission of the City Council of Baltimore, Md., has approved the Bill embodying three special paving-tax rates for raising £1,000,000 to supplement the £1,000,000 paving loan recently authorised, and to make possible the repaving of streets in the old section of the city. The Bill provides that the rates of the special tax shall be to cover one foot frontage for 25 ft. or less, 20c. per foot; for the next 50 ft., 20c. and 5 cents for alleys. At the time the commission authorised the expenditure of over £200,000 for new paving work, covering about 8 miles of street. The outlook is that nearly all the streets will be first asphalted and over the present solid base pavement is to be a concrete base.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President*—Mr. Albert D. Greatorex, M.Inst.C.E., Borough Engineer and Surveyor of West Bromwich.

### FORTHCOMING MEETINGS.

The following meetings are reported as fixtures: June 7th and 8th, Scottish meeting at Stirling; Eastern District, June 15th, at East Ham; Eastern District meeting on June 22nd, at Lowestoft.

A West Midland District meeting will be held at Stourbridge, April 13th, the Paris meeting at Whitsun, and the annual meeting will probably be held July 11th, 12th and 13th.

Provincial members who propose to take part in the visit to Paris will, in cases where the journey exceeds a distance of 30 miles, be able to obtain return tickets to London at a single fare and a quarter.

Members desirous of submitting a paper at the forthcoming annual meeting are requested to give early information of their desire.

Premiums not exceeding 30 guineas are awarded by the council for the best papers read by members and associate members during the year.

Thomas Cole,
*Secretary.*

11 Victoria-street,
London, S.W.

## INSTITUTION OF MUNICIPAL ENGINEERS.

*President*—Mr. E. A. Stickland, Assoc.M.Inst.C.E., Borough Surveyor, Windsor.

### NORTHERN DISTRICT.

A meeting of the above district will be held in the Town Hall, Newcastle-on-Tyne, to-morrow (Saturday) at 3 o'clock.

Business.

Minutes of last meeting to be read and confirmed.

Correspondence.

Tenders for printing tabulated list of queries.

Report of committee appointed to consider Mr. Mole's resolution.

Discussion to be introduced by the chairman on—

"The present system of repayment to district councils by county councils for maintenance of main roads."

Accounts to pass for payment.

General discussion on any subject of interest to surveyors.

Louis Robinson,
*Hon. District Secretary.*

Union Offices,
Darlington.
February 8, 1912.

### MEETING IN LONDON.

A general meeting will be held in the Committee-room No. 4 Southampton-row, London, W.C., on Saturday, February 24th, at 6 o'clock, when a paper.

"Superannuation and Security of Tenure: the National Association of Local Government Officers and its Bill," by A. Winter Gray, member of council of the institution, will be read.

Mr. L. Hill, secretary of the association, and, it is hoped, some of its prominent members, will be present and take part in the discussion, which will be an open one.

The building, No. 4 Southampton-row, is almost opposite the Holborn Station of the Great Northern and Piccadilly Tube, and within a minute of the British Museum Station of the Central London Railway.

#### SOUTH-EASTERN DISTRICT.

A discussion evening will be held in the council room of the institution, 39 Victoria-street S.W,, on Wednesday, March 6th, at 7 p.m., when there will be an open discussion on "Methods of Inviting Public Tenders": The advantages and disadvantages of stipulating that: (1) The lowest tender will be rejected; (2) the tender next above the lowest will be accepted.

Another discussion evening has been arranged for Tuesday, March 19th, the subject for consideration being "The Size and Design of Street Gullies, Grates and Weirs."

BERNARD PARTRIDGE.
*Hon. District Secretary.*

Town Hall,
Walthamstow.

#### EXAMINATIONS.

The next examination will be held in May, 1912, at centres to be arranged. The papers set at the November examinations may be obtained in book form, price 1s., post free.

B. WYAND,
*Secretary.*

39 Victoria-street, S.W.

## ROYAL SANITARY INSTITUTE.

#### MEETING AT MANCHESTER.

At a meeting of the Royal Sanitary Institute, to be held at Manchester, on Friday, March 8th, discussions will be opened on "The Application of the Housing and Town Planning, &c., Act, to the Development of Suburban Areas now in Process of Transition," by Mr. F. W. Platt, building surveyor, Salford, and on "The Quantity of Water Available from Upland Drainage Areas," by Prof. J. Radcliffe, M.SC. On the following day visits will be made to places of local interest.

## INSTITUTE OF SANITARY ENGINEERS.

#### FORTHCOMING MEETINGS.

A sessional meeting will be held at Caxton Hall, Westminster, on Monday, February 26th, when a lecture on "Sanitary Building Construction" will be given by Prof. Henry Adams, M.INST.C.E., M.I.MECH.E. Mr. Edwin T. Hall, F.R.I.B.A., F.R.SAN.I., will take the chair at 8 p.m.

A sessional meeting will be held at Caxton Hall, Westminster, on Monday, March 11th, when a paper on "The Modern Home" will be read by Mr. Percival M. Fraser, A.R.I.B.A. The chair will be taken at 8 p.m.

## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

SANITARY SURVEYOR.—February 17th.—Bingham Rural District Council. £100 per annum.—Mr. R. H. Beaumont, clerk, Bingham, Notts.

ROAD FOREMAN.—February 19th.—Southampton County Council. 30s.—£2.—Mr. W. J. Taylor, county surveyor.

ASSISTANT INSPECTOR OF NUISANCES.—February 19th.—Watford Urban District Council. £104—£120.—Mr. W. Hudson, clerk.

INSPECTOR OF NUISANCES.—February 20th.—Northleach Rural District Council. £80 per annum.—Mr. J. H. Stephens, clerk.

ASSISTANT INSPECTOR.—February 21st.—Cheltenham Town Council. £65—£100.—Mr. R. O. Seacome, town clerk.

CLERK OF WORKS.—February 21st.—Lostwithiel Town Council. 50s. a week.—Mr. J. Heath, town clerk.

CLERK OF WORKS.—February 22nd.—Oakwell Joint Hospital Board. 50s. per week.—Mr. W. Middlebrook, clerk, Council Offices, Birstall.

INSPECTOR OF NUISANCES.—February 22nd.—Swadlincote Urban District Council. £100—£120.—Mr. W. A. Musson, clerk.

SURVEYOR.—February 23rd.—Flaxton Rural District Council. £120 per annum.—Mr. J. Peters, clerk, 4 Newstreet, York.

ROAD FOREMAN.—February 23rd.—Corporation of Doncaster. £130—£150.—Mr. R. A. H. Tovey, town clerk.

SURVEYOR AND INSPECTOR.—March 9th.—Llanidloes Town Council. £75 per annum.—Mr. A. Davies, town clerk.

ASSISTANT ENGINEERS.—May 1st.—Indian Public Works and State Railway Departments.—Secretary, Judicial and Public Department, India Office, London, S.W.

TEMPORARY ENGINEERING ASSISTANT.—Chertsey Rural District Council. £2 per week.—The Surveyor.

## MUNICIPAL COMPETITIONS OPEN.

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LONDON.—February 17th.—Sketch designs for new head offices, for the Port of London Authority.—The Clerk.

YORK.—February 17th.—Designs are invited for a public elementary school by the Education Committee.—Mr. J. H. Mason, secretary, Education Offices, Clifford-street, York.

HARROW-ON-THE-HILL.—March 16th.—Enlargement of public offices, for the urban district council. Cost not to exceed £4,500. Premiums of 30, 20 and 15 guineas are offered.—Mr. J. P. Bennetts, engineer and surveyor.

PORTLAND.—April 4th.—Designs and plans for council offices, for the urban district council. Premiums of £50 and £10 are offered.—Mr. R. A. Colenutt, clerk.

HALE.—June 28th.—Designs for a town planning scheme for the urban district council. Premiums of £50 and £25 are offered.—The Clerk.

DUSSELDORF.—July 1st.—Plan for the extension of the city. Premiums of £1,000 and £375 are offered.—The Chief Burgomaster.

WARRINGTON.—Plans for a public elementary school, for the corporation.—Mr. J. Moore Murray, secretary and director of education, Sankey-street, Warrington.

## MUNICIPAL CONTRACTS OPEN.

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### Buildings.

SKIPTON.—February 17th.—For building an engine-house and brick chimney, for the urban district council.—Mr. A. E. W. Aldridge, surveyor.

SHEFFIELD.—February 19th.—For the erection of an infants' and special school, for the Education Committee.—City Architect.

STOCKTON-ON-TEES.—February 19th.—For the erection of school, for the Education Committee.—Mr. J. Tweedy, secretary, 32 Dovecot-street.

BILSTON.—February 20th.—For the erection of fire station and sanitary depot, for the urban district council.—Mr. J. D. Wassell, clerk.

CARDIFF.—February 20th.—For the erection of a public convenience, for the corporation.—Town Clerk.

LANCHESTER.—February 20th.—For the erection of a filter house, for the Water Committee.—Mr. T. C. Hughes, town clerk.

LYMM.—February 20th.—For building stable and cart shed, for the urban district council.—Mr. David Mort, surveyor.

Colchester.—February 20th.—For alterations at a school, for the Education Committee.—Mr. T. H. Baker, Head Gate-court, Colchester.

Durham.—February 20th.—For the erection of a school at Easington Colliery, for the county council.—Mr. A. J. Dawson, clerk, Shire Hall, Durham.

Glamorgan.—February 21st. For the erection of three infants' schools, and alterations at other schools, for the county council.—The Clerk, County Council Offices, Westgate-street, Cardiff.

Wilts.—February 21st.—For the erection of a school at Idmiston, for the county council.—Mr. J. G. Powell, county surveyor, Trowbridge.

West Sussex.—February 21st.—For alterations to toll-house for the county council.—Mr. H. W. Bowen, county surveyor, North-street, Horsham.

Montgomery.—February 21st.—For the erection of a school, for the Education Committee.—Mr. L. Phillips, clerk, County Education Offices, Newtown.

Lostwithiel.—February 21st.—For the construction of a covered reservoir, for the corporation.—Mr. J. Percival Heath, town clerk.

Hants.—February 22nd.—For the erection of a school, for the county council.—Mr. H. Barber, clerk, The Castle, Winchester.

Nantyglo and Blaina.—February 22nd.—For the erection of seventy-four houses at Cwm Celyn, for the urban district council.—Mr. H. J. C. Shepard, clerk.

West Riding.—February 23rd.—For the erection of a school, for the Education Committee.—Mr. F. A. Darwin, County Hall, Wakefield.

Newbury.—February 23rd.—For the erection of twelve cottages, for the corporation.—Mr. S. J. L. Vincent, borough surveyor.

Croydon.—February 24th — March 2nd.—For the erection of an elementary school, for the Education Committee.—The Clerk.

West Riding.—February 26th.—For the extension of the county hall, Wakefield, for the county council. Mr. J. V. Edwards, county architect, Wakefield.

Dewsbury.—February 26th.—For additions to a public school, for the Education Committee.—Mr. S. G. Bibby, secretary, Town Hall.

Dublin.—February 26th.—For the erection of forty-five cottages, for the corporation.—Improvements Committee, City Hall.

Swansea.—February 26th.—For the erection of 103 houses, for the corporation.—Mr. H. Lang Coath, town clerk.

Halifax.—February 26th.—For the erection of a shelter and underground convenience, for the corporation.—Mr. B. Saunders, clerk.

Minehead.—February 26th.—For the erection of conveniences and shelters, for the urban district council.—Mr. L. C. Webber-Incledon, clerk, Minehead, Somerset.

Northumberland.—February 26th.—For the erection of an infants' school, for the county council.—Mr. C. Williams, secretary, The Moot-hall, Newcastle-upon-Tyne.

Basingstoke.—February 27th.—For lining with white glazed tiles the walls and floor of bathing pond, for the corporation.—Mr. F. R. Phipps, borough surveyor.

Wandsworth.—February 27th.—For the construction of public conveniences, for the borough council.—Mr. Henry George Hills, town clerk.

Dartford.—February 27th.—For the extension of the electricity works, for the urban district council.—Mr. W. Kay, clerk.

Blackburn.—February 27th.—For extensions of the town hall, for the corporation. Mr. L. Beard, town clerk.

Somerset.—February 28th.—For the erection of a school, for the Education Committee.—Mr. C. H. Bothamley, secretary, Weston-super-Mare.

Nelson.—March 2nd.—For the erection of public baths at Bradley, for the corporation.—Mr. J. H. Boldwick, town clerk.

Oxford.—March 2nd. For the erection of a school, for the Education Committee.—County Surveyor, 9 New-road, Oxford.

Stepney.—March 4th. For structural alterations at a public library, for the borough council.—Mr. G. W. Clarke, town clerk.

Salford.—March 4th. For the erection of a secondary school, for the Education Committee. Mr. Henry Lord, 42 Dean-gate, Manchester.

Hove.—March 6th.—For building boundary walling, shedding stores, and other work, for the corporation.—Mr. H. Endacott, town clerk.

Bangkok.—March 15th.—For the erection of an electric power station, for the municipality.—Mr. F. B. Shaw, engineer-in-charge, Municipal Electric Power Station, Local Sanitary Department, Bangkok.

## Iron and Steel.

Blackpool.—February 17th.—For the supply of 500 cast-iron standards and about 1,400 lin. yds. of wrought-iron railing.—Mr. J. S. Brodie, borough engineer.

Swinton.—February 19th.—For the supply of cast-iron water mains, for the urban district council.—Chairman of the Water Committee.

Stockport.—February 20th.—For the supply of fencing and gates, for the corporation.—Borough Surveyor.

Rochdale.—February 20th.—For the supply of cast-iron pipes and castings, for the corporation.—Mr. W. H. Hickson, town clerk.

Plymouth.—February 22nd.—For the supply of cast-iron pipes, for the corporation.—Mr. F. Howarth, water engineer.

Berwick-upon-Tweed.—February 22nd.—For the supply of cast-iron pipes, for the sanitary authority.—Mr. W. Weatherhead, clerk.

## Roads.

Headington.—February 17th.—For the supply of granite and chippings, for the rural district council.—Mr. A. Walker, district surveyor, Windmill-road, New Headington, Oxon.

Eastbourne.—February 17th.—For private improvement works, for the corporation.—Mr. A. Ernest Prescott, borough engineer.

Maidstone.—February 17th. For the haulage of granite, for the rural district council.—Mr. Robert Hoar, clerk.

Beds.—February 17th.—For the supply of broken granite, slag, tar-macadam, flints, gravel, and cartage, for the county council.—Mr. W. W. Marks, clerk.

Alnwick.—February 17th—24th.—For laying materials on highways, for the rural district council.—Mr. H. W. Walton, clerk.

Spennymoor.—February 17th.—For street-making work, for the urban district council.—Mr. F. Badcock, clerk.

Eccles.—February 17th.—For the supply of road and other materials, for the corporation.—Mr. E. Parkes, town clerk.

Wisbech.—February 17th.—For the supply of road materials, for the rural district council.—Mr. A. G. Catling, highway surveyor.

Gosforth.—February 17th.—For the supply of team labour, road materials and steam rolling, for the urban district council.—Mr. R. Sheriton Holmes, clerk.

Lowestoft.—February 17th.—For the supply of about 300,000 Jarrah blocks for street paving, for the corporation.—Mr. Geo. H. Hamby, borough engineer.

Rotherham.—February 17th.—For making up part of May-street, for the corporation.—Mr. E. B. Martin, borough engineer.

Plymouth.—February 19th.—For making up certain roads, for the corporation.—Mr. James Paton, borough engineer.

Peterborough.—February 19th.—For the supply of granite, slag and gravel, for the rural district council.—Mr. J. W. Buckle, clerk.

Wimbledon.—February 19th.—For surfacing work, for the corporation.—Chairman, Highways and Sewerage Committee.

Westhampnett.—February 19th.—For the supply of road materials, for the rural district council.—Mr. W. D. Ravell, acting clerk.

Hale.—February 19th.—For making up a road, for the urban district council.—Mr. J. G. Whyatt, clerk.

Heavitree.—February 20th.—For making up certain streets, for the urban district council.—Mr. J. Walter W. Mathew, clerk.

Lymm.—February 20th. For the supply of materials, including tar-macadam, for the urban district council.—Mr. W. Mullard, clerk.

Doncaster.—February 20th. For the supply of dross and granite, for the rural district council. Mr. H. M. Marshall, Union Offices, Doncaster.

Skipton.—February 20th. For the supply of high-

way materials, for the rural district council.—Mr. A. Rodwell, surveyor.

POOLE.—February 20th. For the supply of granite, for the corporation.—Mr. S. J. Newman, borough surveyor.

GOOLE.—February 21st.—For the supply of road material, for the urban district council.—Mr. C. G. Bradley, engineer and surveyor.

MUTFORD.—February 21st.—For the supply of road material, for the rural district council.—Mr. E. S. Norton, clerk, 148 London-road, Lowestoft.

ELY.—February 21st.—For the supply of granite, gravel and tar, for the rural district council.—Mr. E. B. Claxton, clerk.

HODDESDON.—February 21st.—For street-watering purposes, for the urban district council.—Mr. W. H. Flood, surveyor.

SPALDING.—February 21st.—For the supply of granite, slag and gravel, for the rural district council. —Mr. H. Stanley Maples.

WISHAW.—February 21st.—For new or second-hand 10-ton steam roller, for the corporation.—Mr. A. S. Macvey, burgh engineer.

WOODBRIDGE.—February 21st.—For the supply of broken granite or basalt, for the urban district council.—Mr. W. Brooke, Council Offices.

SWINTON.—February 21st.—For the supply of road materials, for the urban district council.—Mr. H. Entwisle, surveyor.

FRIERN BARNET.—February 22nd.—For works of making up, for the urban district council.—Mr. Edwin Goodship, clerk.

STOCKPORT.—February 22nd.—For making up certain streets, for the corporation.—Chairman of the Highways Committee.

WIGSTON MAGNA.—February 22nd.—For the supply of broken granite, for the urban district council.—Mr. A. H. Burgess, clerk, 2 Wycliffe-street, Leicester.

THAKEHAM.—February 22nd.—For the supply of road materials, tar and cartage, for the rural district council.—Mr. Percy Ayling, clerk.

RHONDDA.—February 22nd.—For the supply of road materials, for the urban district council.—Chairman of the Roads Committee.

FLAXTON.—February 22nd.—For the supply of road materials, for the rural district council.—Mr. J. Peters, clerk, 4 New-street, York.

BACUP.—February 23rd.—For paving certain thoroughfares, for the corporation.—Mr. J. Entwisle, clerk.

CHELMSFORD.—February 23rd.—For the supply of labour, haulage, broken granite, broken Kent flints, and hire of steam rollers, for the rural district council. —Mr. F. E. H. Powell, surveyor.

BROMBOROUGH.—February 23rd.—For a 250-gallon tar-spraying plant and tar, for the urban district council.—Chairman, G.P.C., care of Mr. W. A. Watson, clerk, The Nook, Eastham.

SOUTH SHIELDS.—February 24th.—For laying *in situ* concrete for footways, for the corporation.—Mr. L. Roseveare, borough engineer and surveyor.

BILLESDEN.—February 24th.—For the supply of granite and chippings, for the rural district council. —Mr. W. E. Richardson, clerk, 18 New-street, Leicester.

BELVOIR.—February 24th.—For the supply of materials and labour, for the rural district council.—Mr. A. E. Pearson, 4 St. Peter's-hill, Grantham.

ST. ANNES-ON-SEA.—February 24th.—For the supply of road materials, for the urban district council.—Mr. T. Bradley, clerk.

SIBSEY.—February 24th. For the supply of granite and slag, for the rural district council.—The Clerk.

NELSON.—February 24th. For making up certain streets, for the corporation.—Mr. W. Shackleton, borough engineer and surveyor.

HUYTON.—February 24th. For making up a roadway for the urban district council.—Mr. G. W. Swift, clerk.

EPSOM.—February 26th.—For the supply of road materials and cartage, for the rural district council.—Mr. A. R. Cotton, clerk.

OXENDEN.—February 26th.—For the supply of road materials, for the rural district council.—Mr. C. Burgoine, clerk, Exchange Buildings, Market Harborough.

SOUTHAMPTON. February 26th. For the supply of broken granite, for the corporation. Town Clerk.

FYLDE.—February 26th.—For the supply of a steam road-roller, for the rural district council.—Mr. Fred. H. Brown, clerk.

SURBITON.—February 26th.—For the supply of Guernsey granite, concrete flags, cast-iron goods, Devonshire limestone, tar paving, granite kerbing, granite paving setts, flints, tarred macadam, and quarrite, for the urban district council.—Mr. Frederick W. Wood, clerk.

TORPOINT.—February 26th.—For making up a street, for the urban district council.—Mr. A. N. F. Goodman, clerk, 11 St. Aubyn-street, Devonport.

MAIDENHEAD.—February 27th.—For the supply of tarred macadam, for the corporation.—Mr. P. Johns, borough surveyor.

SMALLBURGH.—February 27th.—For the supply of road materials, for the rural district council.—Mr. F. Davies, clerk.

DISS.—February 27th.—For the supply of granite, for the urban district council.—Mr. Alfred Cooper, surveyor.

GATESHEAD.—February 27th.—For paving work in certain streets, for the corporation.—Mr. W. Swinburne, town clerk.

HAZEL GROVE.—February 27th.—For the supply of road materials, for the urban district council.—Mr. G. S. Doncaster, surveyor.

WINCHESTER.—February 27th.—For the supply of road materials, for the corporation.—Mr. T. Holt, town clerk.

SALISBURY.—February 27th.—For the supply of stones and gravel, for the rural district council.—Mr. W. H. Jackson, clerk.

ASHTON-UPON-MERSEY.—February 27th.—For making up certain streets, for the urban district council.—Mr. J. W. L. Foulkes, clerk.

HARWICH.—February 28th.—For the supply of granite, for the corporation.—Mr. H. Ditcham, borough surveyor.

DULVERTON.—February 28th.—For the supply of roadmen's tools, implements, and granite, for the rural district council.—Mr. J. Johnson, district surveyor.

PRESTWICH.—February 28th.—For making up several streets, for the urban district council.—Mr. Lewis A. Orford, clerk.

WEST SUSSEX.—February 28th.—For surface tarring on main roads, for the county council.—Mr. H. W. Bowen, County Offices, Horsham.

NEWBURN.—February 28th.—For the supply of road materials, for the urban district council.—Mr. G. Wilkinson, clerk.

SALE.—February 29th.—For making up certain roads, for the urban district council.—Mr. D. Hallewell, clerk.

HAMPTON.—February 29th.—For the supply of hand-broken granite, chippings, broken Kentish brown flints, Derbyshire limestone marple, tar-paving material, tar, forage, coal and brooms, for the urban district council.—Mr. Sidney H. Chambers, surveyor.

HETTON-LE-HOLE.—February 29th.—For making up a certain street, for the urban district council.—Mr. G. Young, clerk, William-street, Houghton-le-Spring.

BOGNOR.—March 1st.—For making up certain streets, for the urban district council.—Mr. O. C. Bridges, surveyor.

EAST RIDING.—March 2nd.—For the supply of stone, for the county council.—Clerk, County Council Offices, Beverley.

BELPER.—March 2nd.—For the supply of road materials, for the rural district council.—Mr. R. C. Cordon, surveyor, Duffield, near Derby.

SAWBRIDGEWORTH.—March 4th.—For work of street watering, for the urban district council.—The Clerk.

LICHFIELD.—March 4th.—For the supply of granite and slag, for the rural district council.—Mr. John Derry, clerk.

GLASGOW.—March 4th.—For paving certain streets with rock asphalte, for the corporation.—Mr. A. W. Myles, town clerk.

HUNTS.—March 4th.—For the supply of granite and slag, for the county council.—Mr. Herbert Leete, county surveyor.

CHERTSEY.—March 4th.—For the supply of highway materials, for the rural district council.—Mr. H. Beeney, surveyor, High-street, Chobham.

SLEAFORD.—March 4th.—For the supply of granite and slag, for the urban district council. The Clerk.

Lewisham.—March 5th.—For works of road making, for the borough council.—Borough Surveyor.

Bingham.—March 6th.—For the supply of team labour, for the rural district council.—Mr. R. H. Beaumont, clerk.

Horsham.—March 11th.—For the supply of granite, team labour, hire of two steam rollers, and two tar boilers, for the rural district council.—Mr. A. C. Coole, clerk.

Strood.—March 13th.—For the supply of road materials, for the rural district council.—Mr. J. E. Povey, clerk.

Nelson.—March 16th.—For the supply of granite macadam, limestone macadam, limestone paving chippings, Barns flags, Yorkshire flags, grit setts, kerb, Portland cement, and oil for the corporation.—Mr. J. H. Boldwick, town clerk.

## Sanitary.

Windsor.—February 19th.—For the construction of a main sewer, for the rural district council.—Mr. J. E. Gale, clerk, 3 Sheet-street, Windsor.

Leeds.—February 19th.—For the supply of earthenware drain pipes, sewer ironwork, galvanised dirt boxes, and cement, for the corporation.—Mr. W. T. Lancashire, city engineer.

Scunthorpe.—February 20th—March 5th.—For the construction of sewage disposal works, for the Joint Sewerage Board.—Mr. G. E. Davy, clerk.

Leyton.—February 20th.—For scavenging work, for the urban district council.—Mr. E. H. Essex, surveyor.

Castletown.—February 20th.—For the construction of new sewerage, for the Town Commissioners.—Messrs. G. Kay & Co., 22 Athol-place, Douglas, Isle of Man.

Aylesbury.—February 21st.—For the construction of surface-water sewers, manholes, &c., for the urban district council.—Mr. P. A. Wright, clerk.

Wortley.—February 21st.—For the laying of stoneware pipe sewer, &c., for the rural district council.—Mr. J. Morton, clerk.

Lanchester.—February 21st. For the construction of pipe sewer, manholes, &c., for the rural district council.—Mr. W. H. Ritson, clerk.

Croydon.—February 22nd.—For emptying cesspools, for the rural district council.—Mr. E. J. Gowen, clerk.

Hoddesdon.—February 23rd.—For providing horses and men for dust removal, for the urban district council.—Chairman, Public Health Committee.

Bromley.—February 24th.—For the removal of refuse, for the rural district council.—Mr. E. Hasehurst, clerk.

Norwich.—February 26th.—For flushing cisterns and water-closet pans, for the corporation.—Mr. A. E. Collins, city engineer.

Horbury.—February 28th.—For the construction of sewage disposal works, for the urban district council.—Mr. T. Barker, clerk.

Bath.—February 28th.—For laying sewage pumping main, for the corporation.—Mr. F. D. Wardle, town clerk.

Hackney.—February 29th.—For the removal of house refuse, for the borough council.—The Town Clerk.

East Westmorland.—March 1st.—For constructing sewer, tank and manhole, for the rural district council.—Mr. W. Hewitson, clerk.

Tadcaster.—March 1st.—For carrying out a sewerage scheme, for the rural district council.—Mr. G. A. Bromet, clerk.

Driffield.—March 2nd.—For scavenging work, for the rural district council.—Mr. H. Botterill, clerk.

Tangier.—March 4th.—For the construction of a drain, for the Special Committee of Public Works.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

Coulsdon.—March 4th.—For work of scavenging, for the rural district council.—Mr. E. J. Gowen, clerk.

Croydon.—March 5th.—For the collection and removal of refuse, for the rural district council.—Mr. E. J. Gowen, clerk.

Wallington.—March 7th.—For scavenging work, for the rural district council.—Mr. E. J. Gowen, clerk.

## Stores.

Northampton.—February 17th.—For the supply of broken granite, granite kerb, setts, artificial stone paving, stoneware pipes, Portland cement, ironmongery, tar-paving, tar-macadam, brooms, team labour, &c., for the corporation.—Mr. Herbert Hankinson, town clerk.

Belfast.—February 19th.—For the supply of stores for the tramway and electricity departments, for the corporation.—Mr. R. Meyer, town clerk.

York.—February 19th.—For the supply of Portland cement, stoneware pipes, sludge-press cloth, building and sewage lime, pitch and creosote oil, Yorkshire stone, kerbing, setts, whinstone, and limestone chippings, for the corporation.—Mr. F. W. Spurr, city engineer.

Acton.—February 20th.—For the supply of brooms, coke, coal, disinfectants, road materials, cement, stoneware pipes, ironmongery, oils, &c., for the urban district council.—Mr. W. Hodson, clerk.

Eccles.—February 20th.—For the supply of granite setts, flags, kerbs, channel stones, broken rubble, granite macadam, prepared tarred limestone, gravel, castings, pitch, gullies, stoneware pipes, &c., for the corporation.—Mr. Thomas S. Picton, borough engineer.

Shoreditch.—February 20th.—For the supply of paving repairs, asphalting, broken granite, plumbers' work, smiths' work, drain pipes, drain rods, timber, sewer ironwork, lime, cement, cartage, ballast, scavenging, paints, gas mantles, printing, &c., for the borough council.—Mr. J. A. D. Milne, town clerk.

Goole.—February 21st. For the supply of road materials stoneware pipes, Portland cement, tar-macadam, brough gravel, coal, paints, bricks, and disinfectants, for the urban district council.—Mr. C. G. Bradley, engineer and surveyor.

Belfast.—February 21st.—For the supply of earthenware sewer pipes, timber, slates, iron castings, plumber's work, shovels, scavenging brushes, cement, uniform clothing, &c., for the corporation.—Mr. R. Meyer, town clerk.

Greenwich.—February 22nd.—For the supply of road materials, tar-paving, horse hire, shoeing, oils and paints for the borough council.—Mr. Francis Robinson, town clerk.

Mansfield.—February 23rd.—For the supply of granite, slag, macadam, kerbing, channelling, Portland cement, stoneware pipes, sewer ironwork and castings, ironmongery, &c., for the corporation.—Mr. J. Harrop White, town clerk.

Merton.—February 23rd.—For the supply of horse hire, refuse removal, broken granite, flints, tar-paving, stoneware pipes, Portland cement, brooms, sewerage ironwork, &c., for the urban district council.—Mr. C. J. Mountfield, clerk.

Newton-in-Makerfield.—February 24th.—For the supply of steam tubes and fittings, main cocks, plug stop-cocks, sheet iron and steel, disinfectant powder, iron main pipes, hydrants, valves, gas meters, Portland cement, retorts, granite macadam, setts, concrete flags, kerbs, &c., for the urban district council.—Mr. C. Cole, clerk.

Bromley.—February 24th.—For the supply of timber, ironmongery, builders' materials, tools, paints, tar-paving, and steam road-rolling, for the corporation.—Mr. Fred. H. Norman, town clerk.

Finsbury.—February 26th.—For the supply of fodder, blacksmiths' work, castings, granite patent stone, cement, stoneware goods, wood-paving blocks, leather hose, brushes, brooms, tools, &c., for the borough council.—Mr. George Whitehead Preston, town clerk.

Leeds.—February 26th.—For the supply of bolts nuts, washers, brushes, chemicals, electrical sundries, iron and steel, ironmongery, springs, coal, river sand, cement, &c., for the Tramways Committee.—Mr. J. B. Hamilton, general manager.

Westminster.—February 26th.—For the supply of ballast and sand, boots, bricks, brooms, asphalte, macadam, granite, and wood carriage and footway repairs, cement, coal, disinfectants, flags, granite, granite setts, harness, gullies, sewerage works, shovels, steam road roller hire, stoneware goods, &c., for the city council.—Mr. John Hunt, town clerk.

Southend-on-Sea.—February 26th.—For the supply of stoneware pipes, flints, bricks, timber, ironmongery, paints, cement, team labour, tar paving, tar-macadam, iron castings, road materials, harness, brooms, &c., for the corporation.—Mr. H. J. Worwood, town clerk.

Winchester.—February 27th.—For the supply of broken granite, chippings, brooms, Portland cement, coal, coke, stoneware pipes, and concrete paving slabs, for the corporation.—Mr. Thomas Holt, town clerk.

HEATON NORRIS.—February 28th.—For the supply of stone, granite, and sanitary pipes, for the urban district council.—Mr. F. W. Brooke, clerk.

SOUTH SHIELDS.—March 2nd.—For the supply of road materials, cement, cast-iron work, brooms, disinfectants, sanitary pipes, tar, oils, &c., for the corporation.—Mr. Leslie Roseveare, borough engineer.

EALING.—March 4th.—For the supply of limes, pipes, cement, ironmongery, iron castings, paints, oils, granite, gravel, sand, tarred macadam, tar, wood-paving repairs, &c., for the corporation.—Mr. Geo. E. Brydges, town clerk.

GUILDFORD.—March 6th.—For the supply of broken granite, chippings, Durax cubes, cast-iron pipes, brooms, flints, disinfectants, horse hire, cartage, iron castings, oils, pitch, tar, Portland cement, &c., for the corporation.—Mr. A. D. Jenkins, town clerk.

TWICKENHAM.—March 13th.—For the supply of ballast, shingle, granite cubes, cement, coal, street gullies, drain pipes, broken granite, &c., for the urban district council.—Mr. H. Jason Saunders, clerk.

LANARK.—March 15th.—For the supply of tools and implements, fencing materials and drain pipes, for the District Committee of Middle Ward.—Mr. W. E. Whyte, district clerk, Hamilton.

## Miscellaneous.

NELSON.—February 19th.—For the supply of sulphuric acid and the purchase of surplus tar, from the corporation.—Mr. J. H. Baldwick, town clerk.

LANCHESTER.—February 17th.—For cleansing privies, &c., for the rural district council.—Mr. J. R. Lupton, surveyor.

ACTON.—February 20th.—For the supply of works and goods, for the urban district council.—Mr. W. Hodson, clerk.

BOLTON.—February 26th.—For the supply of ironmongery, brushes, timber, lighting materials, oils, overhead materials, painting materials, trolley-pole sundries, coal, &c., for the corporation.—Mr. Samuel Parker, town clerk.

WANDSWORTH.—March 2nd.—For the purchase of disused slop vans, slop carts, water carts, and other carts, for the borough council.—Mr. P. Dodd, borough engineer.

MALVERN.—Offers wanted for fire appliances, including two-horse tender, with 50-ft. escape, small manual engine and fire-escape.—Mr. W. Osborne Thorpe, surveyor and chief officer.

# TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BECKENHAM.—For making up Balgowan road and part of Belmont-road, for the urban district council.—Mr. J. A. Angell, engineer and surveyor:—

| | |
|---|---|
| Fry Brothers, Greenwich | £616 |
| Pearce & Co., Forest-hill | 558 |
| Mowlem & Co., Westminster | 467 |
| Woodhams & Son, Catford | 461 |

BOURNE.—Accepted for the supply of granite and slag, for the rural district council.—Mr. A. R. Agnew, surveyor:—

Granite.—Groby Granite Company, Leicester, 3,000 tons; Charnwood Granite Company, Loughborough, 2,000 tons; Whitwick Granite Company, Leicester, 1,000 tons.

Slag.—Holwell Iron Company, Melton Mowbray, 600 tons; Ellis and Everard, Peterborough, 500 tons.

CAMBERWELL.—For kerbing, channelling, foundations for asphalte paving, and roadwork in Dovercourt-road, Dulwich, for the borough council:—

| | |
|---|---|
| H. E. Chandler, Belvedere, Kent | £1,108 |
| W. Marsden & Co., Leyton | 1,042 |
| A. L. Etheridge, Old Kent road | 1,007 |
| A. T. Carley, Lloyd-square | 999 |
| T. Adams, Wood Green | 911 |
| T. Wood & Sons, Limited, Swanley, Kent | 891 |
| J. Mowlem & Co., Limited, Westminster | 873 |
| W. H. Wheeler & Co., Limited, Camberwell | 858 |
| W. Griffiths & Co., Limited, Bishopsgate-street | 857 |
| G. J. Anderson, Poplar | 812 |
| Fry Brothers, Greenwich | 806 |
| Woodham & Sons, Catford | 804 |
| W. Pearce, Forest-hill † | 778 |

The asphalte paving work will be carried out by the council's contractor for asphalte paving.

CIRENCESTER.—For the erection of twenty-four houses, for the urban district council.—Mr. T. Hibbert, surveyor:—

| | |
|---|---|
| — Tydenham, Swindon | £6,205 |
| Mr. Jones, Gloucester | 5,722 |
| Wall & Hook, Stroud | 5,722 |
| W. Nicholls, Gloucester | 5,420 |
| — Kilminster, Swindon | 5,050 |
| Byard & Son, Gloucester | 4,840 |
| Drew & Sons, Calne | 4,839 |
| W. F. Drew, Cirencester | 4,700 |
| — Spackman, Swindon | 4,605 |
| P. C. Cousens, Gloucester | 4,580 |
| A. J. Coulborn, Swindon | £4,500 |
| Orchard & Peer, Stroud | 4,403 |
| Saunders and Sons, Cirencester | 4,255 |
| W. Drew, Cheltenham | 4,180 |
| G. F. & E. Newcombe, Cirencester | 4,140 |
| H. Fleetwood, South Cerney * | 3,838 |
| W. G. Tanner, Cirencester | 3,834 |

CHINGFORD.—For the supply of granites, stone ballast, hoggin, and boiler clinker, for the urban district council:

| Granite. | 1½ in. s. d. | 2 in. s. d. |
|---|---|---|
| St. Keverne Stone Company (Cornish) | 10 9 | 10 9 |
| London Granite Company (Quenast) | 11 11 | 11 11 |
| Croft Granite, Brick & Concrete Company (Jersey) | 11 9 | 11 9 |
| W. Griffiths & Co. (Guernsey) | 13 1 | 13 1 |
| Brookes, Limited (Guernsey) | 12 6 | 12 6 |
| Brookes, Limited (Quenast) | 12 6 | 12 6 |
| Brookes, Limited (Welsh) | 12 0 | 12 0 |
| J. Mowlem & Co., Limited (Guernsey) | 12 6 | 12 6 |
| J. R. White & Co. (Leicestershire) | 11 2 | 11 8 |
| Dosthill Granite Quarry Company (Dosthill) | 11 9 | 12 3 |
| Croft Granite, Brick & Concrete Company (Croft) | 11 10 | 11 10 |
| Ellis & Everard (Bardon Hill) | 12 3 | 12 3 |
| Ellis & Everard (Botts Hill) | 11 6 | 11 6 |
| Mountsorrel Granite Company, Limited (Mountsorrel) | 12 3 | 11 9 |
| Charnwood Granite Company (Charnwood) | 12 3 | 12 3 |
| A. E. Marten & Co. (Warwickshire) | 10 10 | — |
| A. E. Marten & Co. (Nuneaton) | — | 11 7 |
| Cliffe Hill Granite Company (Cliffe Hill) | 11 8 | 11 11 |
| Enderby & Stoney Stanton Granite Company (Enderby) | 11 8 | 11 11 |

| Gravel. | Per ton. s. d. |
|---|---|
| F. A. Tollworthy (in the district) | 5 6 |
| W. Skipp (Chingford Station) | 4 5 |
| H. Brazier (Chingford Station) | 4 3 |
| H. Brant Jones (in the district) | 6 0 |

| Hoggin. | |
|---|---|
| F. A. Tollworthy (in the district) | 5 6 |
| W. Skipp (Chingford Station) | 4 7 |
| H. Brazier (Chingford Station) | 4 4 |
| H. Brant Jones (in the district) | 5 4 |

| Clinker. | |
|---|---|
| F. A. Tollworthy | 2 3 |
| F. Keep (Chingford Station) | 2 3 |
| H. Brant Jones | 2 6 |

| Team Labour. | Per day. s. d. |
|---|---|
| F. A. Tollworthy (for horse, cart, and man) | 8 0 |
| H. Brant Jones (for horse, cart, and man) | 7 6 |

| Steam Roller. | |
|---|---|
| G. J. Anderson | 30 0 |
| G. J. Anderson | 23 0 |
| A. Cheeseman | 24 0 |
| A. Cheeseman | 26 0 |
| T. Adams | 27 0 |
| T. Adams | 22 6 |
| T. Adams | 22 6 |
| T. Adams | 22 6 |
| T. Rowley, Junior | 25 0 |
| T. Rowley, Junior | 23 0 |
| G. Porter | 22 0 |
| Essex Steam Rolling Association | 28 0 |
| Essex Steam Rolling Association | 25 0 |

| Dust Removal. | |
|---|---|
| F. A. Tollworthy | £155 |
| H. B. Jones | 178 |

GELLYGAER.—For the carrying out of street works, for the urban district council. Mr. H. P. Jones, engineer and surveyor:—

| | |
|---|---|
| D. H. Love, Bedlinog | £414 |
| J. B. Packer, Nelson, Glam. | 410 |
| W. Frances, Pontlottyn | 320 |
| J. J. Thomas, Nelson, Glam. | 317 |
| J. Lawrence, Bargoed | 308 |
| J. Jones, Bedlinog * | 290 |

HERTS.—For the erection of three schools, for the Hertfordshire County Council.—Mr. Urban A. Smith, county surveyor:—

| Watford Higher Elementary School. | |
|---|---|
| W. E. Blake, Limited, Plymouth | £2,082 |
| J. & M. Patrick, Wandsworth | 2,004 |
| Clark Brothers, Watford | 1,893 |
| C. & J. Waterman, Watford | 1,887 |
| Chessum & Son, London | 1,870 |
| Davey & Armitage, Southend-on-Sea | 1,825 |
| Easer & Ward, Watford | 1,794 |
| Hunt & Son, High Wycombe | 1,779 |
| O. F. Dreyer, Kettering | 1,740 |
| G. Wiggs & Sons, Watford | 1,741 |

| Letchworth County Council School, Pixmore. | |
|---|---|
| B. Jewell, London | 6,446 |
| Beckley & Turpie, Letchworth | 5,958 |
| Salisbury & Son, Harpenden | 5,639 |
| Hucksley Brothers, Wellingborough (amended tender for revised scheme) | 5,585 |
| Bailey & Co., Ashwell | 5,462 |
| Palmer & Wray, Letchworth | 5,448 |
| Brown & Son, Wellingborough | 5,395 |
| Henson & Son, Wellingborough | 5,211 |
| Willmott & Son, Hitchin | 5,189 |
| Jucklin & Son, Royston | 5,058 |
| G. W. Souster, Letchworth | 5,043 |
| Redhouse & Son, Stotfold | 5,036 |
| E. Clark, Melton Mowbray | 5,030 |

| Waltham Cross County Council School. | |
|---|---|
| Clark Brothers, Watford | 6,607 |
| Fitch & Cox, Enfield | 5,689 |
| Brown & Son, Wellingborough | 5,647 |
| J. Day & Son, Bishop's Stortford | 5,638 |
| Chessum & Son, London | 5,566 |
| P. R. Faul, Waltham Abbey | 5,448 |
| Hucksley Brothers, Wellingborough | 5,375 |
| Foster & Son, Loughton | 5,324 |
| F. & F. H. Higgs, London | 5,292 |
| Henson & Son, Wellingborough | 5,178 |
| Clark & Sons, Cambridge | 5,155 |
| Lawrence & Son, London | 5,048 |
| Willmott & Son, Hitchin | 4,941 |

KETTERING.—For work of tar paving and the supply of granite, to the rural district council. Mr. W. Hedley Darby, surveyor.

Granite.—Enderby & Stoney Stanton Granite Company, Narborough.
Slag.—New Crimsley Iron & Steel Company, Kettering.
Slag.—Kettering Iron & Coal Company, Kettering.
Slag.—W. Prestwich & Sons, Kettering.
Tar Paving.—T. Painter & Sons, Desborough.

ST. PANCRAS.—Accepted for the supply of materials, &c., for the year ending March 31st, 1913, for the borough council.—Mr. W. N. Blair, borough engineer and surveyor:—

Removal of Road Sweepings and Gully Soil.

| | | | |
|---|---|---|---|
| J. Abrahams, Limited | for Wards 1 & 2 | at | £2,600 |
| Wakeley Brothers & Co., Limited | ,, 3 | ,, | 2,610 |
| G. E. Cooke | ,, 4 | ,, | 1,475 |
| J. Walker | ,, 5 | ,, | 1,760 |
| Wakeley Brothers & Co., Limited | ,, 6 | ,, | 1,691 |
| A. Pannell | ,, 7 | ,, | 1,447 |
| J. Abrahams, Limited | ,, 8 | ,, | 1,790 |

Horsing Water Vans.

| | | per day. s. d. |
|---|---|---|
| J. Walker | for Ward 1 | 9 5 |
| | * and chain horse | 6 9 |
| R. Deards | for Ward 2 | 8 9 |
| Capon & Sons | ,, 3 | 8 4 |
| R. Deards | ,, 4 | 8 9 |
| Capon & Sons | ,, 5 | 8 6 |
| R. Tozer & Sons | ,, 6 | 9 0 |
| J. Abrahams, Limited | ,, 7 | 8 5 |
| R. Tozer & Sons | ,, 8 | 9 2 |

Horsing Road Machines, &c.

C. W. French & Sons, at 9s. per day and 1s. per hour.

Cartage.

W. Weatherley.—For carting materials or rubbish, at 1s. 10d. per load of 1½ cubic yards; for carting clay or rubbish and providing shoot at 3s. 8d. do.

J. Walker.—For carting clinkers, ashes, &c., and providing shoot, 2s. 4d. per ton; for horse, water-cart, and man to distribute fluid deodorants at 9s. 9d. per day of 10 hours; for horse, water-cart and man to attend steam roller at 9s. 9d. do.

G. H. Bull.—For horse, water-cart, and man to attend steam roller, at 9s. 6d. per 8½ hours: horse, cart, and man at 9s. per day of 10 hours; horse, cart, and man, at 8s. 9d. per day of 8½ hours; horse, cart, and man, at 1s. per hour; horse, cart, and man, at 1s. per hour between 6 p.m. and 6 a.m.; horse, van, and man, at 1s. per hour, between 6 a.m. and 6 p.m.

Timber.

F. H. Norman & Co., at 7½ per cent. under schedule prices

Wood Paving Blocks.

Acme Flooring and Paving Company Limited.—For creosoted deal blocks, 3-in. by 9-in. and 5-in. deep at £7 12s. 6d. per 1,000 blocks; 3-in. by 9-in. and 4½in. deep at £6 18s. 6d. do.; 3-in. by 9-in. and 4-in. deep, at £6 4s. 6d. do.

Burt, Boulton & Haywood.—For creosoted deal blocks, 3-in. by 8-in. and 5-in. deep at £6 1s. per 1,000 blocks; 3-in. by 8-in. and 4½-in. deep at £5 9s. do.; 3-in. by 8-in. and 4-in. deep at £4 16s. 9d. do.

Millar's Karri & Jarrah Co.—Jarrah blocks, 3-in. by 9-in. and 5-in. deep at £12 15s. per 1,000 blocks; 3-in. by 9-in. and 4½-in. deep at £11 10s. 6d. do.; 3-in. by 9-in. and 4-in deep at £10s. 5s. do.; 3-in. by 9-in. and 3½in. deep at £9 do.; 3-in. by 9-in. and 3-in. deep at £7 14s. 10d. do.

Barrows, Trucks, &c.

Stephens & Carter, at 15 per cent. under schedule prices.

Paints, &c.

F. How & Co., at 25 per cent. under schedule prices.

Oils, &c.

F. How & Co., at 35 per cent. under schedule prices

Candles and other Chandlery.

Middleton Brothers, at 22½ per cent. under schedule prices.

Smiths' and Founders' Work.

F. Bird, for items 1 to 50 at 12½ per cent. under schedule prices.
F. & F. Wright for items 51 to 68 at 20 per cent. under schedule prices.

General Ironmongery.

T. Sampson, at 37½ per cent. under schedule prices.

Tools and other Hardware Goods.

J. Gibb & Co., at 42½ per cent. under schedule prices.

York Paving and Artificial Paving Slabs

Brooks & Brooks.—For 2½-in. York Paving at 5s. 7d. per square yard; 2½-in. York Paving to any given dimensions, not exceeding 30-in. by 48-in., at 5s. 8d. do.; ¾-in. York Landings at 8s. do.

Excelsior Patent Stone Company.—For 2-in. New Artificial Paving Slabs at 3s. 8d. per square yard.

Granite Kerbs, Setts, Broken Granite, &c.

J. Mowlem & Co., Limited.—For 12-in. by 8-in. Aberdeen, &c., Straight Kerb at 2s. lineal foot; 12-in. by 8-in. Aberdeen, &c., Flat Circular Kerb at 2s. 4d. do.; 6-in. by 12-in. Guernsey Straight Edged Kerb at 1s. 5d. do.; 6-in. by 12-in. Guernsey Circular Edged Kerb at 1s. 7d. do.; 12-in. by 8-in. Guernsey Flat Circular Kerb at 1s. 11d. do.; 6-in. by 12-in. Aberdeen, &c., Straight Edged Kerb at 1s. 8d. do.; 6-in. by 12-in. Aberdeen, &c., Circular Kerb at 2s. do.; 6-in. by 12-in. Norwegian Granite Straight Edged Kerb at 1s. 7d. do.; 6-in. by 12-in. Norwegian Granite Circular Edged Kerb at 1s. 11d. do.; Guernsey, &c., Angle Blocks, 24-in. radius at 8s. 6d. each; New Mountsorrel Granite Paving Setts, 3-in. by 6-in. at 32s. per ton.

Enderby and Stoney Stanton Company.—For new Enderby or Stoney Stanton Paving Setts, 3-in. by 6-in. at 30s. per ton.

J. Mowlem & Co., Limited.—For Guernsey or other approved Paving Setts, 5-in. by 7-in. at 23s. 6d. per ton; 3-in. by 6-in. Paving Setts at 32s. do.; Broken Blue Guernsey Granite at 15s. 5d. cubic yard; Broken Bardon Hill Granite at 15s. 5d. do.; Broken Mountsorrel Granite at 15s. 5d. do.; Broken Markfield Granite at 16s. 5d. do.; Broken Granite, 1-in. ring, at 13s. 6d. do.; Guernsey Granite Siftings, ¼-in. mesh, at 10s. 5d. do.

Enderby and Stoney Stanton Company.—For Leicestershire Granite Siftings, ¼-in. mesh, at 10s. 3d. cubic yard; Leicester Granite Siftings, screened, at 11s. do.

W. Griffiths & Co., Limited.—For Kentish Ragstone at 11s. 4d. cubic yard.

Gravel and other Roadway Materials.

J. & B. Martin.—For Loam or Hoggin at 6s. 7d. cubic yard. Clean Rough Gravel at 6s. 2d. do.

J. Mowlem & Co., Limited.—For River Ballast at 6s. 3d. cubic yard.

W. Cory & Sons.—For River Sand at 7s. 9d. cubic yard.

J. Arnold.—For Pit Sand at 8s. 11d. cubic yard. Pit Sand specially screened and washed at 6s. 10d. do.

J. Mowlem & Co., Limited.—For Fine River Ballast, ¾-in. mesh, at 6s. 10d. cubic yard. Fine River Ballast, ¼-in. mesh, at 7s. 5d. do.

J. & B. Martin.—For Pit Flints at 8s. 2d. cubic yard.

W. Boyer & Sons.—For Clean Hard Silted Shingle, ¾-in. mesh, at 7s. 5d. cubic yard.

Lime, Cement, Bricks, Pipes, &c.

Young & Sons.—For Grey Stone Lime (lump) at 21s. 11d. per ton: Stourbridge Fireclay aground at 18s. 3d. do.

Lawford & Sons.—For Portland Cement at 28s. 6d. per ton.

J. Knowles & Co.—For Blue Bricks (pressed) at £3 8s. per 1,000; Blue Bricks (unpressed) at £2 14s. do., Blue Bricks (pressed and radiated at £4 1s. 3d. do.

Lime, Cement, Bricks, Pipes, &c.—*continued.*

Leeds Fireclay Company.—For Best Stourbridge Firebricks at £3 9s. 9d. per 1,000 (less 2½ per cent).

Bagworth Brick Company. For Bagworth Wire Cuts, at any railway station in the borough at £1 9s. per 1,000.

J. Knowles & Co.—For Pipes, Bends, &c. at 60 per cent up to 9 in., and 52 per cent up to 12 in., under standard price list; Closet Pans and Traps, L.C.C. pattern, at 3s. 4d. each; "Winser" Interceptors, 6-in. diameter at 4s. 5d. each, 4 in. diameter at 3s. 2½d. each; Stoneware Yard Gullies, 6 in. square, 4 in. diameter at 1s. 9½d. each; Stoneware Yard Gullies, back or side inlets, at 2s. 2½d. each; Stoneware Yard Gullies, back and side inlets or two side inlets, at 2s. 7½d. each.

All quotations of J. Knowles & Co. for pipes, &c., are less 2½ per cent.

Bass Brooms, &c.

Association for the Welfare of the Blind. For Bass Broom Heads at 14s. 6d. per dozen; Small Bass Broom Heads at 9s. 6d. do.

G. Tyrie.—For Bass Horse Brush Stocks at £1 16s. 9d. per set of six; Refilling Brush Stocks at £1 2s. 9d. do.

Association for the Welfare of the Blind.—For Bass Urinal Brushes at 6s. 9d. per dozen.

Tarpaulins, Hemp, and Rubber Goods.

Adam & Co., Limited. For Tarpaulin Sheets, D.D. Canvas, at 1s. 4d. per yard super.

Gourock Ropework Company.—For Tarpaulin Sheets, Cotton Duck (Birkmyre Cloth), at 1s. 10½d. per yard super.; Best Hemp Rope at 33s. per cwt.; Best Hemp Rope (tarred) at 30s. per cwt.

G. MacLellan & Co.—For Grey Rubber in Strips, 3 in. by ⅛ in., at 1s. 1d. per pound; Grey Rubber in Washers at 1s. 1d. do.; Grey Rubber 3-ply Hose, ¾ in. diameter, at 5d. per foot; Grey Rubber, 1 in. diameter, at 6d. do.; Grey Rubber, 1¼ in. diameter at 8½d. do.; Grey Rubber, 2 in. diameter, at 11d. do.; Grey Rubber, 2½ in. diameter, at 1s. 1d. do.; Grey Rubber Armoured Hose, ¾ in. diameter, 3-ply, at 6d. do.

Pitch, Tar, Oil, Carbolic Powder, Coke, &c.

J. Smart & Son.—For Soft Coal Pitch in Block at £4 8s. 3d. per ton; Refined Coal Tar at 3½d. per gallon; Creosote or Green Oil at 3½d. do.

— Adcocks.—For Soluble Creosote or Disinfectant Fluid at 7½d. per gallon; Disinfectant Pine Fluid at 10d. do.; Disinfectant Pine Blocks in tins at 19s. 9d. per cwt.; Carbolic Powder at 2s. 10½d. do.

G. J. Cockerell & Co.—For Broken Coke screened) at 1s. 1d. per cwt.: Small Coke (screened and washed) at 1s. 4d. do.

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WANGFORD (Suffolk).—The rural council have accepted the tender of the London Granite Company for 660 tons of Quequast granite, for delivery at Beccles, Brampton, and Homersfield; 860 tons of broken and fine gravel, by Mr. Ayton, of Wymondham, for delivery at Beccles, Bungay, Ellingham, and Homersfield; and 60 tons broken gravel by Mr. E. J. Edwards, of Norwich, at North Cove, and 35 tons of marl at Beccles and Homersfield.

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WHITEHAVEN.—Accepted for excavation and road forming, for the rural district council.—Mr. E. B. Croasdell, clerk:—

H. J. Dolloughan, Cleator Moor, £170.

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WILLENHALL.—For the construction of sewage disposal works, for the urban district council. Mr. T. E. Fellows, surveyor —

| | |
|---|---|
| P. D. Hayes & Sons, Stockport | £15,771 |
| Pethick Brothers, Limited, Westminster | 14,700 |
| Pethick, Dix & Co., Westminster | 13,855 |
| Airds, Limited, Westminster | 13,676 |
| G. Law, Kidderminster | 13,257 |
| J. Wilson & Sons, Birmingham | 13,099 |
| G. Shellabear & Son, Plymouth | 13,000 |
| T. Vale & Sons, Limited, Stourport | 12,900 |
| Currall, Lewis & Martin, Birmingham | 12,800 |
| Firth & Co., Derby | 12,692 |
| A. Hill & Co., Kidderminster | 12,584 |
| W. Cunliffe & Sons, Limited, Birmingham | 12,481 |
| G. Bell & Sons, Manchester | 12,318 |
| G. Holloway, Wolverhampton | 12,150 |
| H. Holloway, Wolverhampton | 11,982 |
| A. H. Price & Co., Nottingham | 11,880 |
| W. Thompson & Co., Tipton | 11,965 |
| Martin & Element, Smethwick | 11,748 |
| B. Firth, Harrogate | 11,641 |
| T. J. Mason, Stourbridge | 11,435 |
| M. A. Boswell, Wolverhampton | 11,000 |
| Childs & Withers, Worcester | 10,732 |

Engineer's estimate, £11,800.

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WIMBLEDON.—Accepted for the supply of two motor fire engines, for the corporation.—Mr. A. S. Sheldon, town clerk:—

Dennis Brothers, Guildford, £2 140.

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## MEETINGS.

*Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.*

FEBRUARY.

16.—Institution of Civil Engineers: Vernon-Harcourt Lecture to Students on "Works for the Prevention of Coast Erosion." By W. T. Douglas, M.Inst.C.E. 8 p.m.

16.—Edinburgh Architectural Association: Associates' Annual Dinner. 7.30 p.m.

16.—Institution of Mechanical Engineers: Annual General Meeting; Discussion on Annual Report and Note by President on Proposal for Examinations. 8 p.m.

16.—Royal Institution: Sir John H. A. Macdonald on "The Road: Past, Present, and Future." 9 p.m.

17. Institution of Municipal and County Engineers: Northern District Meeting at Newcastle-on-Tyne.

17.—Junior Institution of Engineers: Annual Dinner, Hotel Cecil. 7 p.m.

21.—Institution of Civil Engineers: Students' Visit to G.W.R. Reinforced Concrete Warehouse, near Battersea Park Station.

23.—Junior Institution of Engineers: Mr. G. L. Morty on "Breakdown Experiences."

24.—Institution of Municipal Engineers: Council Meeting. 3 p.m.

24.—Institution of Municipal Engineers: General Meeting in London: discussion on "Superannuation and Security of Tenure—the National Association of Local Government Officers and its Bill."

26. Institute of Sanitary Engineers. Prof. Henry Adams, M.Inst.C.E., M.I.M.E., on "Sanitary Building Construction." Caxton Hall, Westminster. 8 p.m.

MARCH.

6. Institution of Municipal Engineers: Discussion on "Methods of Inviting Public Tenders." Institution Offices, 7 p.m.

11.—Institute of Sanitary Engineers: Mr. Percival M. Frazer, A.R.I.B.A. on "The Modern Home." Caxton Hall, Westminster, 8 p.m.

19.—Institution of Municipal Engineers: Discussion on "The Size and Design of Street Gullies, Grates and Weirs."

## APPOINTMENTS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No.* 1359 *Holborn), subject to later confirmation by letter.*

AGENTS required in unrepresented districts for the Imperial Accident Insurance Co., Ltd. Est. 1878. Horses Insured against Death from Accident or Disease, Mares for Foaling and Loss of Foals; Farmers' Liability for Accidents to Labourers, Servants, and Workmen's Compensation. Claims paid, £500,000. Address Agency Manager, 17 Pall Mall East, London, S.W.

A LONDON Firm require Agents for the Sale of their well-known Material for Road Binding, on commission only. Applications invited from those able to influence business with Municipal Authorities, &c., in the following districts: Lancs, Newcastle, Glasgow and Edinburgh, Birmingham, South Wales, Exeter, Southampton or Portsmouth, Eastern Counties and Kent.—Apply Box 1,130, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

ENGINEERING ASSISTANT required for three months. Must be a good draughtsman, surveyor, expert leveller, and experienced in drainage work; age not over 30; salary £2 per week, to include the provision of a bicycle.—Apply in handwriting, giving references, and particulars of experience and age, to H. Beeney, Surveyor, Chertsey Rural District Council, Surveyor's Office, High-street, Chobham, near Woking.

ENGINEERING PUPIL.—The Borough Engineer of Bridlington, Mr. E. R. Matthews, A.M.I.C.E., F.G.S., has a vacancy in his office for a Pupil (premium required).—For particulars apply to him, Borough Engineer's Office, Town Hall, Bridlington.

## EX-PUPILS AND ASSISTANTS.

ASSISTANT (21) disengaged, 3 years' articles and 1¼ years Assistant to Borough Engineer, A.M.I.C.E., good Surveyor, Leveller, Draughtsman; excellent testimonials; Territorial (Royal Engineers); salary 25s. week.—Box 1,129, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

*(Continued on p.* xxii.*)*

## TENDERS WANTED.

### HUNTS COUNTY COUNCIL.
MAIN ROADS, 1912-1913.

Tenders are required for the Supply of Granite and Slag for the year ending March 31st, 1913.

Form of Tender and Conditions of Contract may be obtained on application to the undersigned, to whom Tenders are to be delivered not later than Monday, the 4th of March, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

HERBERT LEETE,
County Surveyor.

36 High-street,
Huntingdon.
February 12, 1912.

### METROPOLITAN BOROUGH OF WANDSWORTH.
DISUSED ROLLING STOCK.

Tenders are invited for the purchase of 21 Slop Vans, 5 Slop Carts, 10 Water Carts, and 4 General Purposes Carts.

The vehicles can be seen at Clapham Depot, 374A Wandsworth-road, Clapham, any day between the hours of 9 a.m. and 4 p.m. (Saturdays 9 a.m. to 1 p.m.).

Form of Tender can be obtained on application here any time during office hours.

Tenders, on the prescribed forms, to be sent to the undersigned not later than Saturday, March 2nd next.

The Council does not bind itself to accept the highest or any Tender.

P. DODD, M.INST.C.E.,
Borough Engineer.

215 Balham High-road,
London, S.W.
February 13, 1912

### TWICKENHAM URBAN DISTRICT COUNCIL.
CONTRACTS.

The above Council hereby invite Tenders for the under-mentioned Goods or Materials for a period of One, Two or Three Years, from the 1st April next:—

(1) Ballast, Shingle, Flints and Gravel.
(2) Granite Cubes and Setts.
(3) Portland Cement.
(4) Coal and Coke.
(5) Fodder and Forage.
(6) Oil and Colourman's Goods.
(7) Iron Castings.
(8) Street Gullies and Drain Pipes.
(9) Broken Granite.

Forms of Tender and Specification for the whole of the above may be obtained on application to Mr. Fred. W. Pearce, F.S.I., Surveyor to the Council, Town Hall, Twickenham.

Sealed Tenders, endorsed "Tender for ——," are to be delivered to me by hand, or by registered post, on or before noon of Wednesday, the 13th day of March, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
H. JASON SAUNDERS,
Clerk to the Council.

Town Hall,
Twickenham.
February 14, 1912.

### LICHFIELD RURAL DISTRICT COUNCIL.
TENDERS FOR GRANITE AND SLAG.

The above Council invite Tenders for the Supply and Delivery of 2½-in. Granite and Chippings and Slag, at various Stations and Wharves during the ensuing twelve months, to be sent at such times and in such quantities as the Surveyor shall require and direct.

Sealed Tenders, endorsed "Tender for Granite," must be sent to the undersigned on or before Monday, the 4th day of March, 1912, and samples must be delivered on or before that date (free of charge), at the Surveyor's Office, Union Workhouse, Lichfield.

The Council do not bind themselves to accept the lowest or any Tender.

Further particulars and Forms of Tender may be obtained upon application to Mr. C. O. Rawstron, District Surveyor, Lichfield.

(By order)
JOHN DERRY,
Clerk to the said Council.

Rural District Council Offices, Lichfield.
February 9, 1912.

### THE URBAN DISTRICT COUNCIL OF SURBITON.

The Council invite Tenders for the Supply of the following Materials for the year ending 31st March, 1913:—

| | |
|---|---|
| Broken Guernsey and Penlee Granite | (Form 2). |
| Concrete Flags | (Form 3). |
| Cast-iron Goods | (Form 7). |
| Derbyshire Limestone Tar-paving Materials | (Form 11). |
| Granite Kerbing | (Form 13). |
| Granite Paving Setts | (Form 14). |
| Flints. | (Form 15). |
| Tarred Macadam | (Form 18). |
| Quarrite. | |

Tenders must be made out on the Forms provided (which may be obtained from the Surveyor to the Council) enclosed in the envelopes which are also supplied, and delivered at these Offices not later than 10 a.m. on Monday, February 26th, 1912.

No Tender will be entertained unless the above conditions are strictly adhered to, and unless samples of the Materials proposed to be supplied are delivered, carriage paid, to the Council's Highway Depot, Alpha-road, Surbiton, by the above-mentioned date.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
FREDERICK W. WOOD,
Clerk to the Council.

Council Offices,
Ewell-road,
Surbiton.
February 9, 1912.

## BOROUGH OF EALING.

The Town Council of the Borough of Ealing hereby invites Tenders for the Supply of (1) Limes, Pipes, &c.; (2) Cement; (3) Ironmongery; (4) Iron Castings, &c.; (5) Paints, Oils, &c.; (6) Granite; (7) Gravel, Hoggin and Sand; (8) Tarred Macadam; (9) Tar Paving; (10) Disinfectants; (11) Refined Tar. (12) Wood-paving Repairs; (13) Slab-laying, &c.; (14) Stationery; (15) Timber; (16) Uniforms; (17) Repairs to Harness, &c.

Printed Forms of Tender, Conditions of Contract and full particulars may be obtained on application to the Borough Surveyor, Mr. Charles Jones, M.INST.C.E., at his Office, Town Hall, Ealing, W., on or after Saturday, 17th February, 1912.

Tenders (in the envelopes provided) to be delivered at the office of the undersigned not later than 12 noon on Monday, the 4th day of March, 1912.

The Council does not bind itself to accept the lowest or any Tender, and any person whose Tender may be accepted must enter into a proper contract, with, if required, two sureties to be approved by the Council.

(By order)
GEO. E. BRYDGES,
Town Clerk.

Town Clerk's Office,
Town Hall, Ealing, W.
February 10, 1912.

## COUNTY BOROUGH OF SOUTH SHIELDS.
### TENDERS FOR MATERIALS.

The Corporation invite Tenders for the Supply of the following Materials, required for the year ending 31st March, 1913—*viz.*: Northumberland Whinstone, Fifeshire Whinstone, Aberdeen and Norwegian Granite, Slag, Granite Chippings, Caithness Flags, Portland Cement, Cement Concrete Flags, Cast Ironwork, Shovels, Scavenger Brooms and Machine Brooms, Coal, Coke, Disinfectants, Leather Hose, Sewer Boots, Jackets, &c., Sanitary Pipes, Paints, Paint Oils, Glass, Timber, Iron, Horseshoe Nails, Cart Axles, Springs, &c., Tar, Pitch, Oils, and General Stores.

Specifications and Forms of Tender may be obtained on application to the undersigned.

Tenders, endorsed "Tender for Materials," to be delivered at the Borough Engineer's Office, Municipal Buildings, South Shields, not later than 12 noon on Saturday, 2nd March, 1912.

LESLIE ROSEVEARE, A.M.I.C.E.,
Borough Engineer.

Municipal Buildings,
South Shields.

## DULVERTON RURAL DISTRICT COUNCIL
### MAIN ROADS.

The above Council invite Tenders for the Supply of Granite (block and broken) for the year ending March 31st, 1913, delivered at Dulverton Station.

Specification and Tender Forms may be obtained from the District Surveyor on receipt of an addressed envelope.

Tenders, endorsed "Tenders for Granite," to be sent to the Clerk to the above Council (R. Sowton Barrow, Esq.) not later than February 28th, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

J. JOHNSON,
District Surveyor.

Surveyor's Office,
Dulverton.
February 6, 1912.

## DULVERTON RURAL DISTRICT COUNCIL.
### ROADMEN'S TOOLS AND IMPLEMENTS.

The above Council invite Tenders for the Supply of Roadmen's Tools and Implements, delivered at Dulverton, for the year ending March 31st, 1913.

Tender Forms may be obtained from the District Surveyor on receipt of an addressed envelope.

Tenders, endorsed "Roadmen's Tools and Implements," to be sent to the Clerk to the above Council (R. Sowton Barrow, Esq.) not later than February 28th, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

J. JOHNSON,
District Surveyor.

Surveyor's Office,
Dulverton.
February 6, 1912.

## HORSHAM RURAL DISTRICT COUNCIL.

The above Council invite Tenders for the following:

1. About 4,500 cubic yards of Granite or other approved Stone, and about 4,000 cubic yards of Flints.
2. Team Labour for Haulage of Materials at per cubic yard.
3. Hire of Two Steam Rollers for about 60 days, commencing October next.
4. Two Tar Boilers of 80-gallon capacity, fitted with arrangements for drawing either by horse or hand power. Full specification and particulars, with sketch, to be given.

Forms of Tender may be obtained on receipt of stamped addressed envelope of the Surveyor, Mr. W. Dengate, 58 Park Street, Horsham.

The Council do not bind themselves to accept lowest or any Tender. Tenders must reach me on or before noon, March the 11th, 1912, marked "Granite, Flints, &c.," as the case may be.

(By order of the Council)
A. C. COOLE,
Clerk.

9 Carfax, Horsham.
February 13, 1912.

## WEST SUSSEX COUNTY COUNCIL.

Tenders are invited for Surface-Tarring on Main Roads during the ensuing season.

Specification and Forms of Tender may be obtained on application to the County Surveyor, County Offices, Horsham, Sussex.

Tenders, endorsed "Tar-Treatment," to be delivered to the undersigned not later than Wednesday, 28th February, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

H. W. BOWEN, ASSOC.M.INST.C.E.
County Offices,
23 North-street,
Horsham.
February 16, 1912.


WRITE: ASTON MANOR, BIRMINGHAM.
WIRE: "YATONIAN, BIRMINGHAM."
'PHONE: EAST 400, 401 and 402,
Private Branch Exchange.

JOHN YATES
& CO., LTD.

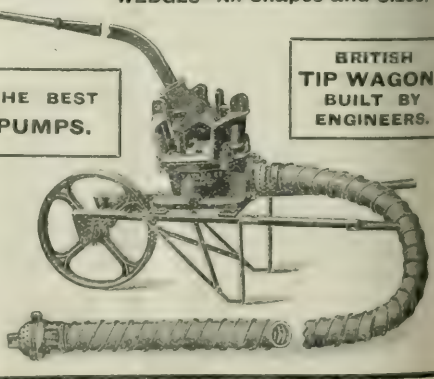
ALL KINDS OF
HAMMERS, SHOVELS, PICKS and BARROWS.

CORPORATION TOOL MAKERS SINCE 1804.

WEDGES—All Shapes and Sizes.

THE BEST PUMPS.

BRITISH TIP WAGONS BUILT BY ENGINEERS.



# The Surveyor

And Municipal and County Engineer.

Vol. XLI. FEBRUARY 23, 1912. No. 1,049.

## Minutes of Proceedings.

**Sir John Macdonald's Discourse on Roads: A Popular Lecture.**

The audience in the lecture hall of the Royal Institution last Friday were fortunate in being able to avail themselves of an opportunity of surrendering themselves to the charm with which Sir John Macdonald's vigorous and alert personality invested his graphic and suggestive sketch of Roads of the Past. Sir John is not one of those who have suddenly discovered the importance of roads; on the contrary, he has for many years been well to the fore in highway matters and a consistent exponent of the advantages of road improvement and mechanical traction, and his views on the subject of highway administration deserve, and receive, the respectful attention of all who are concerned with road problems of the day. While much of the subject-matter of the first part of his lecture is familiar to most of our readers, it was exceedingly well-chosen for the purpose of an address to an educated public audience, and admirably presented. The engineer who reads the first part of the address—the whole of which is reported in our present issue—will not, however, fail to see a glimpse of what is to come in the second part, in which, dealing with roads of the present, the lecturer exhibited that sternly critical attitude towards the road-making of the end of last century which largely, we regret to say, discounts the value of his view of practical road-making and road maintenance. He dwells upon the difficulties and drawbacks of Telford's and Macadam's systems almost to the exclusion of any consideration of their advantages, and without, so it seems to ourselves, any grasp at all of the fact that valuable principles embodied in these systems are basic principles which will never die. Exactly the same criticism may be made of his quite unfair and one-sided account of the work of the steam-roller. He describes bad practice, and holds it up as an example of failure of the methods which, in actual fact, produced roads which were very nearly all that could be desired, and are such even to-day. His account of what happens to an ordinary broken-stone crust in various kinds of weather does not do justice to a method which, except under the most severe conditions of main-road traffic, was a very successful compromise, and largely balanced weather effects and traffic effects. The cures for waviness produced by improper rolling are known to engineers, and it is quite needless to speak of this condition as though it were an evil to be ascribed to the method.

Coming to the third head, Roads of the Future, Sir John briefly sketched some of the most important of recent administrative changes. As regards the improvement of roads he omitted, however, to point out that in the view of the Road Board, of which he is a conspicuous and specially well-informed member, the word "improvement" means a change from fair to good, or from good to better. The view of the rest of the English-speaking world, including ourselves, and, we believe, the framers of the Act under which the Board works, is that the word "improvement" covers also changes from "bad" to "fair," and it is much to be regretted that this view is not shared by the Board, since their, as we think, unauthorised attitude presses very hardly on some of our rural districts. It is impossible for qualified engineers to attach much importance to opinions as to roads of the future when these opinions are introduced by the statement that to break into holes was "the fate of all the roads of the past." Through the whole range of roads, from the splendid main roads of some of the counties in the closing years of last century down to the humblest class of local lanes, there have been thousands of miles of roads which wore out with reasonable smoothness when tended with ordinary care, and as an introduction to a strenuous advocacy of bituminous-bound roads the remark is particularly unfortunate, since the tendency to wear into holes has been conspicuously and painfully demonstrated in some very recent examples of crusts of this kind. It is, of course, difficult for a layman to grasp the fact that each new method brings its own difficulties—such a difficulty, for instance, as that brought about by the fact that smoothness in a road-surface, if carried beyond a certain point, greatly increases the labour of the horse.

Sir John dismisses the subject of foundations by saying that Macadam did not consider Telford's method to be necessary, and he "proved to be right." All we need say is that the Scotsman, though one of our greatest benefactors in the matter of road improvement, was, like Sir John Macdonald, not a civil engineer. Telford was—a very good engineer. Our own technically qualified readers will, without our help, recognise the limited application in each case of some of the arguments which the lecturer put forward in his lecture, both as regards the physical properties which Sir John regards as necessarily admirable in a road crust, and with reference to the benefits which will follow the putting down of crusts of the nature of tar-macadam. That the average efficiency of such crusts will be increased in the near future cannot be doubted, but at the present time, we believe, the tendency is to put too much faith in the experimenter and the contractor, and not enough faith in the road surveyors, many of whom—and we think Sir John Macdonald might have made the observation—are qualified and competent men, not only those in charge of country

roads, but also those in charge of municipalities and districts. Our criticisms of the lecture as a technical guide must not be read as involving the slightest reflection upon the lecturer's high administrative gifts, and we sincerely hope that Sir John will for many years to come be able to employ his great capacities and virile energies as a deeply respected member of the Road Board.

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**Roadside Ditches and Roadside Grids.**

Following the annual meeting of the American Society of Civil Engineers, last January, a conference was held for the purpose of giving an opportunity for a topical discussion on road construction and maintenance. From a brief report of this meeting, which appears in *Engineering News*, it is clear that the administrative changes in highway matters which have taken place recently in the United States have been accompanied by an important advance in highway engineering. We do not find, in the present instance, any point or any expression of opinion of special interest to British engineers; but since, had we done so, we should have drawn attention to it, it is only fair that we should express our disagreement with two recommendations made by Mr. H. P. Willis, a division engineer of the New York State Highway Department—our disagreement, that is, with these recommendations, regarded as of wide or general application, and not as confined to special situations in New York State, where they may possibly be of some value. They are, (1) lining side ditches with puddled clay, and (2) a vertical ditch, along the edge of the stone, filled with vertical plates of tile or asphaltic clay. To give adequate support to the edge of the crust, and resistance to breakage under chance wheel loads, such a ditch would have to be provided with very strong plates, the cost of which would probably far exceed the cost of unjointed pipes laid in a trench of dry, broken stone; and, if we understand aright what is intended, the maintenance of effective drainage along the ditch between these plates would be a very troublesome matter. As regards its application to city streets, the idea has considerable merit, but would probably cost too much if carried out effectively and kept in good working order.

Reverting to the first recommendation, as to the puddling of side ditches, it is, of course, ordinary practice to have a puddled ditch when its purpose is to carry water away and not to intercept percolation. A puddled ditch, for instance, is suitable as a catchwater-drain when the water enters from one side, but should not be allowed to percolate from the other side of the ditch towards the road. Generally, however, the side ditch proper is not puddled, except in so far as it puddles itself, and this puddle may have to be removed or stirred loose from time to time. Even a catchwater-drain may be left unpuddled on one side, if that be feasible, when it is intended to intercept percolation water as well as surface water. Usually it would be left unpuddled in practice, since the percolation of entry would be through a larger surface than the percolation towards the road. There would not necessarily be any percolation towards the road, since the bottom and the sides, for some way up, would puddle themselves. Moreover, percolation into the ditch tends to remove puddle on the up-hill side, while percolation out of it towards the road tends to puddle the down-hill side. And so on. It is all so simple when you see it: the danger is lest single ideas should dominate situations of some complication and even of considerable subtlety.

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**Town Planning: The Manchester Scheme.**

An interesting lecture on town planning was given on Monday last at the Manchester Municipal School of Technology by Mr. Patrick Abercrombie, of the Department of Civic Design of Liverpool University, in which instructive figures were quoted by the lecturer on what has been already done under the provisions of Mr. John Burns's Act. Up to the present time ten schemes have been authorised by the Local Government Board. These include 12,580 acres, and allowing an average of twelve houses to the acre—in some cases, taking into consideration the provision made for open spaces, the number would be twenty-five—provide sites for 150,960 houses; and taking the average number of inhabitants per house at 4·5, they will house a population of about 680,000. Eleven other authorities who have not yet obtained sanction for their schemes have issued notices under the Act, and if we assume that these schemes represent a similar area as the ten which have been already approved, it means that the twenty-one schemes will provide for the housing of a population of 1,250,000 under conditions as healthy and as pleasant as modern hygiene and a proper care for the preservation of objects of natural beauty in the surroundings can secure. In addition there are some fifty schemes, more or less, in the air, so that the appearance of the fruits of the Housing and Town Planning Act are only a question of time.

The *Manchester Guardian* supplements its report of Mr. Abercrombie's lecture with a plan of the proposed town planning scheme for Manchester, and we gather that the city authorities have, wisely, as we think, adopted the policy of first of all settling matters with the landowners concerned before approaching the Local Government Board. It is on the outskirts of the city that the planner's work will be done, so that when the city grows it will embrace land ready to receive its people and its traffic. "We now know," says our contemporary, "that when the city spreads north and east it will not straggle haphazard along streets that lead nowhere and highways that are not thoroughfares. Again, the use as permanent playing fields of the low-lying land by the Mersey at Northenden, which is too damp for building on with safety, and the provisions of a park well out on Stockport-road are sensible conceptions. The nearer of the city's southern outskirts have fresh air secured to them in Platt Fields and Birch Park, but already there are populous districts beyond these, and it is for them that our town-planners have wisely taken thought. Manchester is assured of every help from the Local Government Board, which has long been expecting her schemes, and as she has, it seems, got the goodwill of her landowners, no time need be lost in completing and pressing forward the plans." On every hand, among small equally with large municipal authorities, there is evidence of the quickening of a new conscience in housing and sanitation, thanks to the influence of the Housing and Town Planning Act, which is destined to effect a revolution in our social system compared to which many of the great measures of high politics must pale their ineffectual fires.

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**The Visit to Paris.**

Arrangements are now being completed for the visit of the Institution of Municipal and County Engineers to Paris in May next, and the full programme, we are informed by the secretary, Mr Thomas Cole, will shortly be issued to those intimating their intention of joining the party. It is important that all who desire to participate in the visit, and who have not yet notified Mr. Cole, will make known their intentions at the earliest possible moment. Messrs. Thomas Cook & Son, who have the arrangements for the excursion in hand, state that accommodation is already becoming very limited, and it is therefore essential that rooms should be secured without delay. Those who desire accommodation to be reserved for them should advise Messrs. Cook & Son as to the hotel at which they wish to stay, and in doing so forward a deposit of £1, addressed to the firm's Conducted Tours

Department, Ludgate-circus, E.C., the balance being payable prior to the date of departure.

As already stated in these columns, it is proposed to leave London on Thursday, May 23rd, and the proceedings will open at the Hotel de Ville on the following day with a reception by the president and members of the Paris Municipal Council. There will be a meeting at the rooms of the Société des Ingénieurs Civils, where it is intended to read a short paper descriptive of the works to be visited. These include the reservoirs at Montmartre and Montsouris, waterworks at Ivry and St. Maeur, of which ozonisation plant is a feature, destructor works and workshops, in addition to which inspections will be made of the city sewers and the irrigation farm at Gennevilliers. Altogether the programme is a most attractive one, and it is to be hoped that the number of members taking part will be such as to ensure the complete success of the visit.

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**Sanatoria.**

The provisions of the Insurance Act as to the establishment of sanatoria for the treatment of patients suffering from tuberculosis have aroused great public interest in the possibilities of these institutions. Scientific opinion is now generally agreed that tuberculosis in its early stages is amenable to treatment, and the success of such treatment depends to a very great extent upon the proper construction of the buildings in which it is carried on. The subject of "Hospitals and Sanatoria and their Relation to Tuberculosis," which was discussed at a recent meeting of the Institute of Sanitary Engineers, will therefore be seen to be one of great and urgent public importance. The discussion was founded upon two papers, read respectively by Dr. F. C. Davies, medical officer to the Battersea Tuberculosis Dispensary, and Mr. Alban Scott, M.S.A. The former dealt more particularly with the medical aspect of the question, while Mr. Scott was concerned with the practical details of construction. We have pleasure in publishing some extracts from Mr. Scott's paper, which contained much that will be of interest to our readers. Mr. Scott dealt very fully with the varied considerations which arise in the selection of a site, and drew special attention in this connection to the importance of studying the line of saturation and its varying levels. The expulsion of ground air by rising subsoil water has a most deleterious effect on people who are in the weak state of health which is common to the inmates of a sanatorium, and such an institution should therefore be built on ground which is quickly and naturally drained during heavy rains. Other matters referred to, in addition to the usual details of hospital construction, were lighting, ventilation, heating and fire prevention. We specially commend Mr. Scott's paper to the attention of those of our readers who are practically interested in hospital design.

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**A Signal Honour.**

Municipal engineers throughout the country will join in congratulations to Mr. J. A. Brodie, M.INST.C.E., the city engineer of Liverpool, on the signal distinction that has been conferred upon him by the request that he should assist the Government of India in remodelling and laying out the city of Delhi, the new capital. That the honour is well deserved will be admitted by all who have any knowledge of Mr. Brodie's brilliant career. He is a past-president of the Institution of Municipal and County Engineers and of the Liverpool Engineering Society, a member of the Institutions of Civil and Mechanical Engineers, a Whitworth Scholar, and holds the degree of Master of Engineering of Liverpool University. The possession of these qualifications alone marks their holder as being no ordinary man, but taken in conjunction with Mr. Brodie's practical achievements in various parts of the wide field of engineering, and particularly his knowledge of and enthusiasm for the science of town planning, it will be seen that the Government of India have made a very wise selection of an expert adviser for the important work which they have in hand.

We may perhaps be pardoned some special gratification in the knowledge that a municipal engineer has been chosen for this work, as we have always maintained that no one is more fitted for the design and execution of a town planning scheme than the municipal engineer, who has a wide experience of the mistakes of the past, and whose whole training and experience have been directed towards the acquisition of the knowledge that may be most usefully applied in the maintenance of health conditions in city life.

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**The Civil Engineers' Appointments Board.**

The establishment of an Appointments Board with the full approval of the Council of the Institution of Civil Engineers is a matter of very considerable general importance, more particularly, perhaps, to those younger members of the profession who are seeking appointments. The new Board are prepared to receive applications for engineering employment, as well as applications from employers for engineering assistants. The course to be pursued by those who desire to get into touch with the Board is set out in a letter which will be found in another column. The idea which underlies the establishment of the Board is an excellent one, and we confidently expect that it will be found most useful in bringing together qualified assistants and employers who are in need of their services. We would suggest that the Board might be found specially useful to the Colonial and Indian Governments when making appointments to engineering posts, as in this way they would secure an impartial selection of qualified applicants from whom a choice could be made. We wish the new venture every success.

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**Routes for Motor-Omnibuses.**

In the report of the recent meeting of the Council of the Institution of Municipal and County Engineers it will be seen that among the matters which arose for consideration was a resolution from the Lower Thames Valley District Surveyors' Association recommending that further powers should be conferred upon local authorities to define routes for motor-omnibuses and other motor vehicles. The matter was deferred, and we think quite rightly so, as the proposal appears to aim at giving some traffic control to the local authority, whose jurisdiction would thus to a certain extent overlap that of the police. We quite agree that some further control of motor-omnibus traffic in suburban and outlying districts is badly needed, both from the point of view of amenity and that of public safety, and we hope that now the question has been raised it may not be allowed to drop. Nevertheless careful consideration should be given to the question of the controlling authority before any action is taken with a view to securing legislation on the subject.

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**Professional Ethics.**

In another column will be found a letter on Professional Ethics, written by Mr. S. H. Adams *à propos* of the presidential address recently delivered by Mr. A. J. Martin before the Institute of Sanitary Engineers. While we cannot go all the way with Mr. Adams in his indictment of "the lowest tender," we have great pleasure in publishing his letter, which calls attention to some unworthy phases of commercial life which are all too frequently met with. We are afraid that a general discussion of the merits or otherwise of the competitive system is hardly within the functions of a paper like THE SURVEYOR, but the consideration of the points made by Mr. Adams can do no harm and may tend towards the infusion of a little more humanity into our purely business life.

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# Preliminary Studies in Bridge Design.

By REGINALD RYVES, ASSOC.M.INST.C.E.

*(Third Article.)*

We have now to consider the third class of streams and rivers, those which change their courses, suddenly or gradually. If we are thinking geologically the class is a very large one, but for practical purposes it only includes those in which the change is rapid, taking ordinary measures of time. A river of this class may desert a bridge which has been built across it and wander off on quite a different course. Such cases are by no means very rare, particularly in India, and the same principle is at work in deltas, where the relative sizes of different branches often vary very much in the course of time. Sometimes there is a long struggle to keep the river from outflanking the bridge and breaching the road. In other cases there is a bridge spanning the dry bed of the river, and when the rains come the river does not appear; or it flows for some weeks, when it succeeds in breaking through some barrier further upstream, and gradually makes a bar across the old bed. Lastly the deviation may occur in a sudden flood after a long period of gentle flow, or occasional small freshets, during which the vents have become choked, partly by silt, partly by bushes, and partly by drifting sand. The obstruction causes a heading up, which results in a breaching of the bank, often an artificial flood bank, and the river takes another course. The prime cause of such wandering is that the river is so situated as regards the bed-fall, the quantity and nature of the silt, and the manner in which freshets occur, that it is adding

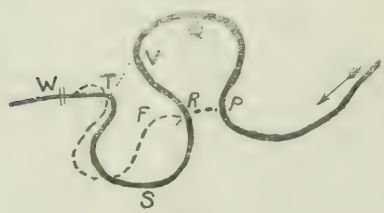


FIG. 11.

to its bed rather than scouring it out, and the most serious cases, generally, are those of large rivers which are kept between high flood banks. The river continues to raise its bed, the inhabitants go on raising the banks. The higher the banks are raised the deeper and more regular is the flow, and the more the river's position silt, raising its bed still higher. Probably the worst of such cases occur on some of the rivers of China. But the same thing may occur naturally. The silt which is deposited on [illegible] is not subject to scour afterwards, and in a country of small rainfall, or where a [illegible] gives continuity to vegetation, such banks may be fairly stable. They restrict the river, which flows deeper than before, and [illegible] Most silt is [illegible] the river with its banks is at a higher level. Its [illegible] such, and when the river overflows near a course of [illegible] it may follow that course, either [illegible] blocking the old course, or gradually using the new channel at first as a flood channel or "spill," afterwards as the principal channel, and, finally, as its sole bed. The sketch (Fig. 10) shows diagramatically four successive stages before the river takes a new course.

### THE ACTUAL PROBLEM.

Leaving the study of what happens in the case of a great river flowing through a wide plain, let us take the case of a stream in a valley sufficiently well-defined to restrain its course within moderate limits of deviation. First we may, if other circumstances allow, reduce the chance of trouble happening soon by a careful selection of the site, choosing a position near the downstream end of a straight reach, preferably one that is nearly parallel to the general course of the stream, and one the

FIG. 10.

cross-sections of which show considerable falls towards the stream. Such a reach may last many times as long as other reaches. In a narrow valley, however, and when the stream is small, it may be better to choose a diagonal reach which can be crossed by the road more conveniently. In such a case it may be good economy to spend some money on the protection of the outer bank of the bend above the bridge. Generally, a study of the course of the stream near the proposed site should be made, in order to see whether that site is likely to be one of the pivots about which the bed of the stream shifts, and therefore likely to move more slowly than other parts of the course. These considerations apply more particularly to new countries, but in settled countries, too, have considerable force on waste lands, such as some moorland valleys where no control of the course of the stream is attempted. The tendency to wander is in proportion to the flatness of the valley, lengthwise and across, and depends, too, upon the relation between the fall down the valley and the fall towards the stream. It must also be noted that the stream running down a steeper part of the valley into a flat part will enter the flat part with a velocity which will make its attacks on the banks at bends fiercer than usual for some distance downstream. In such a case, and in some others, the *extreme* downstream end of a straight reach may be a bad site on account of the tendency of the stream to cut back its bed.

This brings us to a consideration of the effects of straightening a stream, by making short cuts between bends. The way in which this may occur naturally has already been outlined; but whether it happens naturally or artificially, the possible [illegible] If a stream has a bend half a mile long between two points while the straight distance is a quarter of a mile, by making a short cut we make the slope or fall twice as steep, and increase the velocity. A straight piece of the stream approaching the bridge with the higher velocity may be more troublesome to deal with than the winding stream would have been. It is far easier to cajole than to coerce running water.

In the diagram (Fig. 11) it is better to make a short cut P R than to allow the stream to make one at V T. First, P [illegible] the direction of the bridge (or W), and later on, when the curve has moved to

the position of the dashed line, there may be another cut, F T, natural or artificial, directly towards the bridge. Secondly, the total fall from P to T is only made about twice as steep by the short cut P R, at any rate at first; while the short cut V T replaces the length V R S T, and the velocity is likely to be very great. Lastly, the cut V T will cause a strong set of current, in the direction shown by the line of dots, where it may result in the bridge being outflanked, or the abutments undermined.

THE BRIDGE AT A BEND.

Supposing, now, that the site is fixed, by necessity or selection, and that it is on a bend where the scour is likely to be great, and a strong attempt will be made by the stream to shift the bend many yards

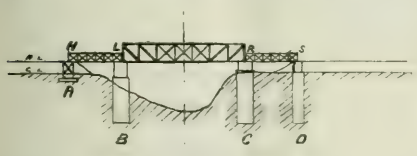


Fig. 12.

within a few years. To protect the bend by pitching is not necessarily the most economical or the most sure way of meeting the difficulty. Rivers have a way of treating the end of the pitching as they would have treated the abutments of the bridge, and a large amount of pitching may be needed.

Often it is a better plan, particularly on large streams, to place the transverse centre line of the bridge not in the centre line of the current, but some way towards the bank which is on the outside of the curve. Where the movement is slow this may be enough in itself. A further precaution, necessary where the movement is considerable, is to make the abutment on that bank in the form of an abutment pier. In the case of an arch bridge it may be necessary to make it so that it will be

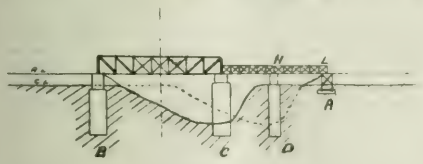


Fig. 13

stable without having earth behind it; but, especially if the erosion is never long continued, it may be sufficient to make it so that another arch can quickly be built against it. In the case of a girder bridge, it is chiefly a matter of making foundations to a depth which would be suitable for a pier in mid-stream, and this is, of course, essential also in the case of an abutment for an arch.

If the movement of the curve is likely to be fairly rapid, so that in ten years or so some additional work may be called for, a girder bridge will probably be more suitable than an arch bridge. In the case of a fairly long bridge it may be a matter of bringing one span from the inside bank to the outside bank. A bridge of six spans would in such a case have to be made as a bridge of seven spans. This, however, involves the abandonment of an abutment, or an abutment pier, or the removal of its material to the other side, and in most cases the difficulty will best be met by making both abutments with approach spans, the outside of the curve being pitched if necessary. The removal of the approach span on the inside of the curve, and its erection at the other end of the bridge, would sometimes carry us as far into the future as we need to see. See Figs. 12 and 13. The pier can easily be moved if made in the form of a steel trestle put together with bolts. But if the movement is likely to go beyond the stage shown in Fig. 13, it is clear that the long span may eventually be wasted. If such movement is anticipated, it is better to make some such arrangement as that shown in the diagram (Figs. 14 and 15), in which case the span is shifted to the new position. Both trestles A and F are moved to new positions, and a new solid pier is sunk at M. The trestle G should be made of sections suitable for other local purposes, or it should be of quite a temporary character. Trestles, or screw piles, would be used instead of solid abutments for the shore spans. The girders would be so built as to be easily moved, a matter of no difficulty and small additional expense.

The writer has been concerned in the design of a bridge which was to be built at a bend of a river flowing through soft ground, and in this case one abutment was designed as a pier with deep foundations. Pitching was also to be done, the idea being to keep the bend at its present stage as long as possible, after which an extra span, not necessarily a long one, could be added from the abutment pier to a new pier to be built further on.

BRIDGES ON SCREW PILES.

A very simple and effective way of applying the principle is to make a girder bridge resting on screw piles. Long piles are used at G and C (Fig. 14) in the first instance, and those at G can be removed

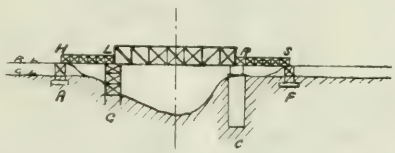


Fig. 14.

to M (Fig. 15) when the girder is taken to the other end. If necessary they can be lengthened and driven down deeper later on. Screw piles might be used in bridge work more than at present. The iron screw piles of the old Coum Bridge at Madras, recently taken up after fifty years' service, were in a very good state of preservation, and in marked contrast with the girders. A point to be remembered is that if the bridge, at a bend, is one of many spans, it is worth while making the shore spans the same length as the others, even if the probability of having to shift one girder is very small.

THE POOLING METHOD.

While the measures just described are more particularly applicable to the case of a bridge built at a bend in a large stream the shifting of which is comparatively slow, they may also be taken into

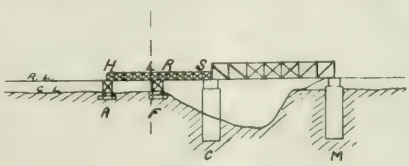


Fig. 15.

consideration when a bridge has to be built at a somewhat unstable site on a smaller stream. In such a case, however, the relatively small cost of protecting the banks, and the possibility of coercing the stream if necessary, alter the general position a good deal. What is often a better way of dealing with a small stream, the wanderings of which take place within well-defined limits of deviation, is what we may call the "pooling method." It consists in taking the earthen embankment right across the valley bottom without making an ordinary

bridge either for the present course or the future course of the stream, but providing instead a sufficient number of small spans to take the whole flow.

The cost, if we use quite small spans, may be much less than that of an ordinary bridge, in spite of the greater total width of waterway necessary in some cases—not all—and in other cases the pitching of a part of the embankment. The floors of the vents being placed at a level well above that of the old bed of the stream, there will be pooling up. If, however, the pooling is only intended to take place during floods, and the land is at other times under grass, for instance, we may provide a

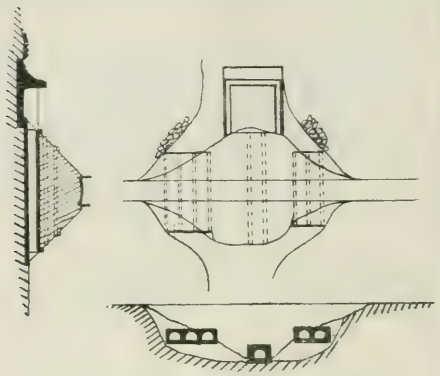

Fig. 16.

vent at a lower level, sufficient to take the normal flow (Fig. 16).

It may be necessary to check the velocity of the stream through this vent under heading up caused by floods, but floods do not always increase the effective head. Sometimes they reduce it, some obstruction below the bridge being a greater check than the bridge itself. When a considerable amount of pooling cannot be allowed, it may be possible to get something of the same effect by making an artificial channel near the embankment, so that wherever the stream approaches it may turn and find an outlet through the vents. The design for a perennial stream would necessarily differ from that for an occasional torrent. To meet the case of a site where the silting is considerable and rapid growth of bushes and other

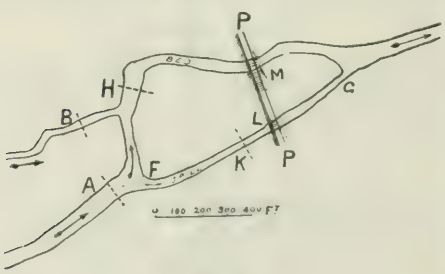


Fig. 17.

plants takes place, grouping of the vents may sometimes be necessary, in order that the stream may establish definite channels and keep them reasonably clear.

A CROSSING AT A SHARP BEND.

Fig. 17 is a plan of a site where it was recently proposed to bridge a stream which, at any rate at this place, is of the wandering type. The stream was already forming a "spill" at the place marked F, while it had been intended to place a bridge of two spans of about 35 ft. at the place marked H, and a culvert of 12 ft. span on the spill F G, at the place marked K. Estimates were, however, prepared for an alternative design on the pooling system, and it was proposed that, as the season was too far advanced for the bridge to be built immediately, the stream should be encouraged to make the short cut already heralded by the spill. The best way to help a spill to develop is to make a deep cut in it where it re-enters the stream. For the rest, it was proposed to abandon the projected bridge on the bend, to place a main vent of about 20-ft. span across the spill at L, and to make a number of other vents, M, to discharge the water from the pool in times of flood; the embankment being carried right across. These smaller vents, about 15-ft. span, would provide the waterway needed at considerably less cost than that of the same waterway in two spans. An alternative would have been to build two bridges, one at A and one at B.

*(To be continued.)*

## REGINA WATER SUPPLY.

### MR. WYNNE-ROBERTS'S SCHEME.

As reported in our issue of last week, Mr. R. O. Wynne-Roberts, M.Inst.C.E., F.R.San.I., has been retained by the authorities of the Canadian city of Regina to carry out works of water supply which, providing for an ultimate supply of 10,000,000 gallons daily, is expected to cost £300,000. The scheme has for its object the connection of several watersheds into one trunk main, and the works are designed so that they may be carried out in sections, as the council deems necessary.

Mr. Wynne-Roberts, who has been investigating the sources for supply for several months past, states that 7,000,000 gallons of water are available daily, providing the system is extended at a cost of over £221,000, but he points out that this quantity would be insufficient to meet the demand if the growth of the city continues at its present rate. In his opinion the proper course is to take immediate steps to render the present supply sufficient for a population of 75,000 persons, or, in other words, to prepare a supply for two and a-half times the present population.

The scheme outlined by Mr. Wynne-Roberts in his report provides for the laying of 40 miles of pipes—steel and earthenware—the erection of a central pumping station and water softening plants, and the construction of four reservoirs.

There are no catchment areas in the southern quarter of the city, and no large sources of supply are to be found west of the city. On the northern quarter there is considerable water available, but the main sources of supply are said to lie on the eastern side of the city. The report deals in the utmost detail with the supplies of water available from the various springs. The supply to the city will be maintained at a pressure of about 65 lbs. to the square inch—or about 150 ft. head, which will be sufficient to reach the highest buildings, and it will be possible to work under a greater pressure when necessary.

One of the most interesting and readable features of Mr. Wynne-Roberts's report is a chapter devoted to the geological formation of the country, due mainly to the action of the huge glacier which covered a large area of the North-west 10,000 years ago.

As mentioned in our previous issue, Regina is developing at an extraordinary rate, and British engineering firms will, we are advised, find ample room for the supply of machinery to the city.

**Vienna's Modern Fire Engine.**—The Austrian capital has now an automobile fire engine which is unique in some respects. The engine, which propels the vehicle may be connected to a water pump with three hose connections, so that three lines of hose may be served. The pump is of the centrifugal type, and delivers 264 gallons per minute. It was recently used at a big fire in the city, and stood the strain of continuous work for twenty hours. The apparatus can draw water from three hydrants, and can be used as an auxiliary for two steam engines. It drives the water a distance of 500 ft. The automobile carries a quantity of hose and a number of ladders, which are supported on a frame above the driver and crew.

# The Road: Past, Present and Future.*

By SIR JOHN H. A. MACDONALD, K.C.B., LL.D., F.R.S., M.INST.E.E., Member of H.M. Road Board.

The Road during the latter half of the nineteenth century was a matter in which the public took little, if any, interest. When the railroad era set in, the mail coach, the travelling carriage, and the long-distance delivery wagon were swept off the road, which was used only for short journeys. Thus the highway, which before that time had presented a goodly show of traffic, became a secondary consideration in county affairs. The Bath Road furnishes a graphic illustration of the change. The 140 mail coaches crossing one another on that route each day disappeared, and nothing remains now to tell of the active road bustle of that time but the disused pumps standing at every interval of 2 miles, from which the entire road was watered daily to keep down the dust cloud which so many people seem to think had no existence until the motor car came on the scene. So little was efficiency thought of in road management that the post of road surveyor became the consolation gift to the worthy local man who had been a failure at everything else. The appointment once again fell into the position described at an earlier period of which we read in evidence given before a Select Committee, that the surveyors in a particular district included "a miller, an undertaker, a carpenter, a coal merchant, a publican, a baker, an infirm old man, and a bedridden old man who had not been out of his house for several months." And it was declared that nineteen times out of twenty the appointment was "a perfect job." This is not to be wondered at, for in the same Blue-Book we read that it was usual to appoint "a prodigious number of commissioners for the care of 10 or 15 miles of road; and thus a business of art and science is committed to a promiscuous mob of peers, squires, farmers and shopkeepers, who are chosen, not for their fitness to discharge their duties, but from the sole qualification of residence within a short distance of the road to be made or repaired."

These quotations relate to the early years of the last century. Doubtless there was some amendment when Macadam and Telford came upon the scene; but, as I have said, things fell back again sadly when the railroad carried off nine-tenths of the traffic. Thus, "like master like man"—as it was with the surveyor, so it was with the road man. Too often he was an old labourer bending under rheumatism, who was no longer fit for his ordinary employment, and, the choice being between putting him on the rates as a pauper and giving him wages to do road work for which he had no training, and to do which efficiently he was unable from senile decay, he was put on and kept on the road as a make-believe roadman, to do work which calls for intelligence and full virility. How often did one see him in the 'fifties of last century, and for many years later, laboriously and slowly scraping off the mud which the traffic had squeezed out of the road in wet weather! In dry weather it was the turn of the stones whose binding had been loosened, and they lay on the surface to cause horses to stumble, or to lame them by wedging between the frog and the shoe. These loose stones the decrepit roadman should have raked off, a duty which I can vouch, from what I saw and suffered in my youth, was but intermittently performed, and often not performed at all.

### TRAFFIC CHANGES.

What a change has come over the scene since the new century was entered upon! The road is now one of the ruling elements, not only in local but in Imperial politics. For once more the traffic of the country, whether for pleasure, for business, or for commerce, is being largely conducted by road, and it is manifest that in the future it will be so in an ever-increasing degree. Millions of miles are now run every month by road vehicles, where, twenty years ago, the mileage run was but a small fraction of what it is now. The rapidity with which this revolution in road transit has taken place has been a great surprise to all—even to those who welcomed it. It has excited varying emotions in the community. Some rejoice; others—a gradually diminishing number—utter anathemas in no gentle tone. But all are in agreement on one thing—that the change by which the road has once more become a principal and not a mere local provision for transit of passengers and goods is a change for all time. The most bitter opponent of the modern power vehicle has to confess that the situation must be accepted. It required a course of years to remove the scales from some eyes. About four or five years ago a very worthy friend of mine delivered himself to me in solemn tones thus: "In another ten years there will not be half the motor cars on the roads that there are now." I grieve to say he did not live finally to test his own prediction, but during the four years that passed he never referred to the subject again, as he lived to see the numbers increasing by tens, or even twenties, of thousands annually, and found himself unable to resist his own family when they desired to use motor cars. To be consistent he would not buy, but he hired. This affords a curious instance of how history repeats itself. Exactly the same kind of remark was made shortly after the introduction of railroad transit. In 1838, Sir Henry Parnell, in his "Treatise on Roads," declared that "the attaining of a speed of 25 or 30 miles an hour cannot be justified on any principle of national utility—how it can be made to contribute very much to the benefit of the country at large, it is not easy to discover." And he added his prophecy: "After the means of moving at the rate of 10 miles an hour is universally established, there seems to be no very great advantage to be derived from going faster," and he declares that railway transit cannot possibly pay, so that "the cheaper method of using horse power will be adopted." One can but smile on reading this in the light of what has taken place since.

That the council of this institution should welcome a paper on The Road, and that you should be here to listen to it, is proof incontrovertible of the great change. I must apologise for speaking of "a paper." In Royal Institution parlance I am delivering a "discourse," and it seems natural that it should divide itself into three heads. The first is the Past, and what is to be said upon it may be interesting and useful for comparison with head two, the Present, and head three, the Future.

### BRITAIN'S FIRST ROAD MAKER.

It is clear from history that the first maker of roads in Britain was the Conqueror from Rome. We can see to-day how the invading Roman made solid, strong roads to facilitate the transfer of his forces, thus lessening the time necessary for moving his legions from point to point, and so making one phalanx worth two in many circumstances of fighting emergency. These roads testify to the skill of the Roman military engineer, solid, strong, well-drained, and with an upper crust of close-laid pavement, thoroughly efficient, an example that later generations were slow to follow.

After the Roman period, and for hundreds of years, road making with design was unknown. The State did nothing, and it fell to the Church to do a little as a work of piety and charity. We read that in the fourteenth century the Bishop of Durham remitted part of the penalties on the sins of those who did good work in helping to "smooth the way of the wanderer," and granted forty indulgences to contributors to road repair. But zeal declined and mud increased. The road user had to be his own road maker. The poorer class trudged on foot, where now they ride in comfortable carriages and feed in dining cars; the richer class, kings, queens, nobles, knights, gentry, merchants, rode on horseback, the ladies being sometimes carried in pillions, or by litters, instead of first-class saloons. The pack-horse team was the mode of conveyance for goods. The road was formed by the traffic following the footpaths. To this is to be attributed the very tortuous character of many of our old ways, the path maker naturally moving round obstructions, and the horse following widened the track, which later the road maker also followed, without straightening the line or relieving gradients by cutting and embankment. As was to be expected, roads thus formed at haphazard were soon impassable at many places. The travellers then went aside; in fact, they were enjoined to do so by an old statute, which declared that "where any highway is worn deep and incommodious, another shall

* Lecture delivered on Friday evening last before the Royal Institution.

be laid out alongside." Thus the curving character of the road was aggravated, and a state of things produced the very antithesis of the old direct, firm, permanent Roman way. The road was a quagmire, full of stones, which rolled about loose when fine weather dried it up.

"A TALE OF MUD."

Of course, looking back over a long distance of time, it all seems highly picturesque to the imagination. The illustrations in the history books of our childhood showed us kings and queens making journeys, and conveyed to us no idea of discomfort or hardship. A Queen Elizabeth or a Queen Mary was represented as arriving at some stately castle after a long day on the road, her velvet skirts without a speck of dust or clot of mud besmirching their beauty. How different must the reality have been! As regards driving, which was being introduced in Elizabeth's time, we read of that Queen complaining to the French Ambassador that she had been "full of aching pains for days," consequent upon a drive through London in a regal chariot which she was using for the first time. And it must have continued to be much the same for many generations. We may set beside Elizabeth's short drive through London Sydney Smith's humorous wail of much later date, when he professed to know, as he said, "approximately" the number of "severe contusions" he received on a journey from Taunton to Bath, his figure being 10,000 to 12,000 jolts. These distresses were the consequence of road construction and maintenance being left to the haphazard attention of each locality, instead of being treated as a matter of general interest, calling for well-thought-out, scientific treatment. Even when laws were passed by which the inhabitants of each locality were ordered to supply six days' labour on the roads annually, the work was done on no system, was evaded by many, was scamped shamefully, and the money provided by those who commuted was squandered and often pilfered. A traveller's book of 1770 gives a graphic description of a main road at that time that from Preston to Wigan.

"I know not, in the whole range of language, terms sufficiently expressive to describe this infernal road . . . let me most seriously caution all travellers to avoid it as they would the devil; for a thousand to one but they break their necks or their limbs by overthrows or breakings down. They will here meet with ruts which I measured 4 ft. deep and floating with mud. . . . The only mending it receives is the tumbling in of some loose stones, which serve no other purpose but jolting a carriage most abominably. . . . I actually passed three carts broken down in these 18 miles of execrable memory."

This is a tale of mud. Sheridan, in "The Rivals," gives us the tale of dust when he makes Bob Acres shout on his arrival at Bath:—

"Warm work on the road, Jack, odds whips and wheels! I travelled all the way from London like a comet, with a tail of dust as long as the Mall."

These instances, the real and the illustrative, apply to a comparatively late period, when the post-chaise had come into common use. Earlier travelling by vehicle was confined to the broad, lumbering, two-and-a-half-miles-an-hour wagon or wain, drawn by a string of six, eight, or even more, horses, that it might be forced through the slough of mud collected in the ruts, which apparently were never filled up until the wagons had their axles scraping the ground. The rate of speed under good conditions was 20 miles a day, wains from Lancashire to London taking ten days in summer and eleven days in winter.

Notwithstanding all the difficulties, efforts were used by enterprising people to introduce stage coaches, which gradually made their way, until in the eighteenth century they were boldly advertised as "Flying Coaches"—the Newcastle to London, named "The Flyer," flew for nine days on the way—a speed of about 25 miles a day. A few years later an advertisement appeared which said that, "incredible as it may appear, this coach will actually arrive in London four days and a-half after leaving Manchester."

"SATANIC" MOTOR CARS.

Then, just as now, these modest steps of progress were denounced by the wiseacres of the day as tending to ruin the country. Carriages were spoken of as "upstart hell carts and coaches," just as now, reverend gentlemen speak of motor cars as satanic. We read that innkeepers complained of the speed at which "people flew through the country." One John Cressit declared that "these coaches are one of the greatest mischiefs to the public, destructive to trade and prejudicial to lands"—and specially injurious to tailors and hatters, as gentlemen who rode on horseback spoiled their clothes and hats, and required to renew them often, whereas clothes lasted longer when one travelled by coach, and so the clothier and hatter lost custom. And Taylor, the poet wherryman, bursts forth:—

> "Carroches, coaches, jades and Flanders mares
> Do rob us of our shares, our wares, our fares,
> Against the ground we stand and knock our heels,
> Whilst all our profit runs away on wheels."

All this time the roads were as bad as ever. Here is an eloquent wail indicating what had to be endured:

"Is it for a man's health to travel with tired jades, and to be laid fast in foul ways, and forced to wade up to the knees in mire . . . to have their tackle, or pearch, or axle-tree broken, and then to wait hours to have them mended, and then to travel all night to make good their stage?"

One more quotation, referring to the year 1737, is interesting, as it speaks of a road which must have passed not many hundred yards from this spot. Lord Hervey, who wrote from Kensington in that year, says:—

"The road between this place and London is grown so infamously bad that we live here in the same solitude as we would do if cast upon a rock in the middle of the ocean; and all Londoners tell us there is between them and us an impassable gulf of mud." At the best of times, if there was no breakdown, a drive from Kensington to St. James's Palace occupied two hours.

How many of you, ladies and gentlemen, have rolled in luxury through Kensington to this institution to-night? Yet such was the state of things in the time of the Georges. It will not surprise you to hear that about the same period, fourteen days was considered a good run from London to Edinburgh, and that Sir Henry Herbert said solemnly in the House of Commons, "if a man were to propose to convey us regularly to Edinburgh in coaches in seven days, should we not vote him to Bedlam?"

So dreadful was the state of things in the eighteenth century that in the first seventy years 530 Acts of Parliament were passed ordering Statute labour, authorising turnpikes, &c., but so indifferent were the public, and so inefficient was the work, that no real improvement was made. That the road should be rutted by the traffic till the vehicles sank to the axles was looked upon as inevitable, and no other remedy was thought of than to bring up the level by pouring in large stones. Thus, as Young sums it up, "we were either buried in quagmires of mud, or rocked to dislocation over pieces of rock, which they called mending." It is interesting to notice that from the time of the Romans down to the middle of the eighteenth century there is no record of any good road being made till General Wade—again for military purposes—constructed a road through the Scottish Highlands, which when order was restored after the "45" proved of great service to the country. An obelisk erected on the road bore this inscription, which contains as good a bull as ever was produced in Ireland:

> "Had you seen this road before it was made,
> You would hold up both hands and bless General Wade."

We now come to the second head of discourse—

## THE PRESENT.

A great improvement took place when Macadam and Telford brought the results of their study and their inventive powers to bear, giving a road well laid below and a crust of small angular stones which, when pressed down close, produced an infinitely better road than had been known before. But it must be admitted that while they provided better materials for a good highway, their mode of completing it entailed upon the road user and his horse and vehicle a great deal of unpleasant road-making work, involving much temporary discomfort, and much wear and tear to animal and carriage. It is hardly to be appreciated by most people to-day, but an old man like myself can remember how in the fifties and even the sixties of last century the road-maker's laying work was ended when he had piled his surface stones loose upon the roadway. The road user had to apply his vehicle to roller work, to force the stones into a closely packed surface. Perhaps some who are present may recall to memory, as I can, how in those days the road man, when he had laid a covering of new metal, placed trestles at intervals, one on one side of the road and another on the other side, so as to compel the driver to zig-zag back and forward over the sharp-edged and pointed

stones, his horse's feet acting as a tamping machine and his wheels as a roller, until the hundred of shoes and iron tyres had pressed down the stones into a macadam crust, and when this was effected on the part of the road that was free for transit, the trestles were moved into position on the made road, and the traffic forced on to zig-zag No. 2, until all the surface had been brought to a macadam consistence, the whole road being packed close by the stones descending gradually, breaking and grinding their own packing off themselves as they were slowly forced down, rubbing one against another. When completed it was a good road for the traffic of the day, but oh! it was trying work when the road user's vehicle not only conveyed his passengers or his goods, but was compelled to act the part of a road roller.

RESULTS OF STEAM ROLLING.

A great change took place when the heavy steam roller was introduced, which in one operation pushed the stones down into position. It afforded a blessed relief to those who used the roads with horses. But though advantageous in saving the road user and his horse and carriage, and more expeditiously completing the new surface, it was not possible to provide a closely fitted road, which should have its interstices filled up by the chip and grit from the stones themselves, and which was an essential desideratum according to the Macadam theory. His principle was that no water should enter the surface of the road, or penetrate beneath the crust. To keep water out of the road was one of the most essential points, if it was to be efficient. He strongly condemned any insertion of loose material into the interstices of the metal, or allowing water to enter between stones of the crust. These maxims of Macadam came to be disregarded when steam rolling was introduced. When rolling was to be done in one operation, a device had to be resorted to that the spaces between the stones might be closed by added packing, and this has been done by making what can only be described as a soup of dirt and water and pouring it upon the stones and brushing and rolling this liquid mud into the crust of the road. The road thus when opened for use is crusted with a coating of stones whose only binding is water thickened with dirt, or perhaps dirt diluted with water is the proper description. The result is that it can never be a good road in wet weather, and can never be a good road in dry weather. As long as it is in a slightly damp state, and not subjected to severe wet weather or long-continued drought, it may be a fairly good road. In wet weather water can get in where it has come out, reproducing the mud soup, and the traffic squeezes it up and out of the road. In dry weather, the binding being reduced in bulk and loosened by the evaporation of the moisture which gave the inserted dirt some cohesion, the stones move and are picked out of the surface, and so holes are left for the water to lodge in the dirt below when again rain begins to fall. What would Macadam say, if he could visit the scene of his scientific labours, to hear the phrase "water binding" used to describe the means employed for consolidating the crust? To call a water-formed road a macadamised road is a contradiction in terms. His emphatic declaration was: "Every road is to be made of broken stones, without mixture of earth, clay, chalk or any other matter that will imbibe water."

But, further, the road roller has not in another aspect proved to be an unmixed blessing. For it is not uncommon to see that its use has developed another evil. The heavy road roller coming on to a layer of stones, surrounded with liquid, and therefore non-resisting mud, and pressing down the stones by its weight, necessarily must move the water and the dirt in suspension, otherwise the stones would not go close together. The liquid is therefore squeezed out of the way, and as the great width of the roller prevents its escape sideways, except at the edges, it must go forwards, and (water being practically incompressible) forces the water and the dirt and the stones in front upwards, forming a ridge before it. The roller advances, and when it cannot force the ridge farther forward, it then mounts it and descends in front, and so *da capo*, with the consequence that the road become a series of ridges and furrows, and when drying up resembles a mackerel's side, a series of dark-toned wet hollows and light-toned dry mounds. The road becomes bumpy for the traveller, and is unable to free its surface from water, and the material remaining soft and wet in the furrows and becoming dry in ridges is open to destruction by the feet of the horses and the wheels of vehicles dumping down and striking compressing blows in the hollow. No worse state of matters for the traveller and his vehicle, or for durability of the road surface, can be conceived. Yet any observant person must have seen this road condition extending for long distances within a very short time after the crust has been relaid.

SIZE OF ROAD STONES.

Another evil which developed itself as a consequence of the adoption of steam rolling has been the too common use of much larger stones than the size prescribed by Macadam. His metal had to pass through a gauge of 1½ in. Such stones packed very efficiently when slowly moved down by the traffic. But road makers, when they adopted the liquid mud binding, fell into the practice of using very much larger stones. Of course their road metal, when prepared, consisted not of stones of the same size and weight, and this state of things brings about very damaging results. Here is a stone of the Macadam gauge, and here are stones that I have taken out of road metal laid down for use, or found pushed out of the road by the traffic. The Macadam stone, as specified by him, was to be only 6 oz. in weight. I have here stones of larger size which weigh fourteen times as much. Let me illustrate to you the evil effects of the use of large stones. I have laid in this box as near a representation of a macadam road as I can, with several stones on the top layer of different sizes. To each of them I have attached a strip of bamboo, with a coloured disc on the outer end. I now press down on the Macadam gauge stone, putting the pressure over one-half of the width. I press at the same distance in from the end of each of the others, and you see how the larger stones are tilted up free of the surface, being loosened out of the binding. The same thing happens when the edge of a horse's shoe or the angle of a wheel tyre presses near the end of a large stone, and thus the surface of the road is broken up. A hole is left in which water can lodge and work its way down with fatal result. The effect is even worse if large rounded stones are used. Here are two stones which I found in the middle of a road—where, I would rather not disclose, as I do not wish to be personal. Suffice it to say that it was not fifty miles from London. Such stones cannot stay in the surface of a road. They must roll loose and leave a hole, to be widened and deepened, and filled with water when rain falls.

Such was the state of matters on the main roads until within a few years of the present century, and it is still the same in many parts of the country. Another evil has come in, that on many roads it has been the practice to pile stones on the centre of the way, without making such arrangements as will keep the camber or curve of the road low. The result is that drivers, to escape the extra strain on their horses by driving along the side of a slope, and to avoid slipping down to the gutter when the road is greasy, keep on the very centre of the road, on which two ruts are soon formed which gradually get deeper, and in which water lodges, with most disastrous effect, the water being splashed out by the wheel, and mud being forced up and out by the blow struck when the tyre goes down into the hollows formed.

All this being so, the greatly increased traffic, and the increased speed of passage, consequent on the development of mechanical carriages, has caused much attention to be directed to road construction.

This brings me to the third head of discourse.

THE FUTURE.

What is the road of the future to be? It is a question which all who are associated with the management of roads have come to see calls imperatively for an answer. The problem is to find the best mode by which a road can be constructed, which will not have its surface broken by traffic, and will make transit easier both for passengers and goods, and shall neither form puddle holes nor exude mud to clog the vehicles and to form thick dust when the weather is dry; in short, that there shall be no loose material from the road, except the small quantity caused by surface wear, which it is found is but trifling when a sound crust has been rolled in. That such a road can be laid anyone may see by paying a visit to the Thames Embankment, the traffic on which was small formerly, the road being shunned as one of the worst in the country, but which is now used by an enormous number of vehicles, often as many as 1,600 in an hour. It will be seen there that water on the surface dries off very quickly, there being no mass of mud to hold it, and that in the driest weather there is practically no dust. No watering is done during the day, the surface receiving one washing during the night because of the horse traffic. But there is no need for the use of water-carts by day. Even during the long drought of

1911 there was no watering, yet there was no appreciable dust.

The necessity for the development of road improvement as a matter of national concern is now recognised, and this has led to the establishment of the Road Board as a Government department, to the charge of which the money raised by taxation of motor vehicles and motor fuel is handed over to be administered in aid of road improvement. The motor users are thus made to pay a large tax, over and above their contribution to the ordinary rates for road assessment—the new taxes amounting to a sum approaching a million pounds sterling yearly—and so to assist in developing mudless and dustless roads, and roads which shall be durable and keep an even surface. It may give an idea of the amount contributed by those who pay the petrol tax if I mention that the owners of every motor omnibus in London are mulcted in £45 a year by the Exchequer for the petrol used, a sum amounting from London omnibuses alone to £76,500 a year.

The board encourages road improvement by giving grants in aid to those road authorities who undertake works of improvement in their districts. The board have also been conducting, and will continue to conduct through their engineer and technical advisers, experiments both in the laboratory and on the road itself. The laboratory experiments are directed to ascertain what are the best materials, to determine the proportions of the different substances found to be suitable to fix the proper thicknesses for the road crusts which have to bear the traffic, and last and not least to endeavour to determine whether any, and if so what, protecting skin shall be placed on the surface so as to come between the hoof or wheel and the bearing crust to protect it from being attacked directly by the traffic.

### SOME PROPHECIES.

I shall conclude by calling your attention to some of the results of recent experiments, by which I think you will see that it has been possible for the board, with the aid of its staff, and the experience of numerous surveyors who have been experimenting for many years, to obtain valuable and practical information, both as regards the choice of material, its manipulation, its proportions, and the mode of laying it, which may ensure that good roads can be made—roads which will keep their surface sound for twice as long as the water-bound macadam road, and will not become uneven and break into holes, which was the fate of all the roads of the past. Such roads in their last years were rough and muddy and dusty according to the weather, deteriorating in a marked manner within a short time after they had been laid down, and in times of heavy and continuous rain having their binding washed out or carried down to the gutters or to lie thick at the bottom of the slope wherever there was a gradient of any steepness. And let it be realised that in proportion to the degrees in which improvement becomes attainable, in like proportion will not only the comfort and convenience of the community be augmented, but the wear and tear of horses, of venicles, and of tyres will be lessened in a marked degree, and the moving of passengers and goods be facilitated more and more, leading to economy in transit. The change will come rapidly. It may seem extravagant to say that in another decade the main roads will have become practically mudless, dustless, and smooth ways, but I do not doubt that my audience will agree with me that if anyone had prophesied on the first day of the new century that before twelve years had passed there would be more than 200,000 motor vehicles upon the roads of Great Britain, that of the 500,000 horses in London 420,000 would have disappeared from the streets, and that reverend rectors who denounced the mechanical vehicles as "engines of Satan," and lashed at motorists with their whips, would have to receive their bishops on diocesan visitation arriving in motor cars, the gifts of the faithful, the presumptuous prophet who said such impious things would have been considered fit only for Hanwell or Colney Hatch. So those who hope, as a consequence of the now irresistible march of the power vehicle, to see the road revolutionised for the benefit of the whole community, hold the hope confidently, and are willing to be laughed at, if you, ladies and gentlemen, choose to do so. . . . We feel sure that we do not go contrary to the Yankee mentor with his "Don't you prophesy unless you know." We do not prophesy, but we do know. We know we say what must happen. And if the words have not become the exclusive property of the politician, I would say, "Wait and see."

### BITUMINOUS BINDING.

Considering what is to be the road of the future, it is unnecessary to say much about the foundation of the road. Telford insisted on a foundation of large stones packed together. Macadam did not consider this to be necessary, and he proved to be right. In the past the road surveyor has recognised what the lower part of the road which is to carry the crust should be, and it need not detain us. But the question: "What shall be the weight-bearing crust?" is one of vast importance, and this is engaging the attention of the advisers to the Road Board. I do not intend to dogmatise on the subject, but only to show you what steps of progress are being made, what has already been consummated in the production of roads which are to the old water-bound macadam what the genuine macadam was to the old track of foot-deep mud and bulky stones, which before Macadam's day led to much strong language, of which I have given you some specimens, also to the untimely destruction of many a horse and vehicle, and enormous commercial waste of time and material. One thing is now universally recognised, that the road of the future shall be a truly bound road, in which, whatever kind of stone is used—a matter into which there is not time to enter—that stone shall be held together by some pitchy or bituminous material, so that it shall be indeed a crust and not something which has no real cohesion, and into which Macadam's enemy, the water, can make its way whenever water falls. That this result has been attained in a practical way is manifest from the pieces of road crust, cut out after they have been under traffic for long periods, and which I now show you (specimens exhibited). You will see, if you care to examine them afterwards, that the stones are in their places as they were laid down with their plastic binding, that no water has penetrated, and that no stones have been picked out or forced out by the traffic, and that the stones have been held so that they have kept their angularity, and therefore do not tend to come out of the road. Experience tends to show that such a road will remain sound, and that for even twice the period that is possible in the case of a mud water-bound road. That you may see how cohesive such a road is, Colonel Crompton, our engineer, has prepared for me these specimens of road, showing how they will hang as a solid piece even with weight attached, which, of course, would be impossible with water-bound material. It could not be held up at all, but would fall to pieces in the very act of taking it out of the road (specimens shown).

Roads formed as regards the crust in this way are now common. Many can be seen in Kent and other counties near London, and stretches are being laid throughout the kingdom. Great success was attained by many surveyors, and notably at an early date by Mr. Hooley, of Nottingham, in putting together road crusts with the aid of tarry components substituted for mud binding. But there is reason for thinking that possibly it is unnecessary and indeed disadvantageous to use any stones of size—even of Macadam's 1½-in.—in making the crust. Experiment is tending to show that suitable stone, reduced to very small size, such as I show you (specimen shown), and properly treated with a binder, will produce crust material of a most satisfactory kind. I have here numerous briquettes of such a combination of small stone bound with suitable material, which have proved to be of great strength.

It will be observed if the briquettes are examined that the cohesion is so close that when the fracture occurs, the stone, in many cases, is not pulled out of the structure, but is broken across, its halves remaining embedded in the binding material. The mode followed in testing these tentative pieces of crust has been to set the briquettes on supports at both ends, having 7 in. without support, to apply a gradually increasing weight where the briquette is unsupported until fracture takes place. The figures I have given as to pressure requisite to cause fracture indicate how different is such a combination from the ordinary crust material, which could not even be set on two such supports as these without breaking on a slight pressure, far less stand up to a weight of many pounds; it is the difference between material that will crumble and material that will cling together—between stone set in mud and stone bound with a strongly cohering substance.

I have probably said enough to show that a good road, which shall keep smooth, be impervious to water, and not tend to disintegrate, is now an accomplished fact, and I only need to add that the cost, taken over a series of years, will not be more—indeed,

there is good ground to believe it will be less—than that of a road as it has been constructed in the past. But the saving to the road user will be very great. Roads will not be heavy in wet weather, putting strain on both horses and vehicles, and giving discomfort to travellers after the rain has ceased to fall. In dry weather there will not be mud gradually turning into a dust carpet, to be whirled about by the wind or thrown up by fast-travelling motor cars. In this there will be much saving of wear and tear of animals and vehicles, of clothes and tempers, the last being not the least of the evils caused by mud and dust.

PROTECTIVE FILMS.

One question remains—will it not be well to endeavour to provide an elastic skin or carpet to lie between the vehicle and the bearing crust? This question is also engaging attention. Can we find some material for the exposed surface of the road which shall be resilient, yielding to traffic but resuming its form and surface. Just as in a golf club-house we protect our floor from being dug into and worn away by the hob-nailed shoes of the golfer, by using a thin film of semi-resilient covering such as kamptulicon or ribbed india-rubber, so it is a question whether we may not protect our road floor—the road crust—by covering it with a film of some substance which will yield and recover without disintegrating in the process. The laboratory experiments made seem to indicate that this will be accomplished. There are certain materials which at ordinary temperatures are—though solid to look at—really in a liquid, though viscous, state. They will flow, but slowly. Their surface if pressed down will yield, but in time will resume its level, and solid bodies, if of lighter specific gravity, placed at the bottom of a vessel containing such a substance will, though not disturbed, float up to the top. A material to be used for an elastic carpet for the road crust must have this viscous, liquid quality. Research has been made with pitch and with bitumen, and the conclusion has been reached that pitch will not give satisfactory results, but bitumen will do so. Here is a stick of pitchy material, and you can see that it has very little resiliency when subjected to strain. Here is a bitumen stick of the same size, and you will observe that it is capable of being twisted without fracture and when freed slowly resumes its shape.

It is expected that with such material laid on the top of the main road crust and integrated with it a valuable road protection will be supplied, so that the road crust will be practically permanent, the upper protecting sheet being remade up and relaid as required.

Time will not permit that I should go into detail in this matter, and in any view it is still in degree in the experimental stage, but let me indicate how such a protective film will operate. We know that if a wooden floor be left bare, then persons going over it will cause much noise, and if nailed boots are used will more rapidly affect the surface than if felt shoes were worn. As regards the noise, which is the thing most thought of, it is, of course, a fact that it is only an effect of the motion of the floor caused by shock as it is struck by the successive blow of the feet coming down upon it. Let a person slide over it without raising the feet, and there will be little or no noise. But the blows of the feet make the whole floor shake, and the vibration causes the noise. It is by preventing the vibration that we prevent the noise, so we put carpets or kamptulicon or oilcloth over it. The blows fall just the same, but the covering, yielding and absorbing the effect of the blow, prevents the floor from vibrating under shock, and so the annoyance of noise is cured. It is the same in the case of the road. The horse strikes a blow on the ground at every pace, and the vehicle going over the unevennesses of the road also strikes blows at every turn of the wheels. This operates downwards on the road and upwards on the passenger in the vehicle. The road as we have it suffers from these blows from the stones being caused to move and to lose their sharpness and become loosened in their hold. It is astonishing to find how far in a macadam road the effects of the blows administered to the surface go down. Here are some stones taken out of a macadam road on which there is heavy traffic. They show the direct action at that distance down of the blows delivered by the traffic. They have been so knocked about that all their holding surfaces are gone, and they can no longer cling together properly to make a firm road.

But if we can clothe the road with a compressible and elastic skin, which will yield and recover, then the main crust may last efficiently for an indefinite period, and the road be less unkind than it often is to persons and vehicles.

To fulfil these ideas of providing a partially elastic carpet, or topping, as the road surveyors are in the habit of calling it, which will carry out the silencing of the rolling noise of vehicles and reducing shock, our engineers at the Road Board have already decided on experimental roads which will consist of a strong road crust intended to carry the weight of the traffic, and on this to superpose the renewable carpet, and for this purpose Colonel Crompton has kindly prepared for me a number of specimens of road crust showing the arrangement proposed.

For the carpet, or topping, the case is somewhat different from the crust. Here strength is not of so much importance as the elastic and silencing qualities, and the freedom from liability to produce any dust in summer or mud in winter. Another requirement which is very difficult to meet in this transition age is that of giving a surface good for motor and mechanical transport, and which will not be slippery, and will afford good foothold for horses.

The specimens before you show these qualities in various degrees. The carpet must be a compromise; it must not be as hard as motorists would wish for, but just so hard that it will wear a little and yet be cheap and easy to maintain. Our engineers tell us that this ideal road of the future need not be a costly one. On the contrary, that once the matter is thoroughly understood, and the roadmen trained to the new methods, the rapidly increasing traffic of the time before us will be carried with little or no increase in the cost of maintenance and probably in some cases with a decrease.

CONCLUSION.

To Colonel Crompton and to Mr. Maybury (of Kent), Mr. Hooley (of Nottingham), and Mr. Wood (of Fulham), I am indebted for much useful aid in preparing this discourse; and I am also thankful to Mr. Aitken, of Fife, for his complete "Treatise on Roads," and to Mr. Edwin Pratt for his recently published work on "Inland Transports," from both of which I have derived much assistance in regard to past history. Mr. Lyon Thompson—son of my late friend Mr. Thompson, the first user of solid rubber tyres, and the inventor of the first pneumatic tyre—has given me much valuable assistance.

Ladies and gentlemen, I trust the discourse has been like a good road, neither dry as dust nor waterlogged. I thank you for your patience, and ask to be allowed to express the hope and to make the request that you will take an interest in road improvement, which will not only add to your own comfort, but will tend to increased commercial prosperity, to greater efficiency of land defence, and last, but not least, will be a powerful agent in improving sanitary conditions, particularly in the towns. May our future roads be in true contrast in efficiency, in durability and in cleanliness to the roads of the past. Whether you are sportingly inclined, or practically inclined, or philanthropically inclined, or it may be a little of each, give your hearty encouragement to all who are endeavouring to make the road more smooth, more convenient and more cleanly, and so more healthy. The raising of the quality of the road is a work which can do harm to no one, and must do good to all. Help, then, by your influence those who are engaged in the work of road improvement. In doing this you will not only earn our gratitude, but will do a good work for the whole community which will not be without reward to yourselves.

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**New Works in New Zealand.**—Proposals to raise loans as follows have been approved by polls of ratepayers in New Zealand: (1) For the construction of a bridge over the Waiapu river at Rotokautuku, Waiapu County, £5,000; (2) for the construction in the borough of Wairoa of a suction-gas plant and works, and of electric lines for the purpose of supplying electricity for lighting and power purposes, £6,000; (3) for water supply works, and the erection of a building and purchase of machinery for fire-prevention purposes, in the borough of Eketahuna, £13,000; (4) for the establishment of gasworks in the borough of Dargaville, £8,500; (5) towards the cost of construction of the Waihenga Bridge over the Ruamahunga river, near Martinborough, Featherston County, £2,000; (6) for the installation and reticulation of a coal-gas works in the borough of Summer, £10,000, and (7) for water supply works in the borough of Invercargill, £32,000.

# Hospitals and Sanatoria.*

By ALBAN H. SCOTT, M.S.A., M.R.SAN.I.

I do not propose to enter upon a long discourse on the selection of a site, as this is a part of the subject which most people are now agreed upon, but a few words on the question of climate, in the broadest sense of the term, may not be out of place, and here we have to consider: (*a*) Temperature, (*b*) rainfall, (*c*) humidity, (*d*) cultivation of surrounding land, (*e*) prevailing winds, (*f*) soil and subsoil, (*g*) line of saturation, (*h*) ground air, (*i*) general locality. The organs of the human body are sensibly affected by all the variations of the atmosphere, particularly the state of humidity and barometric pressure.

*Temperature.*—There are three points here to be considered: (1) Lowest temperature, (2) highest temperature, (3) mean average. Consideration is required both as to the effect of the temperature upon the patients as direct results of heat and cold, and, further, its effect upon the soil and vegetable matter, and consequently the purity of the air. Although the average temperature is some guide, it should be considered only in conjunction with the other factors.

*Rainfall.*—The amount of rainfall, both as to the amount per year and the quantity per month, is very important. This varies in the British Isles from about 21 in. to 185 in. per year, the London rainfall being about 26 in.

*Humidity.*—Atmospheric humidity is not, unfortunately, studied or taken into account so much as the other points included under climate, but in the case of sanatoria it is most important, and must be carefully studied before any particular district or site is selected.

*Prevailing Winds.*—The site should, within reason, be protected by a belt of trees from the direction of the prevailing winds, and, further, should be such that will not allow of the prevailing winds previously passing over a large town and thus getting charged with a large amount of impurity before reaching the hospital or settlement.

*Soil, &c.*—The general question of soil and subsoil has been discussed at the meetings of this institute many times, and therefore we need not go deeply into it just now. The question of line of saturation and its varying levels I suggest requires to have more study than heretofore. Undoubtedly the expulsion of ground air by the rising water has a most material effect, especially so on people who are in a weak state, as many are in such buildings which we are considering to-night. And, although such a structure would probably be on gently sloping ground, the line of saturation might be comparatively close to the surface and also may have a great variation. The nature of the ground should be such that quick and easy natural drainage of the land takes place during heavy rainstorms.

The general lay-out of hospital buildings has during the last comparatively few years taken a great change. Originally it seemed to be the one desire to get the various sections of the buildings all grouped together as close as possible, partly brought about no doubt by such buildings being placed in towns where the land was very high in price; in the later buildings, however, the buildings are more separated. Generally speaking, the actual wards are divided up into various blocks of buildings, such as for the following patients: Medical; surgical, with operating theatres attached; venereal; maternity (septic and aseptic, in separate buildings), with separate operation theatres attached; ward for isolation, such blocks all being well separated, and each having their own complement of necessary rooms.

The departments serving the whole establishment would be: Director's department, consultation departments for out-patients, electrical and special bath department, medical school, probationers' school, nurses' home, kitchen, laundry, general stores, mortuary, central heating, and all other necessary rooms for laboratories, &c.

There are one or two details of general hospital construction I would like to mention. If we commence with the floors, we find that the following materials are being, or have been, used:—

Wards and corridors—(*a*) hard-wood battens, polished; (*b*) hard-wood blocks, polished; (*c*) marble terrazzo, semi-polished; (*d*) tiled; (*e*) jointless flooring; (*f*) linoleum, polished and unpolished, &c.

Operating rooms—marble, terrazzo, tiles, jointless flooring, marble.

Walls and ceilings, wards, &c., and operating rooms—tiles, various colours, shapes and patterns; marble; plaster (painted, distempered, enamelled, or a combination of any).

In considering these items there are several points to keep in mind, such as: (*a*) Junction at floor and walls, and wall and ceilings; (*b*) wear; (*c*) cleaning; (*d*) appearance; (*e*) initial cost; (*f*) cost of maintenance.

All junctions and all arrisses must be rounded, and these should not be of a less radius than 3 in. The wear and tear is considerable, and the staff, having many hours per day to use the floors, the material should be suitable for this. In hospitals the patients have three weeks in which to study the walls and ceilings, therefore they should not be too monotonous. The first cost and maintenance are also both items which are of the utmost importance.

I have come to the opinion that in no hospital, and in no part of same, should dry-cleaning under any circumstances be permitted, and from this point of view our selection should be also made.

With regard to appearance, nothing is more terrible than having to look for three weeks at some fanciful design in tiles, and, further, white or cream tiles are not over-pleasing in our climate. After careful consideration, I suggest, from every point of view for floors to wards, linoleums laid direct on asphalted concrete is best; for walls a fairly hard plaster, gloss-enamelled, and for ceilings the same, but finished mat surface. Corridors as for wards, &c., except perhaps tiles might be substituted for lino. For operating rooms, floors of well-laid terrazzo; ceilings and walls as for wards. For lavatory floors, jointless pavings, and walls and ceilings as for wards. For kitchens and stores to same, grey-tiled floor and white-tiled walls, with ceilings of five-ply boards and enamelled. Laundry and such buildings, smoothed-faced brickwork for walls, well and constantly whitened; the floors tiled or granolithic paving and open roof boarded. Most of the special rooms should be plastered, and enamelled or tiled.

Taking the cost of these materials on a basis of percentages, we arrive at the following figures:—

*Floors:*—

| | |
|---|---|
| Hardwood blocks ... ... ... | 100 per cent |
| ,, battens ... ... ... | 91 ,, |
| Tiles ... ... ... ... ... | 91 ,, |
| Terrazzo ... ... ... ... | 87·5 ,, |
| Lino ... ... ... ... ... | 68·6 ,, |
| Jointless flooring ... ... ... | 63·7 ,, |

*Walls and ceilings:*—

| | |
|---|---|
| Marble ... ... ... ... | 100 per cent |
| Tiles ... ... ... ... | 100 to 50 ,, |
| Plaster, enamelled ... ... ... | 36 ,, |
| ,, painted ... ... ... | 25 ,, |
| ,, distempered ... ... | 22 ,, |

Before leaving the general question of hospitals, I would like to enter a most emphatic protest against the tendency to increase the width of the ward. I think that a ward 22 ft. wide should be the maximum and 20 ft. wide the minimum. A ward properly ventilated and heated requires to be no wider than this, and to ask for greater dimensions is, I would suggest, acknowledging that the proper ventilation of a ward is impossible; and, further, a height of 11 ft. should be the maximum and minimum for a ward. If and when our hospitals become State managed, it will be a most difficult matter to prevent overcrowding, and if the wards are wider or of greater cubic contents, I feel sure we shall live to see a repetition of some of our neighbours, where I have seen wards taking sixty-five patients, while only built to accommodate twenty.

We might conveniently consider now the relative advantages of large and small settlements.

Provided the medical profession has no serious points to raise, it would appear to resolve itself into purely a question of finance, and the importance of reducing the administration or establishment charges is very clearly shown by the report of one sanatoria,

* Extracts from a paper read at a meeting of the Institute of Sanitary Engineers on the 12th inst.

where the average weekly cost per patient for in-maintenance comes to 16s. 8d., and if the establishment charges are added, the total average cost per patient per week equals 42s. 11d., and, further, if the loan account is added, the total is 50s. for capital, and a later report shows that the cost of maintenance is 17s. Establishment charges included, equal 45s. 6d., and with loan account 59s. 4d. As the clerk to the Liverpool Sanatoria points out, "small numbers bring a large average on establishment charges."

The arrangement of sanatoria are, broadly speaking, on three lines: (*a*) The room-and-corridor, or separate, system; (*b*) the pavilion; (*c*) the chalet. That most commonly adopted is the room-and-corridor system.

Before considering the relative costs of sanatoria designed on the (*a*) room-and-corridor, or (*b*) the pavilion, system, it is necessary to take a certain basis to work upon. We will assume that the floor space required is 9 ft. by 11 ft., that the height is 12 ft. floor to ceiling. It does not materially affect the comparative costs where the building has only one or several floors.

Taking the (*b*) pavilion cost as a basis = 100 per cent.

The room-and-corridor system (*a*) costs 208·35 per cent.

Or, taking the room-and-corridor system (*a*) as a basis = 100 per cent.

The pavilion system (*b*) about 48 per cent.

The administration block would cost about the same, whether for the room-and-corridor or the pavilion. Now we might consider the actual results as to the possible number of beds obtainable with a given outlay. To start we will take as a basis 100 beds:

| — | Room-and corridor. | Pavilion. |
|---|---|---|
| | £ s. d. | £ s. d. |
| Accommodation for 100 beds— | | |
| 100 × £83 ... ... ... | 8,300 0 0 | — |
| 100 × £40 ... ... | — — | 4,600 0 0 |
| Administration block, &c. ... | 2,000 0 0 | 2,000 0 0 |
| Total per 100 beds ... | £10,300 0 0 | £6,600 0 0 |
| | Per bed, £103 | Per bed, £66 |

Assuming it were decided to spend £10,300 on the room-and-corridor system, 100 beds could be obtained, but for the same outlay, after allowing for the extra size of the administration block, we could obtain 171 beds, made up as follows: 171 beds at £40 = £6,840; administration block = £3,460; total, £10,300.

I suggest that it is doing more for the prevention of spread and cure of tuberculosis to have 171 beds on the pavilion system than 100 beds on the room-and-corridor system; and, further, in view of the relatively small advantages (if any) of the room-and-corridor system, that no one is justified in asking the tax and rate payers to spend £103 per bed when the same accommodation can be obtained for £60 per bed.

In considering the size of a sanatorium it is a question as to the most convenient and also economical number of beds. No matter what the size, the actual cost per patient for maintenance is about the same, but the capital and maintenance cost on buildings—such as laundry, dining-rooms, kitchen, stores, operation-room, dispensary, nurses' quarters, &c.—is much less per bed for, say, 200 patients than for, say, 100 patients.

Sanatoria have been built from £100 to £1,000 per bed (I believe one cost about £2,000 per bed). Assuming that the accommodation could treat four patients per bed per year, and that the buildings will be suitable for sanatoria for seventy-five years, it means that the capital cost (apart from interest and maintenance of buildings and sinking fund) per patient equals the following figure:

| Cost per Bed. | Capital cost per patient. |
|---|---|
| £2,000 | £6·6 |
| 1,500 ... | 5·0 |
| 1,000 | 3·3 |
| 750 | 2·5 |
| 500 | 1·65 |
| 250 .. .. | 0·82 |
| 100 ... | 0·3 |
| 50 ... | 0·15 |

With the information in Dr. Davies's paper and the figures mentioned, let us consider a plan, first on the corridor system, and secondly on the pavilion system.

I do not advocate blocks containing more than 100 beds, that would mean five blocks for 500 beds. In getting a large ward at the lowest floor, objection might be raised that the coughing would disturb the patients; but if it is permitted to divide the patients up into small rooms, surely there would be no objection to screening off the wards.

In view of the fact that the treatment in sanatoria is essentially an open-air method, I suggest that to provide more cubic space per bed than about 810 cub. ft.—that is, a floor space 9 ft. by 9 ft. and 10 ft. high—is quite unnecessary. If, of course, the rooms or pavilions are heated up to 60 deg. Fahr., and half the windows shut on a mild day, as I have seen done, then the greater cubic capacity is required; but with the windows open, and only a moderate amount of artificial heat (if any), the 810 cub. ft. is ample, as there is a constant and thorough change of air. In the room system, however, we are not so fortunately situated, as the lower part of the room next the corridor, just where the patients are sleeping, is out of the direct line of ventilation; and I much question whether there is any movement in the air at this part, except that caused by the heated breath of the patients, and in the hot weather the movement of air at this point must be almost imperceptible. On the corridor system I should say that mechanical means of ventilation was very desirable if fresh air is necessary. Supposing it is laid down that rooms are necessary, then can we devise a scheme to reduce the difficulties?

The corridors can be constructed of light material, and be much cheaper than if the corridor were formed in the main building. These corridors can be formed of metal and glass, with plenty of parts to open, or with permanent openings formed, kept beautifully sweet and clean, be more economical, and yet serve the same useful purpose as if the corridor were in the main building. Another plan would be to make corridors in the form of cloisters without any enclosing walls. All projections, such as balconies or cornices, if placed immediately above the window tops, obstruct the light, and, what is more important, the actual sun rays. It is a matter for careful thought whether a balcony of sufficient width to be of service does not do more harm than good, and I would advocate that all projecting balconies be entirely omitted.

In some buildings the ground floor is used for medical and other rooms, and the top floor only for patients. The balcony in this case does not affect the wards. It is a question, however, whether it is advisable to have any other accommodation than for the patients in the same block. I would strongly advocate the principle of separate blocks for beds and administration department, and common rooms in blocks to the north of the pavilion. Personally, I should like to see such pavilions containing only the ground and first floors.

### Fire Precautions.

Every ward should have at least two possible exits in case of fire, and the doors should be so arranged that (at least on the ground floor) a bed can be wheeled right into the open, and in the case of upper floors it should be carefully considered whether it is not advisable to have sloping ways as a second means of exit in lieu of the usual staircase. Such a sloping way would allow of the beds being taken right down to the ground level, would cost no more for construction, and would not be more unsightly.

Hydrants are seldom fixed into the actual wards, but should be so placed in corridors, or outside, or both, and the hose of sufficient length so that a fire at any point of the building can be reached, and I am almost inclined to think that all main rooms and wards should be fitted with automatic sprinklers. In all cases the whole of the buildings throughout should be of fire-resisting construction.

### Lighting.

Each ward, and all entrances, corridors, and the principal rooms, should be lighted on two separate circuits, so that if a fuse happens to go, only half the lights are affected. In addition to the double circuit, the operating-room must have an emergency lamp independent of the main supply, and arranged either by accumulators on the roof of such rooms, or by a self-contained electric hand-lamp always kept ready charged.

Of the many hospitals and sanatoria which I have visited during the last few months, I have not found one of the wards or corridors lighted so that the maximum results are obtained with the minimum amount of discomfort to the patients and other users of the building.

The illumination of these buildings requires to be more carefully thought out than has hitherto been the case, and I am sure the discomfort which must result to a patient in an ordinary hospital who occupies a bed on the average for twenty-one days by having a brilliant light in his or her eyes has been but slightly

realised. Undoubtedly indirect lighting is an essential preliminary requirement for all wards. Equally so for corridors and other rooms. The operating-room has received a very considerable amount of study, and these are lighted in various ways, some having six lights flush with the ceiling with partly obscured glass, others having a central fitting with 100-candle power lamp in the centre, and four bull's-eye lights in the form of branches with about 25-candle power, and these are so adjusted that the light can be focussed on any part of the patient. Others, again, are fitted with stand lamps, and others with large swing arms, while some of the operating-rooms have been fitted with arc lamps, and the lights so reflected by mirrors that a concentrated light is obtained on the patient.

Arc-lamps, varying so much in the intensity of light given, seem to be the least desirable of any of the systems. Other operating rooms have powerful rays of light transmitted from the outside of the room, and so reflected by an elaborate system of mirrors that many rays of light are focussed on the table. It would seem to me, however, that such a system involves a large surface of dust-collecting mirrors and other fittings, and that the benefits derived from external lighting are very considerably reduced.

I think the ceiling light, with flush, semi-opaque shades, supplemented by concentrated rays of direct light, is the best that can be obtained for the moment. Then, with regard to the general question of lighting of wards and other rooms, I think that it is so very often forgotten that natural lighting is a very diffused light, always coming from overhead; and it is of little wonder that with the general system of artificial lighting by direct rays, the medical man's practice to-day is so much taken up with defective or weak eyesight in some form or the other.

The power and convenience of electric light has not yet been realised here as it has been done in other countries where lighting has been more to the front. With the old limitations of lighting, such as we must get from oil lamps and gas, which lights were of comparatively small candle power, the same system is not suitable when we get concentrated light and higher candle power, as we do with the metal filament lamps to-day.

I think the ward should be lighted by reflected light from the ceiling and walls, placed in such position and of such power that an evenly distributed light is obtained throughout the ward, such light being sufficient for the purpose of patients reading and for the general conduct of the ward. For bedside examination the lighting should be obtained from plugs at the side of each bed with movable fittings. I think that perhaps many of the lighting systems in our institutions were installed when electric lighting, fittings and lamps were somewhat in their infancy; but now we have metal filament lamps, some readjustment is necessary in the old buildings, and entirely revised systems in the new buildings.

VENTILATION AND HEATING.

I do not propose to go into the question of ventilation very deeply, as the ventilation of sanatoria is a matter which is arranged entirely by nature if the system of the pavilion is adopted. The treatment being essentially one of open air, provided the structure is not designed to contain a large number of impossible corners and dark unlighted recesses, the windows being constantly open and carried right up to the ceiling line, and the air not being imprisoned by deep soffits, no mechanical means of ventilation is required.

As in hospitals, so in sanatoria—the methods of heating are various, some being heated by steam, hot water, low and high pressure, open fires in the centre of wards; in some of the sanatoria no artificial heating is allowed summer or winter.

In the sanatoria a patient's period of occupation is generally about three months; therefore, for the patient's greater comfort and satisfaction, if any heating is adopted, I would favour heating by open fires, supplemented by steam. The reason steam is favoured here is that the pipes can be of a much smaller diameter than even on the accelerated system of low-pressure hot water; and further, the radiators can be of much less size. The radiators, too, should be made of the swing pattern, so that every particle of the wall and floor surface can be thoroughly cleaned. If, however steam is adopted, the humidity of the air must be carefully considered, and it must be helped by a permanent method of fresh air into the wards. If this is done no discomfort is felt from the steam heating.

It is surprising to observe in some sanatoria and hospitals abroad that the patients do not appear to object to the open-air treatment so much from the point of view of the cold; but, being so used to working and living in high temperature rooms with a very dry air, when they come to these public buildings for special treatment they still seem to aim at getting the same dry atmosphere. In many of the sanatoria visited, over 50 per cent of the windows made to open were found to be very much closed, the air being kept dry; and it seems that so long as this is achieved they are quite happy.

There are many forms of shelters used. Some of these are detached, some semi-detached, others are made for two beds in one shelter, and, in fact, every settlement has some little different arrangement, and are formed of many different materials.

CONCLUSION.

We have now been through the most important general method of building sanatoria, and one or two points might be summed up.

I would think that, owing to the great difference in cost, the pavilion system would be the most suitable for national sanatoria; that to reduce disturbance from coughing the pavilion might be divided with light double-glazed partitions, so that about six patients only were in each division; that districts should combine, and buildings to accommodate not less than 150 and not more than 500 patients be erected, and thus avoid such a large capital outlay for fitting up so many independent sets of apparatus, and afford a larger number of patients the benefits accruing from a thoroughly-equipped establishment, the cost of which would be prohibitive in each small unit; that such larger unit would allow of more favourable and suitable sites being purchased, and would avoid so much duplication of lighting, water, sewage, disinfecting and heating plant; that such works managed on a larger scheme would cost much less per bed for staff, upkeep and maintenance than many small units; that the domestic supply contracts could be obtained on better terms, the medical, nursing and domestic staff be more economical, and the research work and statistics more reliable and could be put to better use, as they would be more comprehensive, and more reliable deductions could be made from th m; and still further, the sterilising and Pasteurising plant and apparatus can be made more complete and more freely used than it is at present.

This paper has been taken on broad lines, but there are one or two points which I would like particularly to mention with regard to the fittings. Without exception, the whole of the fittings, of whatever nature and class, should be of the strongest and most simple design possible. The wear and tear is very great, and the cost of maintenance is considerably decreased by purchasing first-class fittings and apparatus in the first instance. It is hardly necessary to refer in detail to the fittings for the sanitary arrangements. I would strongly advocate, however, that sufficient accommodation and room be given here. The fittings should be of the very best class, and so arranged that every part can be thoroughly cleaned; further, that all pipes no matter of what description, should have ready access; and no wires or pipes in any part of the building or grounds should be buried, so that immediate attention can be paid to any part without cutting up or interfering with any other section of the work. All doors should be absolutely flush on both sides, and no mouldings in any part of the buildings allowed under any circumstances.

One word I would also like to give with regard to the question of temporary methods of construction for sanatoria and similar buildings. I am strongly of opinion that the only materials fit for the construction of such class of work are brickwork, stone and reinforced concrete. All other materials I would eliminate, including concrete blocks. I do not in any way consider concrete blocks as suitable for building work, and a building properly and economically designed can, in my opinion, be constructed as cheaply in a permanent form as in any temporary form of construction which is at all feasible or possible for these buildings.

I am aware that each section of this paper is a subject in itself worthy of detailed discussion, but I thought it would be better and more acceptable to you to have the matter treated very broadly. An architect's position in connection with the construction of hospitals and sanatoria is not always that of the easiest. He is the centre pivot around which is collected the doctors' requirements, the matron's suggestions, the sisters' and nurses' wishes, the demands of

the site and the financial limits, not to mention the necessity of working harmoniously with the committee, of obtaining a satisfactory job from the contractors within a reasonable time, complying with the rules and by-laws of the various local and other authorities, and last—but certainly not least—the comfort of the patients. To carry all this out successfully, all the human units must have very broad minds, and work in perfect harmony.

## SOME RECENT PUBLICATIONS.*

THE BACK GARDEN BEAUTIFUL: WHAT TO GROW AND HOW TO GROW IT. By Harry Havart. Price 7d. nett. London: The Amalgamated Press, Limited.

A very practical little book for the proud amateur who finds himself installed in a suburban home with a bit of waste behind it, usually planted with builders' rubbish, and generally limited in size by the width of the house frontage. But there is no reason why this little plot should not be made attractive, even beautiful; and we know of no book better calculated to effect this if used with intelligence by an enthusiast. Under the author's experienced guidance, and with the aid of the numerous illustrative diagrams given, the novice should find delightful occupation and an early reward in the shape of a garden beautified with a minimum of outlay.

HIGHWAY ENGINEERING AS PRESENTED AT THE SECOND INTERNATIONAL ROAD CONGRESS, BRUSSELS, 1910. By Arthur H. Blanchard, M.AM.SOC.C.E., and Henry B. Drowne, ASSOC.M.AM.SOC.C.E. Price 8s. 6d. nett. New York: Wiley & Sons. London: Chapman & Hall.

Prof. Blanchard and his chief assistant have done a useful work in arranging the materials furnished by the Brussels Congress in a form which is at once convenient for reference and suitable for close study. They believe that the highway engineers of one country can learn much from experience in other countries, and lay stress upon "the fact that the subject of foreign practice has not received the attention it deserves by American engineers." The first part of the book, some thirty-four pages, contains an account of the congress, including a brief description of the exhibition. The grouping of the papers is very clearly set forth as follows: Sections Subdivision Subject Question. Then under each "Question" there is given, in small capitals, the part of the subject to which it relates, and the name of the general reporter. The names of the countries follow in heavy black type, and under each there is given the names of the members who presented papers, and the subjects of the papers. The whole is very clearly printed, so that it is easy to make a reference by way of the name, the country, or the subject of the paper. A classification of members follows, so that it can be seen at a glance to what extent any country gave official and unofficial support to the congress. In Part II., "Technical Discussions," the names of those taking part in the discussion are put together at the beginning of each chapter (Subject), and in the text each name, in small capitals, is preceded by the name of the country to which the speaker belongs, printed in heavy black type. The authors state in the preface that although the words of the reporters have sometimes been employed, their object was usually "attained by presenting the important ideas of the reporters in abstract." Those taking part in the discussions are grouped under the names of their countries. It is, perhaps, the duty of the reviewer to give the reader an idea of the degree of fulness with which the technical discussions are presented. Each page contains about 280 words, and there are, under "Economics of Highway Engineering," about 13 pages; "Traffic Census," 5; "Materials of Highway Engineering," 15, and a 2-page table; "Foundation and Drainage," 11; "Macadam and Gravel Roads," 4; "Dust Prevention by the Use of Palliatives," 2½; "Bituminous Surfaces," 11; "Bituminous Pavements," 19; "Brick, Concrete, Stone, Block, and Wood Pavements," 10; "Trackways," 1½; "Footways in Towns and Cities," 5; "Road Machinery and Tools," 10; "Garbage Removal, Cleaning, and Watering," 9; "Removal of Snow and Ice," 11; "Road Signs," 4½; "Pipe Systems in Roads and Streets," 7; "Tramways on Roads and Streets," 11½; "Public Service Conveyances," 7½; "Highway Bridges," 5; and "Tyres," 6. This is followed by the "Conclusions Adopted" at the congress. Appendix I. consists of 2½ pages devoted to the "Proceedings of the Permanent International Commission," and Appendix II. contains the "Regulations of the Permanent International Association of Road Congresses." There is an author index and a subject index. The book is very well got up, but there might have been included in the main title, as it appears on the back, some indication of the scope of the work beyond the words "Highway Engineering." The authors are to be congratulated on having produced a serviceable book which will be of special value to those attending future congresses, to road engineers who have not yet got a clear grasp of the proceedings of the congress, as well as to many others to whom its handiness and convenient arrangement will appeal. Probably most road engineers will want to possess a copy.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

## QUERIES AND REPLIES.

*We cannot undertake to reply to any queries which are not accompanied by the writer's name and address. These are required as a guarantee of good faith, and not for publication. Sketches accompanying queries should be made separately, on white paper, in plain black outlines. Queries relating to legal matters should be brief and plain.*

**891. Construction of Sewers in Quicksand.**—"J. C." writes: I should be obliged if you would give me the name of a recent work dealing with the construction of large sewers in quicksand, and also if you could tell me of any works of this kind that have been carried out within the last eight years?

We would refer our correspondent to Colonel Moore's "Sanitary Engineering," "Sewerage Systems," by H. S. Watson, and Mr. H. C. H. Shenton's book, "Practical Sewerage and Sewage Disposal." The last mentioned is only 3s. 6d., and contains practically all that can be said upon the subject without going into detail and taking into consideration the special circumstances of each case. The information in this book is given in paragraphs 73 and 74, under the heading of "Foundations for Sewers." One large sewer that was laid in running sand was at Camberley, carried out under Messrs. Wilcox & Raikes, of Birmingham, about three or four years ago, but particulars of similar other works can doubtless be found by reference to back numbers of THE SURVEYOR.

**Institution of Mechanical Engineers.**—At a meeting of this body on Friday last the proposals of the council to institute an entrance examination for the younger applicants for admission to the institution were submitted for consideration, and a resolution approving the general principle of the scheme was adopted.

**London's New Approach Road.**—In the House of Commons on Monday it was stated that the offer of the Road Board to contribute to the construction of a new road in the West of London had not yet been considered by any of the local authorities concerned, and that it was not yet possible to make any statement with regard to the details of the proposal. A Bill would be rendered necessary for the construction of the road.

**Law of Private Street Works.**—It is surely a commentary on our system of legislation relating to what may be termed domestic matters that the owner of house property (to say nothing of the occupiers of his houses) has to thread his way through a maze of statutes and decisions to ascertain his rights and his liabilities in connection with questions which may arise every day. Such, however, being the case, text-books dealing with what on the face of them might be deemed to be simple matters have become an actual necessity, although the owner of property is lucky if the text-book suffices and he is not driven to consult a specialist. The work before us* deals with one of such subjects, private street works under the Public Health Acts and the Private Street Works Act, 1882, but not with the Metropolitan Management Acts; the statements in the text are supported by decided cases, with references printed in the text; there is also a table of cases and an index, and it should prove a useful hand-book. We find the recent decisions included, and the work seems to have been carefully prepared.—*The Builder.*

* "Notes on the Law of Private Street Works under the Public Health Acts." By J. B. Reginer Corder, a Solicitor of the Supreme Court. 3s. 6d. nett. London: St. Bride's Press, Limited, 24 Bride lane, E.C.

# Proposals for Dust Suppression and Road Improvement.*

By Dr. GUGLIELMINETTI, Paris and Monte Carlo.

Owing to the fact that I have, on hygienic grounds, devoted my attention for about ten years past to the study of dust suppression (road-tarring), and that I am a member of the permanent International Road Commission at Paris, which has addressed itself to the practical solution of this problem—*viz.*, the adaptation of existing roads to the new motor traffic—I have lately received several inquiries from Switzerland (among others from Colonel Pfyffer, of Lucerne, and Mr. Megevet, of Geneva) as to what is actually being done in Switzerland against the dust, the prevalence of which is undoubtedly one of the chief causes of the embitterment of the Swiss people against automobilism.

When it is remembered that even during the past excessively hot summer the residents on roads much frequented by motors were obliged to keep their windows closed all day long on account of the dust, that country seats on such roads have depreciated in value, that for a width of several yards near the dusty country roads the cattle refuse to eat the grass, that the clothes and hats of people taking a Sunday walk are spoilt, without mentioning the injurious effect upon our health of this dust as a vehicle of various disease germs—bearing all this in mind, it is not to be wondered at that the vast majority of the Swiss people are embittered against the relatively small minority of motorists. One cannot altogether blame the people, but, on the other hand, the entire blame does not rest upon the motorists.

If a motor, with its broad, absorbent rubber tyres, drives—even at a reasonable speed (30 kilometres = 19 miles per hour)—over a road covered with a layer of dust some inches thick, one must not be surprised at clouds of dust being raised. But if the same motor drives at the same speed on a well-made and well-cared-for country road on which no dust is lying, then there is no dust nuisance there; and, speaking generally, it may be said the better the road, and the more resistant the material with which it is made, the less dust there will be. Now, it would certainly cost too much to cover long stretches of road with asphalte, wood, or paving-stone, which is at present being done, as far as possible, in towns where the traffic is heavy; for country roads in several districts, however, improvement is attempted by making the roads more resistant and by watering, tarring, &c., to lay the dust on their upper surfaces.

The chief requisites for a well-kept road are good road material and a steam roller to roll the road metal in properly.

The solution of the dust problem is, therefore, more or less a question of money. Owing to the yearly increase of general traffic, and especially since the spread of motoring, the need of good roads is becoming ever more urgent in all countries, and naturally also in Switzerland, and therefore the earlier method of road maintenance is no longer sufficient.

### PROPOSED SOURCES OF FUNDS.

From whence, then, are these necessary additional expenses to be obtained? Speaking generally, it is not only motorists who require well-kept roads, but also carriers, residents on the roads, &c. Good roads are [illegible] a country's [illegible]. *Vice versâ*, it [illegible]. The Way to Love [illegible].

Every country ought to make it a point of honour to have good roads, but every advance costs sacrifices; it is only stagnation that is cheap. An inferior gravel [illegible] a good type [illegible] does not last so long, and as the result is bad road metal everything suffers. [illegible] much to [illegible] weather and [illegible] are obliged to reduce their loads. The same applies to the rolling: [illegible] almost as much on a good smooth road as the horses on a good macadam for miles with loose gravel. The rolling in of the gravel by the heavy traffic is a different [illegible] from the [illegible] rolling [illegible] it was [illegible] the latter [illegible] it would have [illegible] to have a steam roller. The ever-[illegible] with [illegible] to [illegible] the [illegible] of [illegible] and [illegible] the [illegible] of [illegible] drag-

* Read before the presidents and delegates of the Swiss Motor Club and the Traffic and Hotel Union at Berne on September 4, 1911.

bility of the road is thereby prolonged to such an extent, and the costs of road maintenance for the period are so much reduced, that the final balance-sheet shows a saving has been effected.

Now, it is beyond all doubt that every Cantonal Government perceives the utility of good roads, yet it cannot possibly make the corresponding increase in its road budget all at once. It is therefore very necessary that help should be forthcoming from those whose interests are chiefly concerned. Among these I reckon first of all the motorists (foreign and native), then proprietors of hotels and restaurants, traffic unions, villa residents, all of whom will doubtless be ready and willing to furnish a financial contribution towards a better road maintenance. Motorists who—as, for example, in Aargau—are paying taxes of 10 francs only for a 30-horse power motor car, have told me that they would willingly be prepared to pay taxes up to 100 or 150 francs if these were spent on improving the roads; and such a not too excessive taxation would at once produce an additional yearly revenue of 20,000 francs (£800) for Canton Aargau. If, now, every first-class hotel would contribute, say, 1 franc per bed per annum, and the smaller hotels, say, 50 centimes, this would also yield quite a respectable amount; moreover, the occupier of a country mansion with a garden adjacent to a dusty road would perhaps be willing to spend a few hundred francs in order to be free from dust. At least this is what I have been able to accomplish in the South of France, where the hotels and traffic unions, casinos and villa owners, together with the communes, pay one-half and the State pays the other half of the cost for road-tarring, or for water-sprinkling where tarring is not practicable. This dust-laying has in several French departments quite done away with the dust nuisance, and between Nice and Mentone in the height of the season there are more than a thousand motors running in a day, and yet no one complains any more of the dust, notwithstanding the long and warm period of drought on the Riviera. And now the hotel proprietors have nothing more to pay, because the tarring is paying for itself.

Money, however, is not yet everything; much must also depend on how it is spent. As in every other kind of construction, considerable progress has been achieved of late years in road making; and the problem of adapting existing roads to the new traffic at the lowest cost was the subject of two International Road Congresses—at Paris in 1908 and at Brussels in 1910—which were promoted by the French Government, largely as the result of a petition from our Dust League. To these conferences thirty-three civilised States sent their delegates, Switzerland itself, as well as several individual cantons and towns, being also officially represented.

Although it cannot be affirmed that any miraculous remedy against dust was discovered at these two congresses, yet several ways and directions were indicated, along which a nearer approach is being made towards the solution of this problem, and some general rules were laid down which can be very well adapted for every country, and therefore for our beloved Switzerland also.

### A PROPOSED CONFERENCE.

For the purpose of obtaining an exchange of opinions on the money question—*i.e.*, how to procure the necessary means—as well as on the cheapest and quickest method of adapting some of the greater main roads for motor traffic, according to the nature and weight of the traffic, the kind of stone, the situation and condition of these roads, &c., it appeared to me that the best way would be to have an Inter-Cantonal Conference of the Directors of Public Works, with the Cantonal engineers in attendance, to which those chiefly interested, motor clubs, hotel and traffic [illegible] should be invited, as well as the borough engineers of the larger towns.

I have for this purpose already visited the [illegible] directors of public works, Messrs. Comtesse, Dr. Haab, Zurich; Comtesse, Kohler, Aargau; and Councillor Bucherer, Lucerne, and [illegible] with the presidents of the local motor clubs, Messrs. Wyss, Zofingen; Vodoz, Vevey-Aarau; Bally, and Frencke

Zuel ueh, Aargau and the directors of public works, have gladly welcomed the proposal for a road conference of that kind. Dr. Haab at once declared himself ready to convene such a conference of directors, as he had formerly invited a conference of directors of justice, military affairs and finance, conditionally on his obtaining the necessary assent of his colleagues, of which, however, he felt confident. All three directors thought the moment was opportune, as an ill-wind is blowing over motor affairs in Switzerland at the present time, and there is undoubtedly a tendency to restrict the motor traffic considerably, if not to prohibit it altogether. They did not conceal from us that with them the conditions are just now very unfavourable for motorists, and that as quickly as possible it must be ascertained what can be done to counteract the enormous dust nuisance, especially on certain great main roads. There would shortly be sent from the police headquarters to the respective cantons an agreement proposal on behalf of a uniform regulation as to the speed limit for motors, and the directors of public works are in great embarrassment about making such a proposal to their authorities if nothing is going to be done against the dust. Proposals have already been made, first, to debar from certain roads, and only to allow motoring on certain other roads, secondly, to permit the motor traffic only at certain times, and on Sundays, especially, to prohibit it; thirdly, specified roads within villages and communes to be regularly sprinkled with water, or to be tarred, &c. Now, if these various questions could be discussed, and also answered by the directors of public works unitedly, that would be a very welcome result.

Such a conference would afford an opportunity for an exchange of opinions on the possibility of selecting some of the greater through roads and giving special attention to those places thereon which suffer most from dust. In this way the Zurich Motor Club, for example, has already assisted some villages and communes in procuring water-sprinkling casks, and the Cantonal Government of Aargau has also placed steam rollers and tar-machines at the disposal of the communes. It should not matter in which cantons these dusty districts be; indeed, even the cantonal roads nowadays no longer serve only for intercommunication between different places in one canton, but are becoming more and more through roads. A foreign motorist no longer asks in which canton he is; if he is driving on a bad road, he simply says: "The roads in Switzerland are bad." It may be said, too, that the Aargau roads serve not only the Aargau man, but also the Zürich, Berne, or Bâle man who drives through Aargau. It is, therefore, very desirable that there should be a maintenance centre for individual through roads, and it is perhaps possible that the Traffic Office proposed by Mr. Seiler, member of the National Council or Parliament, would form such a centralisation of the voluntary contributions for roads improvement.

At a conference such as that suggested also, the cantonal engineers would perhaps ascertain which road metal could be got, whether "Eisenschotter), at 6 francs the cubic metre, or Swiss basalt, at 28 francs; why road tarring is very successful in the cantons of Bâle, Vaud, and Geneva, and less successful in the cantons of Zürich, Lucerne, &c.; how large a traffic must be to make it more economical to replace the road metal by stone paving or asphalte; if it would not be more advisable to hire steam rollers instead of purchasing them. These and several other questions of the kind might be dealt with.

If by means of such a road tribunal a solution of these burning questions could be found which should satisfy residents on the roads as well as frequenters and users of these roads, a great advance would thereby have been made, and the best proof would be given to the Swiss people that the motorists intend to make good, as far as is in their power, any damage done by them, and we hope that in the general interest those on the other side will then meet the new traffic with somewhat less of antipathy.

[A "Minute" with reference to Dr. Guglielminetti's article will appear in our next issue. Ed. The Surveyor.]

**A Baxter Plant in Calgary.**—According to the annual report of Mr. J. T. Child, the city engineer of Calgary, Altona, the new rock-crusher plant purchased last year from Messrs. Baxter & Co., of Leeds, is doing excellent work, crushing from 70 to 80 cubic yards a day.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

### COUNCIL MEETING.

At a Council meeting held at the offices of the institution on February 10th there were present: A. D. Greatorex (president, in the chair), Messrs. Blair, Wike, Chambers, Cockrill, Lancaster, Carter, Thomas, Elford, Barber, Stilgoe, Gladwell, Newton, Hayward, Scorgie, Harpur, Thomas Cole (secretary), and H. A. Giles (assistant secretary).

Elected as Member.—Mr. H. C. Whitehead, chief assistant, Southend-on-Sea.

Elected as Associate Members.—Messrs. C. D. H. Vanstone, first assistant, Paignton, Devon; R. S. Macmillan, burgh surveyor's office, Leith; P. I. Payne, resident engineer, Petersfield; A. V. Cole, engineering assistant, Willesden; J. Pryde, assistant county road surveyor, West Fife; and H. C. Swindells, engineering assistant, Withington.

Elected as Students.—Messrs. L. R. Impey, borough surveyor's office, Sudbury; and C. B. Thomson, surveyor's office, Smethwick.

Transferred from Associate Members to Members.—Messrs. S. G. Baggott, deputy borough engineer, Macclesfield; J. G. R. Baxter, deputy borough engineer, Grimsby; R. H. Beaumont, surveyor to the Torpoint Urban District Council; C. D. Bell, surveyor to the Camborne Urban District Council; J. H. Bentley, deputy borough engineer, Oldham; J. T. Briscoe, deputy engineer to the Enfield Urban District Council; R. D. Brown, city engineer, St. Catharine's, Ontario, Canada; A. H. Claypoole, divisional engineer, Bristol; J. E. Cooke, assistant borough engineer, Islington; G. Cowan, district surveyor, Portsmouth; J. Draper, surveyor to the Saltburn-by-the-Sea Urban District Council; E. W. Edwards, surveyor to the Blaenavon (Mon.) Urban District Council; D. Ellison, deputy borough engineer, West Bromwich; H. A. Endsor, surveyor to the Keynsham Rural District Council; J. W. Foster, chief assistant, Bradford; J. Gair, assistant borough surveyor, Marylebone; J. Gordon, assistant borough surveyor, Aberdeen; G. W. Hewes, surveyor to the Barrowford Urban District Council; E. R. Hinchcliff, deputy surveyor to the Barry Urban District Council; W. C. Holloway, engineer to the Waltham Cross Urban District Council; R. J. Jenkins, chief assistant, Portsmouth; F. C. Jenkinson, chief assistant engineer, Rotherham; C. H. Kilmister, Public Works Department, Colombo, Ceylon; J. S. King, assistant surveyor to the Friern Barnet Urban District Council; T. H. Lighbody, surveyor to the Hemel Hempstead Rural District Council; R. S. Lloyd, surveyor to the Hereford Rural District Council; W. H. MacKenzie, assistant borough engineer, Bournemouth; L. S. McKenzie, city engineer, Bristol; W. R. Manning, assistant borough surveyor, Chelsea; F. Mansfield, borough surveyor, Abergavenny; W. J. Merrett, assistant county surveyor, Redruth; J. Neave, chief assistant, Walthamstow; E. W. Oxberry, borough engineer, Kendal; W. L. F. Palmer, district surveyor, Bristol; J. B. Paterson, chief assistant, Dundee; D. H. Price, deputy surveyor to the Mountain Ash Urban District Council; F. Read, deputy surveyor, Pentre, Rhondda; J. Rowbottom, chief assistant, Ashton-under-Lyne; J. S. Sawdon, chief assistant, Margate; E. A. Slater, deputy borough surveyor, Colchester; C. P. Smith, assistant borough engineer, Greenwich; J. R. Thackeray, deputy borough surveyor, Eastbourne; W. Thompson, deputy borough engineer, Burton-on-Trent; W. H. J. White, deputy borough engineer, Cheltenham; and J. H. Williams, deputy borough engineer, Todmorden.

The preliminary arrangements for the visit to Paris were approved. Upon the recommendation of the committee to whom the matter was referred for consideration and report, the council resolved "That it is not necessary or desirable that priced bills of quantities and schedules should be sent in openly with tenders; but that it is essential that the prices in the bill of quantities and schedule should be approved by the engineer before a tender is recommended for acceptance." The secretary was instructed to convey the foregoing resolution to the National Federation of Building Trades Employers, informing them that the council would recommend the members of the institution to adopt this practice in future contracts.

Upon the recommendation of the committee to whom the matter was referred for consideration and report, the council resolved "That the Cement Makers' Alli-

ance be informed that the council regret that they are unable to recommend the members of the institution to adopt the arbitration clause suggested by the alliance."

The following new regulations as to admission of visitors to meetings were approved and adopted: "Members shall be entitled, subject to the approval of the president, to invite as visitors to the meetings of the institution members or officials of local authorities, or engineers engaged in private practice, under the following conditions: 'Members desirous of introducing visitors to the meetings must forward to the president the name, address and profession of the proposed visitor at least five days in advance of the meeting. If permission is granted, the president will issue a card of invitation to the secretary (or hon. district secretary), who will note and forward same to the visitor. The number of invitations may not exceed two, except by permission of the president, and it is to be understood that no person, whether an engineer or otherwise, will be admitted to a meeting who is engaged in any trade or manufacture connected with the work of public authorities.'"

The council resolved that an index to volumes 31-37 should be prepared.

Upon the recommendation of the Roads Committee the council resolved to forward to the secretary of the County Councils Association certain amendments to the recommendations of the Central Committee as to motor signs. The council further resolved to memorialise the Local Government Board with a view to obtaining amendments to the Heavy Motor Car Order of 1904 and in the Locomotives Act of 1878.

A resolution received from the secretary of the Lower Thames Valley District Surveyors' Association, recommending that further powers be conferred upon local authorities to define routes for motor omnibuses and other motor vehicles, was deferred for further consideration.

Messrs. A. D. Greatorex and E. J. Elford were appointed delegates to the Engineering Standards Committee on Cast-iron Pipes for Heating and Ventilation and Mr. E. B. B. Newton was appointed delegate to the London Council for the National Registration of Plumbers.

[illegible] of the Council.

Thomas Coll,
*Secretary.*

[illegible] meeting [illegible] the nomination of Mr. A. W. Beadle, C.S., Holmwood, [illegible] ordinary member of council the name of the town was inadvertently given as Bury.

**New Town Hall for Marylebone.** The Marylebone Borough Council have been recommended to approve the scheme of Mr. E. Cooper Cutts for a new Town Hall for the borough, to cost £61,915.

## THE ROAD BOARD PERSONNEL.

### 1.—SIR GEORGE GIBB.

The subject of the accompanying portrait—the first of several which we propose to give—requires little, if any, introduction to municipal engineers. As the chairman of the Road Board since its formation, his name has become a familiar one to all concerned with highway matters, and the sterling qualities which he has exhibited in the administration of the important department under his control are readily acknowledged by all in a position to judge.

Sir George, who is the youngest son of the late Mr. Alexander Gibb, an Aberdeen engineer, received his education at Aberdeen Grammar School and University, and commenced his career in 1872 as an articled clerk in a solicitor's office. Five years later he became an assistant in the Great Western Railway solicitor's office, and subsequently commenced practice on his own account. In 1882 he was engaged as solicitor to the North-Eastern Railway at York, and was appointed to the post of general manager in 1891. He acted as the arbitrator for the company in the wages arbitration before Lord James of Hereford in 1897, and was a member of the committee on War Office Reorganisation in 1901, and of the Royal Commission on London Traffic in 1903. At the present time he is a director of the North-Eastern Railway Company and chairman of the Metropolitan District Railways Company. Sir George is in the 63rd year of his age.

*From photo by Sarony & Co., Ltd., Scarborough and Harrogate*

SIR GEORGE GIBB.

**The Manchester Building Exhibition.**—The Surveyor advertisement manager has received from Mr. James S. Dunn, borough sanitary inspector of Kimberley, South Africa, a letter intimating that he will be glad to receive from exhibitors at the above catalogues of any up-to-date appliances suitable for that country and used in connection with building or sanitary works.

**Interesting Road Plan Relic.**—The Plans and Works Committee of Edinburgh Town Council have received for the Corporation Museum from Mr. J. Lindsay Hilson, Jedburgh, a plan of the "present and proposed new road between Edinburgh and Newcastle by J. Macadam," dated 1828.

**Milan's Water Supply.**—Milan has recently reorganised its water supply by boring, to a depth of 260 ft., upwards of seventy artesian wells. For supplying the mains eight water stations have been built, and nine are being added. For operating some of the pumping plants Diesel oil engines have been adopted; the others use steam engines. Electric motors are also employed for a number of them.

**The Romance of Engineering.**—When the engineers of the Catskill aqueduct reached the Hudson River and sank their test borings in its bed, they found to their dismay that below its waters was a deep geological gorge, filled to a depth of 800 ft. with loose glacial drift. So they determined to blast out a tunnel below the gorge, going down until they reached absolutely solid rock that was impervious to water. They found that they would have to sink to a level over 1,100 ft. below the surface of the river—and this they have done. So when the work is opened, an artificial subterranean river of pure mountain water nearly 100 miles in length will flow from the Catskills to New York. When it reaches the Hudson, at an elevation of 400 ft. above the river, it will make a sheer drop of 1,500 ft., flow horizontally for over 3,000 ft. at a depth of 1,100 ft. below the river and within walls on each square foot of which the water will exert a pressure of 461 tons, and then rise vertically through a height of 1,500 ft. to the "flow-line" level of the aqueduct. It is a great work boldly conceived and most successfully accomplished.—From *Scientific American*.

# Correspondence.

*"All truth is precious, if not all divine."*—COWPER.

## PROFESSIONAL ETHICS.

*To the Editor of* THE SURVEYOR.

SIR,—

"The time has come, the Walrus said,
To talk of many things,
Of shoes, and ships, and sealing-wax,
Of cabbages, and kings,
And why the sea is boiling hot
And whether pigs have wings."*

These lines came to my mind when reading Mr. A. J. Martin's presidential address before the Institution of Sanitary Engineers, and with your permission I should like to carry his arguments further, to what I take to be their logical conclusion. Mr. Martin says that "a very heavy responsibility rests upon those local authorities who foster a low standard of professional ethics by encouraging the cutting of fees and tempting their engineers to supplement their earnings from other sources." I want to show that this position is brought about mainly by those who deplore it, that engineers and architects are but experiencing in a minor degree the result of the treatment they have meted out to others. We are agreed as to the need for true morality in business and professional as in our private lives. To make this possible for others is to do so for ourselves. The payment of a higher price for services rendered, whether for advice given or work done, is an incentive to better work—from a sordid aspect it is economy. From an ethical standpoint it evolves what is good in man. The actual *cri de cœur* must be for better work and a higher standard of business morality.

Lord Hugh Cecil, in the debate on the Address, said it was true that the sufferings about which they have heard were a result of the *Competitive System* which depended upon a side of human nature which was fundamentally un-Christian. He added that they "could not get rid of competition by Act of Parliament, but only by changing the human heart by moral teaching."

Between our love for the lowest tender and for business morality there is a great gulf fixed, which no anti-sweating laws will bridge, but the human heart *can*. We must choose between the human heart and higher ethics, or the lowest tender and debased morality. The action of each one of us tends to form public opinion, so that our individual actions count. The practice of calling for the lowest tender, and, if possible, still further reducing it, is a direct incentive to evil, it debases every principle of morality, its product is Poverty, and the workman whom some of us fain would help is the hardest hit. To talk Health and to create Poverty is illogical—to remove Poverty is to create Health. I often think that if those who tell us so readily "the lowest price will get it" really knew what that means, we should hear it less; if they could follow the items on that lowest tender through the many works and shops which are used to produce it, and see the numbers of men who in different ways are employed upon it, and follow them to their homes, they would be sad with us too for the sorrows they would see there—sorrows that even 5 per cent more on a contract would wipe away. It is because "evil is wrought for want of thought," that these things exist. We have got into a bad habit of doubting humanity. I may be told that these things are done "in the interest of our clients"; I do not believe it, they are done from habit which has made us too blind to see the result, and from distrust of our fellow-man. Few clients—whether council or owner—would knowingly have work done for them at such a price that by sweating only could the price be given (often below the estimate of the engineer or architect himself). It is wrong to expect more to make such tender and thing to pay a clerk of works to see them honestly carried out.

I am struck, not by the lack, but by the amount of business morality in commercial life. It is a high attribute to the honesty of the British trader that, in spite of the competitive system, this can be said.

It is illogical and wrong and unnecessary that a council or owner who can afford to pay should take advantage of a man who cannot and have the work done at the cost of another.

There is no object in reducing the price of all work to a figure at which no one can live. The lowest tender does this. It is the Spielman of the play. If the Local Government Board is wise in querying the wisdom of competitive designs, surely it is illogical to suggest the acceptance of the lowest tender in contracts. Is not equally good work required in the construction as in the design? If competition is bad for the engineer, it is far worse for the contractor.

Associated with the competitive system is the disregard of ownership for copyrighted articles which it engenders, which allows contractors to suggest and engineers and architects to accept substitutes which are placed on the market purely to take a trade created by another. This practice directly contradicts the higher ethics of business morality.

The fireclay manufacturing trade (among others) has been, and is, practically ruined by the habit of accepting the lowest tender. Underselling is reduced to a fine art, and the only hope of business men—either professional or commercial—is to get beyond the curse of competition.

If the Agenda Club will write over its portals the words of Lord Hugh Cecil, its name will be blessed in the sad, hopeless homes which the lowest tender has created.

"Who counts his brother's welfare
As sacred as his own,
And loves, forgives and pities,
He serveth Me alone."*

—Yours, &c.,

S. H. ADAMS.

White House,
Fulford, Yorks.
February 20, 1912.

* Lewis Carroll. "Alice in Wonderland."

## A NATIONAL HEALTH WEEK.

*To the Editor of* THE SURVEYOR.

SIR,—On behalf of the committee we desire to ask for the help of your readers in the establishment of a National Health Week.

The Health Week Movement is inspired by a recognition of the fact that the improvement of health conditions is approaching the limit of possible progress on existing lines, and that no further advance can be expected until the people themselves have been stirred to take an active part in promoting it. The health of the community depends as much on the man himself as on his surroundings. Personal hygiene, cleanliness, rational feeding, and other matters within the control of the individual are no less important than the work of the sanitary authorities. What now has to be done, therefore, is to arouse in each individual citizen an active and intelligent interest in his personal health.

We may be asked, "Why a Health *Week*? Is it not better to rely on continuous steady work throughout the year?" The answer is that we need both. There is at present no driving force behind this question of health. Any cause which depends for its vitality and force upon public opinion must have something definite on which that public opinion may crystallise, some opportunity for focussing attention and rekindling the enthusiasm of its adherents. The Churches have their great anniversaries, the political parties their general elections and other occasions for emphasising their particular views. Health workers have no such rallying points, with the result that the public take far less interest in matters of health than they do in the least of a dozen other questions of far less real importance.

We hope during Health Week to make health (in its personal and public aspects) the chief concern of every man and every woman in the country who takes an interest in public affairs. We propose to say to them, "Now is the time to look into your local health conditions, your death-rate, your zymotic disease rate, your housing question, the health and physique of the children in your schools. We ask you to look carefully into these matters, and if you see anything which is not as it ought to be, to do your part to remedy it and support your local authority in doing theirs." If we can only get people to concentrate their attention on questions of health, the rest is easy. They will refuse to tolerate a state of things under which 106 of every 1,000 children die in their first year, when they know

* Whittier. "The Vision of Echard."

that the rate need not exceed 9d. The experience of Battersea shows how rapidly the infant mortality rate may be brought down when once public opinion has been focussed upon it.

We are not a new society, and we do not compete or clash with any. Our committee is, in fact, mainly composed of officers of the leading health societies, nominated by those societies as their representatives. The Health Week celebrations in each centre will be under the control of a local committee, composed of representatives of the local health authority, the health societies, the friendly societies, the clergy and others who are in a position to influence public opinion. Several of these committees have already been formed in the metropolitan boroughs and the great towns.

The In- Health Week will begin on Sunday, April 28th next. The extent to which it is observed will no doubt depend very much on local conditions; in a country village there may be only a single sermon on the Sunday; in towns a full week's programme, with towns' meetings, lectures, exhibitions, mee ings of voluntary health societies, and organised visits to municipal works.

We are as a matter of fact, not alarmists. It is easy to get up a scare; but we have steadily set our faces against anything in the nature of sensationalism. We attack no one. We do not ask people to lash themselves into a frenzy. We discard, in short, all the aids which are commonly relied on by the promoters of a popular movement. Health Week is thus at a great disadvantage in competing for attention with other questions which are uppermost just now in the public mind; but we ask the Press and all who have a share in moulding public opinion to make our cause known, and to join us in arousing a great body of sober public opinion pledged to the prevention of preventable diseases and the sweeping away of every unnecessary hindrance to health.

We will not encroach further on your space, but will ask all who desire to assist in improving the national health and promoting national efficiency to communicate with the hon. secretary, National Health Week Committee, 28 Fleet-street, E.C.—Yours, &c.,

A. BOSTOCK HILL, Chairman National Health Week Committee.
W. SCHOOLING, For the Agenda Club.
OWEN SEAMAN,

February 16, 1912.

## CIVIL ENGINEERS' APPOINTMENTS BOARD.

*To the Editor of* THE SURVEYOR.

SIR,—In view of existing difficulties in the way of many engineers, especially of junior rank, securing professional appointments, we have undertaken, at the request of the council of the Institution of Civil Engineers, to form an organisation to assist such men to enter into communication with employers who are in need of the services of qualified engineering assistants.

The Institution of Civil Engineers will be prepared to receive applications for engineering employment, and also applications from employers for engineering assistants, and will endeavour to further the interests of both parties by placing them in communication in circumstances which may seem likely to lead to satisfactory results. Beyond this action the board cannot undertake any responsibilities. At the outset its operations must necessarily be limited in extent; but it is hoped that these may develop in a manner that may be serviceable to the engineering profession.

It appears to be impracticable for this business to be dealt with otherwise than by letter. Applications so made will receive prompt attention; and although correspondence on the subject must be strictly limited, those who apply may be assured that their wishes and requirements will at all times have careful consideration and attention.

To facilitate the business [illegible] seek employment will be furnished with forms in which to state the particulars necessary to enable a judgment to be formed as to suitable qualifications which they may be advised to make inquiry. It is not intended to deal with [illegible] which should not be sent to the board unless asked for, but to leave such details of special qualifications to be stated by the applicants individually to those with whom they may be put into communication.

As the undertaking must be self-supporting, it will be necessary to charge some small fees to those who make use of it, and these will be indicated on the forms.

We [illegible] especially to members of the Institution of Civil Engineers to assist our endeavour by communicating with the board at the address given below when they are in need of assistants, and shall be grateful for the support they may accord.—Yours, &c.,

ALEX. R. BINNIE.
COWDRAY.
ALEX. B. W. KENNEDY.
J. H. T. TUDSBERY.

3 Little George-street,
Westminster, S.W.
February 20, 1912.

## SIR JOHN MACDONALD'S LECTURE.

*To the Editor of* THE SURVEYOR.

SIR,—It may be of some interest to your readers to have an impartial opinion from one of those who were present at the Royal Institution last Friday and listened to the lecture on "The Road: Past, Present and Future," by Sir John H. A. Macdonald. As a member of the Road Board, the lecturer spoke with considerable knowledge of his subject, and his exposition was extremely lucid, while its quiet delivery was enlivened by many humorous sallies. Indeed, the optimistic hopefulness—may, more, the cheerful confidence—of the lecturer was quite remarkable; for, notwithstanding his advanced age, Sir John is not only abreast of the present period, but even ahead of it. Although he expressly disclaimed the gift of prophecy, he evidently anticipates—and with undisguised satisfaction—the practical disappearance of horse traction from our roads at no distant date. He did not entirely ignore the existence of prejudice against the new motor traffic, but showed that something very similar greeted the advent of stage coaches more than a hundred years ago. It was felt, however, by more than one of his hearers, that there are objections to the motor traffic of the present which are really of serious moment, and that the lecturer might have referred to some of these—*e.g.*, one to which a London coroner called attention only a few days ago—*viz.*, the enormous increase in the number of fatal accidents, an increase largely, if not entirely, attributable to the motor traffic, and constituting a considerable set-off to the "valuable sanitary improvement" which the lecturer claimed for the new traffic and the new roads.—Yours, &c.,

PRO VIÂ AD VITÂ.

February 22, 1912.

## ABSTRACTION OF MOISTURE FROM SEWAGE SLUDGE.

*To the Editor of* THE SURVEYOR.

SIR,—I have read with interest the reply of Mr. Wilkinson to your correspondent "N."

Last year I had the pleasure of examining the most up-to-date plant of this type at the Frankfort sewage works. At Frankfort, however, the resultant sludge is passed through a revolving drum after the centrifugal machines so as to rid the semi-dried material of its moisture. My object in visiting Frankfort was to ascertain the suitability of the machine for English sludge. I, however, came to the conclusion that as the method of sewage treatment in Frankfort was so very different from that in use in England, before any definite decision could be given on the matter it would be necessary to erect an experimental machine at an English works, and I offered facilities to the makers for this to be done, but up to the present nothing has come of it. I am afraid that the English sludge is very much finer in character than the Continental sludge—due to the difference in treatment—and therefore a large quantity of the organic sludge would pass through the sieves with the liquid. In that case the machine would be an utter failure from an economic point of view.—Yours, &c.,

REGINALD BROWN, Assoc.M.Inst.C.E., F.C.S.
21 Old Queen-street,
Westminster, S.W.
February 17, 1912.

**Drainage Works and Sanitary Fittings.**—A third [illegible] revised and brought up to date, particularly as regards the questions of concrete sewers, sewer ventilation and flushing, and the Public Health Acts Amendment Act of 1907, still further evidences the success of this little manual,* which manifestly deserves the attention and confidence of all concerned in the [illegible] subject with which it deals. *The Bookseller.*

* "Drainage Work and Sanitary Fittings." By Wm. H. Maxwell. Price 2s. nett. London: St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, E.C.

The Surveyor
And Municipal and County Engineer.

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## OUR CIVIL ENGINEERS.

The following verses from the *Bohemian Magazine*, dedicated to "Our Civil Engineers," form part of a strikingly original pamphlet which we have received from the Canadian Mineral Rubber Company, Limited, 34 Nicholas-lane, Lombard-street, London, E.C., a firm familiar to our readers in connection with the sale in this country of the well-known "Pioneer" asphaltic products, among which may be mentioned road, paving, fibre, reservoir, waterproofing, and sewer-joint asphaltes and mineral rubber-roofing cement:—

No bands are playing gaily when they're going into action,
No crowds are cheering madly at their deeds of derring-do;
They are owing small allegiance to any flag or faction
Their colours on the sky line and their war cry, "Put it through."

They slit the gullet of the earth; disgorge its hoarded riches
(But life's too short for them to stop and scratch a rightful share
They've a booking on the Congo putting in some water ditches;
A dating to take tea with death; they make it by a hair!

No bands are playing gaily and no crowds are madly cheering;
No telegraph behind them tells their deeds of derring-do;
But forward goes the legion, never doubting, never fearing
Their colours on the sky-line and their war cry, "Put it through."

**Abertillery and District Water Supply.**—On the 14th inst. the first sods were cut for the new waterworks to be constructed by the Abertillery and District Water Board at Lower Cwmyoy, at the foot of the Black Mountains, about 5 miles from Abergavenny. At the ceremony in question Mr. Baldwin Latham (the engineer) said they were inaugurating a vast scheme, by means of which the inhabitants of the Western Valleys of Monmouthshire would have a pure supply of water. The pipe will be carried down the Grwyne Valley through the new road to Cwmyoy, thence past Govilon to Waenavon, where a large tunnel will be bored through the mountain into the Western Valleys. Thence the pipe line will run down to the Abertillery district, where a new service reservoir is to be constructed. There will also be a new reservoir near Penyyan in the Abercarn district, and the pipe line will be continued down the valley to the Nantydraenog reservoir, Mynyddislwyn, in the Risca area of supply. The total length of the pipe line will be about 34 miles, and the estimated cost of these works is £247,000.

## VACUUM CESSPOOL EXHAUSTER AND COMBINED WATER CART.

The vacuum system of cesspool emptying, owing to its cleanliness and economy of working, is being increasingly adopted in districts where cesspools are in vogue. Briefly, the apparatus consists of a cylindrical tank, in which a vacuum is created by means of an air pump. A suction pipe is then dropped down the cesspool, and, on a valve being opened, the contents are drawn up into the tank without contaminating the atmosphere in any way.

The system was first introduced into this country by Messrs. Merryweather & Sons, of Greenwich, about fifteen years ago, and has met with considerable success. Our illustration shows one of the latest examples of the apparatus, but in this particular plant a somewhat novel departure has been made. In addition to being a cesspool emptier, the tank is also fitted with a spreader at the rear, and other necessary fittings, enabling it to be also employed as a water cart.

The tank has a capacity of 300 gallons, but other sizes are also made varying from 100 to 500 gallons.

MERRYWEATHER'S VACUUM CESSPOOL EXHAUSTER AND COMBINED WATER CART.

[illegible] capacity. The tank is constructed of steel, thoroughly well galvanised, and is fitted with a vacuum gauge, a gauge to show the depth of the contents, manhole, dome, and inlet and outlet sluice valves. The air pump for creating the vacuum, which is of the double-barrel, single-acting type, with gun-metal barrels and valves, is fitted in front of the carriage, between the tank and the driver's seat. It can be worked by two men. The road-watering attachment is fitted with arrangements so that the water can be turned on [illegible] as required. Pole and sway-bars are provided for two horses, a lever brake [illegible] and a skid pan is also included.

The addition of a spreader to a plant of this kind undoubtedly adds to its usefulness, and should be a further inducement to public authorities to adopt it.

**The Destruction of Vermin.**—The damage done and nuisance caused by rats and mice are so serious that the best means of exterminating these pests has been the subject of exhaustive tests by the Swedish, Norwegian and Russian Governments. The result of the experiments, we are given to understand, has been to prove that the only preparation giving complete satisfaction is "Ratin." Wherever used, "Ratin" practically exterminates rodents, and in such a manner that the dead bodies subsequently cause no offensive smell. The preparation consists of a food inoculated with bacteria. All that is necessary to be done is to place portions of the food, wrapped in paper, near the haunts of the vermin. It is then eaten greedily, communicating to the rodents a disease which speedily effects the work of extermination. "Ratin" is guaranteed harmless to human beings and domestic animals, and should be used by everyone who is troubled by rats or mice. Further particulars, including a pamphlet on "The Scientific Extermination of Rats and Mice," may be had on application to the "Ratin" Bacteriological Laboratory, 155 Fenchurch-street, E.C.

# Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

## QUESTIONS.

This week answers are invited to the following questions:—

**223. Reinforced Concrete Bridge.** Design a reinforced concrete bridge to carry a 36-ft. main road over a river (at right angles), single span 60 ft. between abutments, 36 ft. wide, 20 ft. from mean surface of water to the crown of arch. Banks 5 ft. above mean water level; foundations 15 ft. clay, then hard red sandstone. Allow for usual main road traffic, and show calculations. (A. P., *Liverpool.*)

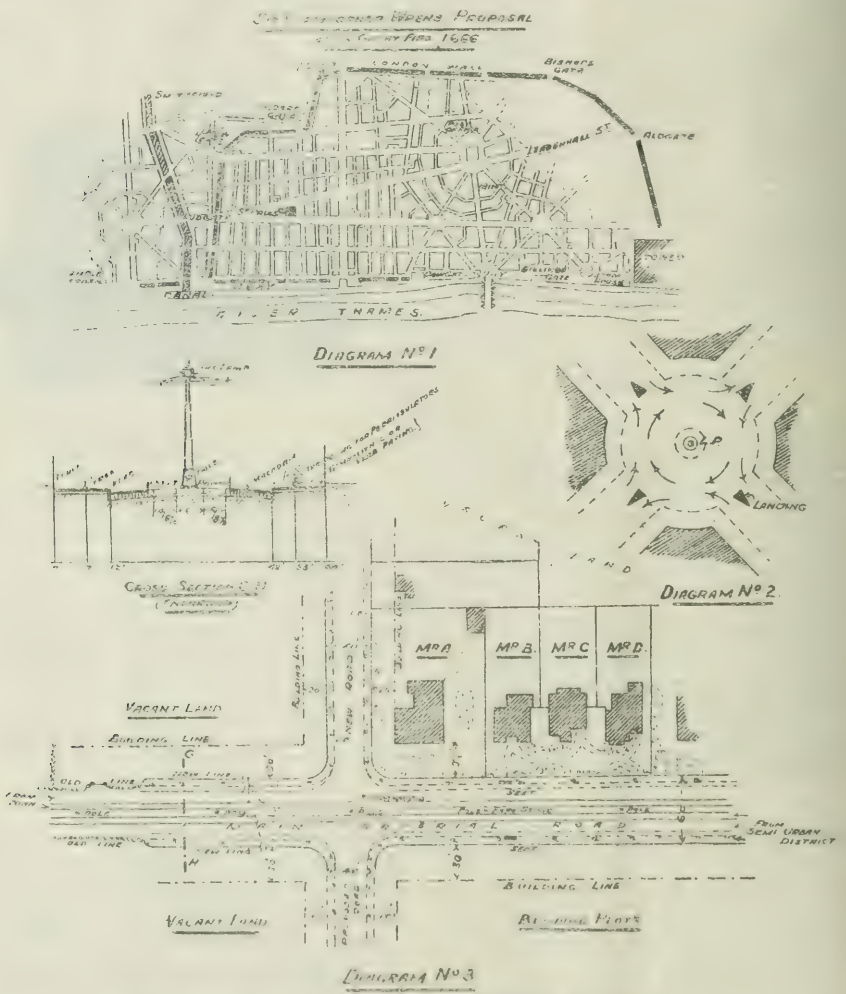
**230. Refuse Disposal.**—Describe, with sketches, a device for the mechanical sorting of house refuse.

**231. Discharge of Sewage.**—What is a suitable formula for calculating the discharge of sewage having a variable velocity over a 90° V-notch? (H. E. R., *Barnard Castle.*)

## REPLIES TO QUESTIONS.

**224. Town Planning.**—What are the chief points to be considered in laying out a new town?

Town planning cannot claim to be a twentieth-century invention. London, for instance, owes much




DIAGRAMS ACCOMPANYING REPLY TO QUESTION ON TOWN PLANNING.

**227. Refuse Disposal.**—Describe, with illustrations, the most efficient and economical form of refuse destructor for a village of 500 inhabitants. (M.Inst.Mun. and C.E., *Newcastle.*)

**229. Swimming Bath.**—Give sketches showing plan and [illegible] of an open-air swimming bath, say 60ft. by 120ft., with dressing accommodation. What method would you adopt for heating the bath? (M. and C.E., *Newcastle.*)

to the Great Fire of 1666, and might have owed more had Sir Christopher Wren's remodelling been carried out as in diagram 1. This subject is now a living one, and we must profit all we can from our Continental neighbours, who have already adopted [illegible] Town plans resolve themselves into one of the following: (*a*) Rectangular; (*b*) triangular; (*c*) radiating; (*d*) irregular or picturesque;

with perhaps combined variations in whole or part.

In towns or urban districts particular attention must be given to the lines, widths, and directions of all the main and subsidiary routes, due regard being paid to traffic, prevailing external elements, and preservation of scenery; also to public buildings both existing and prospective—such as churches, theatres, post offices, municipal buildings, and so forth. Open spaces, too, must be allotted for public squares, parks, and recreation grounds; likewise suitable districts reserved for factories (near rivers, railways, or canals preferred), with regulations as to the heights of the latter, according to their relative positions.

All parks should be freely sprinkled with trees and shrubs, and judiciously dotted about to take neglected areas. For town streets I advocate a slightly irregular line of frontage, the spaces so formed being used as stands for taxis, fire-calls, and other conveniences. Where straight streets are arranged, they should have definite motives; although they are economical, the natural contour of the ground, and other local circumstances cannot be entirely neglected. There are other important factors in large schemes due to constant and heavy traffic, and more particularly so since the advent of motors. Level [illegible] one street could bridge over another, as at Holborn. Where this is not feasible circular traffic regulation might be advantageously adopted, as in diagram 2.

Every one admits that nowadays [illegible] either in the country or the immediate outskirts of the town is work in the course of [illegible] infant towns, commonly termed semi-urban or rural districts. Owing to present-day [illegible] services, these districts rapidly evolve into large and flourishing towns. In building up these smaller towns, however, do not allow the town to creep from the centre, build upon all the ground necessary for the time for future development. The case for this is obvious, as new streets are not projected in the close the class of buildings adaptable for central sites.

Trees should be planted along [illegible] three these being desirable both as regards also pleasing to the eye. These districts should have main arterial streets, to serve as air ducts and connecting links [illegible] adjoining larger towns, as diagram 3. (A. G. V. *Concluded.*)

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**Institution of Civil Engineers.**—At a students' meeting on Friday next a paper on "The Design and Construction of Masonry Dams" will be read by Mr. H. J. F. Gourley.

**Wood Green's New Recreation Ground.**—Wood Green District Council have received sanction from the Local Government Board to borrow several thousands of pounds for the purpose of laying out a new recreation ground, which is to consist of tennis, football and cricket pitches, and a model yacht pond.

**Parliamentary Memoranda.**—In the House of Commons during the week the Birmingham Corporation Bill, the Church Stretton Urban District Water Bill, the London County Council (General Powers) Bill, the Ramsbottom Urban District Railless Traction Bill, the Shipley Urban District Council Bill, and the Tavistock Urban District Council Bill were read a second time.

**Fidelity and Deposit Company of Maryland.**—Firms who are required under the conditions of a contract to find sureties for the due carrying out of building, sewer, reservoir, tramway and similar works should be interested in the arrangements made for their accommodation by this company as set forth in the official booklet to 1912. The financial position of the company, whose guarantee is accepted by the Admiralty and municipal authorities, appears to be most satisfactory, judging by the considerable increase in its assets which took place last year.

**Liverpool City Engineer's Visit to India.** — At the meeting of the Liverpool Town Council on Wednesday the Health Committee formally recommended the granting of the request of the Secretary of State for India that the services of Mr. J. A. Brodie, the city engineer, should be lent to the Government of India for a period not exceeding five months, to advise them as to the laying out the new capital at Delhi. The recommendation was greeted with general cries of "Agreed," and it was passed without discussion. The Lord Mayor, in congratulating Mr. Brodie on his selection, said he believed good results would come of it, adding that while they congratulated him he thought they could also congratulate the Government on having got the right man for the work.

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Batley T.C.** (February 7th. Major J. Stewart).—£5,138 for the purposes of Wilton Park.—The town clerk, Mr. J. H. Craik, gave details of the application, and asked for as long a period as possible for the repayment of the loan, it sanctioned. Of the amount asked for, £2,143 represented what had been already overspent, and £2,995 was required for works which had yet to be completed and started. In regard to Wilton Park, which was the pleasure ground of Batley, the Local Government Board had already granted two loans, and the further loan now asked for was found necessary for the completion of the work. The borough surveyor, Mr. O. J. Kirby, gave details with regard to the amount expended over and above the original estimate, and the purposes for which the additional money was required.

**Birmingham T.C.** (February 20th. Mr. W. H. Collin).—£1,852 for works of street improvement in War-lane, Harborne; £751 for the purchase of certain land in Stonehouse-lane, California, for the purposes of a refuse tip; £2,830 for the purchase of certain land in Belcher's-lane, Bordesley-green, for the purposes of a playground in connection with the public elementary schools in the neighbourhood; and sums amounting to £15,270 for the provision of public baths for women at the corner of Kent-street and Gough-street. The town clerk, Mr. E. V. Hiley, and the city surveyor, Mr. H. E. Stilgoe, gave details of the several schemes.

**Blackrock (co. Dublin) U.D.C.** (February 15th. Mr. P. C. Cowan). £2,400 for the purpose of providing a recreation ground.—The town clerk, Mr. R. Finlay Heron, said a piece of ground in Seapoint's Avenue one of the most thickly populated parts of the district had been selected for the purpose of a recreation ground. A large proportion of the houses on the site had been closed by a magistrate's orders, and orders for the demolition of some of them have also been obtained. The area of the proposed recreation ground was about one-third of an acre.—It was proposed to repay the loan in fifty years.

**Bolton T.C.** (February 8th. Mr. R. H. Bickneth). £5,570 for the purchase of a disused quarry situate at the junction of Cliffe-road and Bolton-road, and adjoining Peel Park, to be used for tipping purposes.—According to the facts supplied to the inspector, the tip covers an area of 38,000 yards and has a capacity of 32,240 cubic yards. It was proposed chiefly to tip clinker, ashes, and excavation matter at the place, and the price of the purchase was at the rate of 2s. 10½d. per yard.

**Bournemouth T.C.** (February 17th. Mr. Courtenay Clifton).—£1,200 for the extension of the Winton depot, and £390 for the provision of an underground convenience in Alma-road.—The town clerk, Mr. Herbert Ashling, said it was proposed to add eight stalls, a loose-box, and carry out other extensions at the Winton depot.—The borough surveyor, Mr. F. W. Lacey, made a statement as to the necessity for the convenience, and subsequently accompanied the inspector on a visit to the site.

**Cannock U.D.C.** (February 13th. Mr. F. H. Tulloch). £1,300 for extensions to the council offices.—The clerk, Mr. C. A. Loxton, explained that the urban council offices had been built about 35 years. The work of the council had considerably increased, and it was considered necessary to provide more accommodation. Upon consideration of the proposed expenditure on furniture, the inspector intimated that the Board could not sanction a loan for the provision of linoleum, coal-boxes, and fire-irons, and contingencies amounting in all to £55. Ultimately the amount of the proposed loan was fixed at £1,060 and the inquiry closed.

**Crediton U.D.C.** (February 15th. Mr. P. M. Crosthwaite).—£480 for the purposes of the town's water-works at Walson. The surveyor, Mr. T. Jones, stated that the predecessors of the council, about 1893, found that the water in the adit at Walson was greatly diminished. Fearing that the water would run short, they decided to construct a dam across the adit at a point where a stratum of clay in a vertical position, and varying in thickness from 1½ inches to 8 inches, and forming a natural dam across the valley, had been broken when constructing the adit. The council now proposed to re-pen the ground over the dam, which was to be continued to a height of about 37 ft. from the bottom of the adit, thus allowing the water to rise in the shafts and the ground in the wet seasons to its original

height, which would not only prevent the damaging of the dry adit, but also increase the storage of water.

**Hinckley U.D.C.** (February 9th. Major J. Stewart). £2,000 for additional plant at the Snarestone pumping station.—The clerk, Mr. A. S. Atkins, stated that it was proposed to replace the old cooling pumps by larger ones.—It is also proposed to supply Barwell and Earl Shilton, which together have a population of 7,300, and for this about 150,000 gallons daily will be required.—It was requested that the period of repayment should be thirty years.

**Margate T.C.** (February 7th. Mr. A. A. G. Malet). —£1,579 for the provision of public lavatories on the new lower promenade at Hodge's Flagstaff, Cliftonville, and £450 for the extension of the men's public lavatory at the Fort. It was stated by Councillor Reeve, chairman of the Finance Committee, that in 1909-10, the receipts from lavatories were £1,005; 1910-11, £1,170; and 1911-12 (to date), £1,322. The gross profit for 1910-11 was £347. This year the gross profit would be more than sufficient to meet the loan charges and interest. The profit went to the general district rate, and last year the lavatories were no charge upon the rates, but showed a clear net profit—The surveyor, Mr. A. Borg, gave evidence as to the nature of the constructions, material to be used, &c.

**Newcastle-upon-Tyne T C.** (February 15th. Mr. Thomas Adams).—This was an application of the corporation for authority to prepare a town planning scheme in respect of an area known as Craghall Dene.—Mr. H. Lee, deputy town clerk, stated that the Newcastle Corporation had sought to carry out the purpose of the Town Planning Act before it was passed. They were entitled to take credit to themselves in regard to the garden city movement. There was a big scheme now under consideration, which would shortly be laid before the Board, in respect of an area of 1,400 acres in the east end of the city. He took it the scope of the present inquiry was restricted to the making out of a *prima facie* case for including the Craghall Dene area in a Town Planning scheme. The area contained a little over 50 acres, and the question had become urgent nearly 12 months ago, in connection with the development of a portion of the area just beyond the city area. It involved a question of access. The scheme of access proposed would save a detour of something between three-quarters of a mile and a mile and a half. That detour could be prevented by continuing the present roads for a short distance.—Mr. W. J. Steele, city engineer, gave statistical information showing the extent of properties on the area, and stated his opinion on the probability of further developments.

**Northwood U.D.C.** (February 6th. Mr. G. Hetherington).—£1,360 for works of sewerage. The clerk, Mr. R. Abbott, stated that the proposed sewer extensions were in Bridle-road and Wiltshire-lane, Eastcote, and Brickwall-lane, Howlett's-lane, and Wood-lane, Ruislip.—The surveyor, Mr. W. L. Carr, gave evidence.

**Wallasey T.C.** (February 17th. Mr. F. H. Tulloch). —£4,427 for purposes of street improvement, and a further sum of £2,232 for the provision of a recreation ground between Birkenhead-road and Bridle-road, Seacombe.—Of the former sum it is intended to devote £1,410 to widening and improving Liscard-road, opposite Littler's-terrace; £1,065 for a similar purpose with respect to the south side of Church-street, Egremont, the remainder of the money to be expended in minor street improvements.

### APPLICATIONS FOR LOANS.

**Aberystwith T.C.**—£11,793 for workmen's dwellings at Trefechan.

**Alnwick U.D.C.**—£4,060 for an improved water supply.

**Bishop's Stortford U.D.C.**—£2,970 for an extended water supply.

**Bucks C.C.**—£2,000 for the purchase of a site for an asylum, £365 for a new police-station, and £2,650 for a school at Haddenham.

**Buxton U.D.C.**—£5,000 for the improvement of the pump room.

**Clown R.D.C.**—£15,000, further loan for the water scheme.

**Cudworth U.D.C.**—£6,700 for the provision of gasworks.

**Exeter T.C.**—£2,500 for improvements at Exe Bridge.

**Hastings T.C.**—£10,000 for the purchase of land for road making.

**Irthlingborough U.D.C.** £850 for the purchase of the recreation ground.

**Newport (Mon.).**—£3,900 for the construction of a service reservoir at Beechwood Park, and £766 for a motor fire engine.

**Padiham U.D.C.**—£800 for gas main extensions.

**Penzance T.C.**—£2,500 for the Battery-square improvement.

**Radcliffe U.D.C.**—£2,000 for the construction of a footbridge over the river.

**Radcliffe U.D C.**—£26,610 for the erection of 124 houses.

**Ramsgate T.C.**—£3,257 for the erection of a shelter.

**Ryton U.D.C.**—£1,200 for private street works.

**Saltash T.C.**—£900 for road works.

**Scarborough T.C.**—£1,891 for street improvement works and £2,500 for drainage purposes.

**Stoke-on-Trent T.C.**—£1,550 for the erection of a fire-station.

**Tring U.D.C.**—£600 for street improvement works.

**Welshpool T.C.**—£1,000 for the purposes of the reservoir.

**Yarmouth T.C.**—£1,000 for the extension of the Marine-parade-north.

### LOANS SANCTIONED.

**Alsager U.D.C.**—£500 for water supply purposes.

**Dublin T.C.**—£9,650 for the provision of workmen's dwellings.

**Harwich T.C.**—£750 for the purchase of land for a school.

**Maldens and Coombe U.D.C.**—£3,185 for street improvement works in Coombe-road, Malden-road, and Kingston-road.

**Nelson T.C.** £6,460 for the erection of a swimming bath, amd £280 for slipper and vapour baths.

**Prestwich U.D C.**—£682 for sewerage and sewage disposal works.

**Runcorn R.D.C.**—£2,400 for the extension of the isolation hospital.

**West Sussex C.C.**—£2,142 for the extension of the Upper Beeding School.

### FORTHCOMING INQUIRIES.

| | £ |
|---|---|
| FEBRUARY. | |
| 26.—**West Ham.** For fire brigade purposes (Mr. W. O. E. Meade-King) ... ... ... | 8,247 |
| 27.—**Accrington.** For the purposes of the electricity undertaking (Mr. T. C. Ekin) | 33,750 |
| 27.—**Carshalton.** For works of sewerage and depot purposes (Mr. Courtenay Clifton) | 1,381 |
| 27.—**Grange.** For the purposes of the waterworks (Mr. F. H. Tulloch) ... ... ... | 416 |
| 27.—**Grimsby.** For electricity purposes (Mr. M. K. North) ... ... ... ... | 700 |
| 27.—**Newport (Mon.)** For electricity purposes (Mr. H. R. Hooper) ... ... ... | 5,000 |
| 27.—**Wanstead.** For sewage disposal purposes (Mr. A. A. G. Malet) ... ... ... | 10,700 |
| 28.—**Bingley.** For sewage disposal purposes (Mr. R. G. Hetherington) ... ... ... | 10,500 |
| 28.—**Blackburn.** For electricity and culverting purposes (Mr. T. C. Ekin)... ... ... | 48,470 |
| 28.—**Ramsbottom.** For the provision of council offices (Mr. F. H. Tulloch) ... ... | 2,130 |
| 29.—**Abertillery.** For the provision of a refuse destructor (Mr. H. R. Hooper) ... ... | 6,166 |
| 29.—**Burton-upon-Trent.** For electricity extensions (Mr. T. C. Ekin) ... ... ... | 17,150 |
| 29.—**Finchley.** For street improvement works (Mr. Courtenay Clifton) ... ... ... | 6,150 |
| 29.—**Market Harborough.** For the purposes of council offices and sewerage (Mr. M. K. North) ... ... ... ... ... | 940 |
| 29.—**Rawtenstall.** For road improvement purposes (Mr. F. H. Tulloch)... ... ... | 870 |
| MARCH. | |
| 1.—**Hoole.** For works of sewerage (Mr. F. H. Tulloch) ... ... ... ... ... | 1,750 |
| 1.—**West Ham.** For the electricity undertaking (Mr. T. C. Ekin) ... ... ... ... | 87,825 |
| 2.—**Hale.** For the provision of public offices (Mr. F. H. Tulloch)... ... ... ... | 4,020 |

# Municipal Work in Progress and Projected.

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The following are among the more important projected works of which particulars appear below. Buildings—Edinburgh £6,000, Glasgow, Greenock Hampshire £355,000, Wednesbury £5,000; housing and town planning—Doncaster, Woking; refuse collection and disposal—Largs, Newport (Isle of Wight); roads and materials—Barry £15,761, Hastings £10,000, Penzance £2,886; sewerage and sewage disposal—Kettering £5,900; Truro, Willenhall £10,732; water, gas and electricity—Aberdeen, Dumbarton £1,683, Plympton, Westhoughton £2,138; miscellaneous—Barry £500, Maldens and Coombe £900.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

## BUILDINGS.

**Dumbarton T.C.**—The offer of the Brock Trustees to build public swimming baths has been accepted.

**Edinburgh T.C.**—The Plans and Works Committee recommend the erection of public wash-houses at Fountainbridge, at a cost of £6,000.

**Failsworth (Lancs) U.D.C.**—It has been decided to adopt the Baths and Wash-houses Acts.

**Glasgow T.C.**—Filtration and aëration plant is to be fitted up in one of the public baths as an experiment.

**Greenock T.C.**—Alternative schemes for the erection of baths and wash-houses have been prepared by the master of works, Mr. Low.

**Hampshire C.C.**—Plans have been approved by the council for the erection of a new asylum, for the joint use of the county and the county boroughs of Southampton and Bournemouth, at Park Prewett, near Basingstoke, at a cost of £355,000, and for the construction of a private railway from Basingstoke Station to the site, at a cost of £700.

**Hanwell U.D.C.**—The surveyor, Mr. S. W. J. Barnes, has been instructed to prepare plans for an open-air bath.

**London C.C.**—It has been agreed to provide conveniences on the Victoria Embankment, near Blackfriars Bridge.

**Wednesbury T.C.**—The Sanitary and General Purposes Committee have prepared a report emphasising the necessity for the provision of better accommodation at the municipal and education offices, and suggesting that structural alterations should be carried out, by means of which enlarged and much-needed committee rooms for the use of members of the council and additional offices for the staff will be available. The committee also propose to utilise the old library building, in part, for carrying on the work of the Education Committee, and in other part for an extension of the public baths. It is estimated that the cost of the entire works will be £5,000. The committee recommend that Messrs. Scott & Clark, of Wednesbury, should be appointed architects to initiate and carry out the work.

## HOUSING AND TOWN PLANNING.

**Doncaster T.C.** Plans for the provision of sixty-four workmen's dwellings have been submitted to the Local Government Board.

**Newport (Isle of Wight) T.C.**—A special sub-committee has been authorised to prepare a draft scheme embodying the land in the area of the borough which, in the opinion of the sub-committee, should be made the subject of a town planning scheme.

**Pershore R.D.C.**—The council have referred to a committee a letter from the Local Government Board in which, referring to a report by their inspector after the enquiry held by him, they state that the need for further houses for the accommodation of the working classes in the parish had been proved, and they were of opinion that the council should take action to provide the necessary further accommodation without delay. A very substantial addition to the number of existing houses appeared to be necessary to meet the reasonable requirements of the population, and the houses to be erected should be designed to provide a living room, scullery, and three bedrooms.

**Woking U.D.C.**—A scheme has been approved for the erection of sixty-three industrial dwellings.

## REFUSE COLLECTION AND DISPOSAL.

**Basingstoke T.C.**—The Works Committee report that the refuse destructor has now been at work during the past six months with very satisfactory results. The tests required by the specifications of the borough surveyor, Mr. F. R. Phipps, and carried out by Messrs. Manlove, Alliott & Co., under his superintendence, have satisfactorily complied with the requirements.

**Devonport T.C.**—The question of providing a destructor has been raised in the Sanitary Committee, the members of which are unanimous that something should be done to improve the means of refuse disposal.

**Largs T.C.**—The new destructor is to be erected at Holehouse, beside the refuse depot which the destructor will supersede. The estimated cost of the building and equipment is £4,000.

**Newport (Isle of Wight) T.C.**—The Local Government Board have asked the council to consider the question of providing a refuse destructor.

## ROADS AND MATERIALS.

**Barry (Glamorgan) U.D.C.**—The Parks and Public Works Committee have recommended the council to include in their next Parliamentary Bill power to construct a sea wall and promenade at Whitmore Bay, Barry Island, and to provide a shelter with shops, the estimated cost of the whole scheme being £15,761.

**Cornwall C.C.**—It has been agreed to make a grant of £300 per annum for two years in aid of the improvement at the entrance to Falmouth near the Yacht Club premises.

**Deptford B.C.**—It is proposed to pave some of the worst streets in congested areas, at a cost of about £1,500.

**Derby T.C.**—The Improvement Committee have been instructed to make the necessary arrangements for the widening of Rose Hill-street, near the bowling green.

**Esher and the Dittons U.D.C.**—A deputation is to wait upon the Surrey County Council to ask for the provision of an alternative route to the new arterial road which, as proposed, would divide Littleworth Common, a course which the chairman described as "desecration."—It has been formally resolved to make up Imber Park-road under the Private Street Works Act.

**Forfar C.C.**—It has been agreed by the Arbroath District Committee to strengthen and widen the bridge at Pitmales, at an estimated cost of £260.

**Hastings T.C.**—Land is to be purchased and new roads made in connection with the Brisco estate, at an estimated cost of £10,000.

**Keynsham (Somerset) R.D.C.**—With respect to a proposal for the direct maintenance and repair of the rural main roads by the county council, the surveyor of highways at the recent council meeting stated that at present the Keynsham district spent about £900 a year by being able to distribute the men from one lot of roads to the other. If the new scheme were adopted the county council would need new depots, new storeyards, and a lot of arrangements they did not seem to know much about at present. The additional cost on the Keynsham district alone might amount to £500 or £600. It was agreed that the clerk and the surveyor should confer together and draft a strong letter of protest to be submitted to the council at their next meeting.

**Newport (Mon.) T.C.**—The accepted tender for tar-spraying having been withdrawn, the Works Committee have decided to recommend the acceptance of that of Mr. Fothergill, of Exeter, which was the next lowest. Instructions have been given to the borough engineer, Mr. H. Tremelling, to procure tenders for tar-macadam work in Alexandra-lane.

**Norwich T.C.**—Tar paths are to be constructed on one side of Cyprus-street, Harford-street, and Lindley-street, and the kerbs adjusted at a total estimated cost of £454.

**Penzance T.C.**—The borough surveyor, Mr. F. Latham, has submitted an estimate, amounting to £386, of the cost of putting King's-road, on the Polwithen estate, in a proper state of repair, and the council have agreed that, in the event of the owners

of the road paying this amount to the council, the road should be taken over as a highway. The borough surveyor has also prepared plans for improving the approach to the bathing-place at the Battery Rocks, involving the acquisition of Battery-square, at a cost of £2,500, and subject to the sanction of the Local Government Board it has been decided to carry out the scheme.

**Poole T.C.**—It has been agreed to purchase from Messrs. Llewellin & James one 250-gallon tar-spraying machine for work on carriageways at £88, and two 80-gallon machines for work on footpaths at £42 10s. each.

**Rhyl U.D.C.**—A proposal to extend the promenade eastwards to join up with the East Promenade, and so make a continuous esplanade from one end of the district to the other is under the consideration of the Road Committee.

**Stafford T.C.**—The Estates and Works Committee have been instructed to submit to the council a complete scheme giving the cost of a road between the Lammascotes and Lichfield-road.

**Stokesley R.D.C.**—The state of the local roads came under review at the meeting of the council recently, when it was recommended that the highway rate should be increased from 1s. 4d. to 1s. 6d. in the £. The chairman of the Finance Committee (Major R. B. Turton) said the surveyor (Mr. W. H. Dixon) estimated a rate of 3s. in the £ was really necessary to put the roads in the condition in which he would like them to be. The council were hardly, however, likely to consent to the doubling of the rate. Mr. J. J. Burton said the blame for the roads was generally thrown on the surveyor, but he could only spend what was voted him. Traffic on the roads was increasing, and they required more money to be spent on them. It was agreed to defer the fixing of the rate till the next meeting in order that further consideration might be given to the surveyor's estimates.

**Stratford-on-Avon T.C.**—The surveyor, Mr. R. Dixon, has been instructed to widen and relay the footpath on the side of Union-street, at an estimated cost of £100.

## SEWERAGE AND SEWAGE DISPOSAL.

**Bromsgrove R.D.C.**—A report has been presented by Mr. W. Fiddian for dealing with the sewage of that portion of Rednal village which by reason of the Birmingham extension scheme has been transferred to the parish of Cofton Hackett. The site for an outfall suggested by Mr. Fiddian is land belonging to the Earl of Plymouth, and the cost of the proposals is estimated at £1,330.

**Kettering U.D.C.**—The council have approved of the plans and estimates submitted by Messrs. Everard, Son & Pitchford for sewerage and sewage disposal for the parish of Corby, at an estimated cost of £5,900.

**Truro T.C.**—The chairman of the Sanitary Committee and the city surveyor, Mr. F. A. Barnes, have been authorised to visit places where slate-beds are in use with a view to the preparation of a sewage disposal scheme.

**Willenhall U.D.C.**—The tender of Messrs. Charles & Warner, of Worcester, at £19,732, has been accepted for the execution of the new sewage disposal scheme.

## WATER, GAS, AND ELECTRICITY.

**Aberdeen T.C.**—Mr. C. P. Hogg, Glasgow (of Messrs. Church & Hogg), has been appointed to advise on the new water supply for the city.

**Atherstone R.D.C.**—The surveyor, Mr. H. J. Coleby, has advised that a trial boring for water should be carried out at Warton, at a cost of about £500.

**Bridgnorth T.C.**—The Gas Committee have been able to reduce the price of gas to 3s. per 1,000 cubic feet to ordinary consumers, and 2s. 11d. and 2s. 10d. respectively to larger consumers for heating and motive power.

**Dumbarton T.C.**—It has been agreed to spend a sum of £1,683 in laying new water pipes at Garshake.

**Hastings T.C.**—It has been decided to extend the electric light mains in London-road, St. Leonards, with a view to the whole of the existing gas lamps in that road being fitted up for lighting by electricity, at an estimated cost of £326.

**Leicester T.C.**—Five Keith lamps have been erected in Market-street with most satisfactory results, and the Gas Committee propose to extend the mains so that shopkeepers may take advantage of the improved light if they desire to do so, and it will also enable the Street Lighting Committee to consider to what extent they will adopt it for improving the street lighting of the town.

**Okehampton R.D.C.**—A sum of £700 is to be spent on covering the North Tawton reservoir.

**Plympton (Devon) R.D.C.**—The Local Government Board have written disapproving of the proposed water scheme for Newton Ferrars, and suggesting that a more desirable plan would be to provide a supply from the Plympton source, which would also enable a supply to be provided for the village of Brixton. The matter has been referred to the Water Committee.

**Walsall T.C.**—The annual report of the Electricity Committee shows a loss on the year's working of £184, due to the committee having to scrap thousands of pounds' worth of machinery to instal more up-to-date plant. The gas undertaking shows a nett profit of £8,762.

**Westhoughton (Lancs) U.D.C.**—A tender, at £1,258, has been accepted for supplying a ferro-concrete water tower on Syndale Hill, and the estimate of the surveyor, Mr. George Hayes, for mains and connections in conjunction with the water tower, amounting to £650, which, together with the by-pass to be put in by the Bolton Corporation for £230, amount to £2,138, has also been approved.

## MISCELLANEOUS.

**Barry (Glamorgan) U.D.C.**—A fire engine is to be purchased, at a cost of £500.

**Hull T.C.**—It has been decided to allocate £12,000 out of tramway profits to the relief of the rates.

**Maldens and Coombe U.D.C.**—A committee has recommended the provision of a first-aid motor fire engine, with ladders and small pump, the cost contemplated being from £650 to £900.

**Romford U.D.C.**—The tender of Messrs. Wilson, Border & Co., of Romford, has been accepted in connection with the cemetery extension.—Surface and subsoil drainage, £441; laying out, £271; fencing and gates, £177.

# PERSONAL.

Mr. William Rodger, burgh surveyor of Dunoon, has had his salary increased by £25 per annum.

Mr. George Watt, Portsoy, has been appointed surveyor of Keith at a salary of £100 per annum.

Mr. G. W. Warr, surveyor to the Steyning East Rural District Council, has been voted a £10 increase of salary.

Mr. John Cox, surveyor to the Margam Urban District Council, has had his salary increased by £50 per annum.

Mr. Frederick W. Girven has been appointed surveyor to the Nailsworth Urban District Council at a salary of £100 a year.

Mr. W. H. Morton, ASSOC.M.INST.C.E., city engineer of Wellington, New Zealand, has been elected a member of the Royal Sanitary Institute.

Mr. C. W. Leney, assistant surveyor to the Steyning East Rural District Council, has been appointed road surveyor and sanitary inspector of East Preston (Sussex).

Mr. R. O. Wynne-Roberts's salary as consulting engineer in connection with the waterworks scheme about to be carried out by the city of Regina, Sask., has been fixed at £960 per annum.

Mr. T. H. Mawson is, it is reported, likely to be retained by the city authorities of Vancouver to go there next spring and prepare for the Parks Board a plan for the development of Stanley Park.

Mr. Reginald Aglio Dibdin, second son of Mr. W. J. Dibdin, was married on the 14th inst. at St. Mark's, St. John's Wood, N.W., to Elsie Millicent, only daughter of Mr. Edward James Marvin, of Maidstone.

Mr. William Finch, who has been acting county surveyor and bridgemaster to the Cumberland County Council since the death of Mr. Bell, has been appointed county surveyor and bridgemaster. The salary is £350, rising to £500.

Mr. Walter T. Dunn, who for twenty-seven years filled the position of secretary to the Junior Institution of Engineers, was on Saturday last, at the annual dinner at the Hotel Cecil, presented with an illuminated address and a cheque in recognition of his long and valuable services.

Mr. Frank Wilkinson, ASSOC.M.INST.C.E., deputy borough engineer and surveyor of Wimbledon, was married recently at All Saints' Church, Margaret-street, W., to Elizabeth (Lily), the youngest daughter of the late Mr. Alexander Baxter, of West Hartlepool, and Mrs. Baxter, of "Elmswood," Tooting Bec Gardens, Streatham. The bridegroom was the recipient of a very handsome silver tea and coffee service from his colleagues at Wimbledon, the presentation being made by the town clerk, Mr. A. Steele Sheldon, in a felicitous speech, to which the borough surveyor, Mr. C. H. Cooper, added a few well-chosen words.

Mr. W. Harpur, city engineer of Cardiff, has, says the *South Wales Daily News*, returned to Cardiff from London, "where he has been engaged on arbitration proceedings, and has been the subject of many facetious remarks among the councillors in committee. The expert witness has entered into the spirt of the chaff, and declares he has returned for a little while. The chairman of the Health Committee suggests that the council should erect a mansion house in Town, or, as an alternative, purchase a pension at Brighton for jaded councillors and officials after transacting business in London." The expert witness has proverbially to face greater terrors than those of the witness chair, and it is well when, like Mr. Harpur, he meets them with courage and the saving grace of good temper.

## FOR OTHER ADVERTISEMENTS

See End of Paper.

### CUDWORTH URBAN DISTRICT COUNCIL.
TO STONE MERCHANTS.

Tenders are invited for the supply and delivery of the following Materials:—

About 1,000 tons Granite.
About 750 tons Slag.

Further particulars and Form of Tender can be obtained from W. T. Lynam, Surveyor, Council Offices, Cudworth, upon receipt of a stamped addressed envelope.

Sealed Tenders, endorsed "Tender for Road Material," and samples, to be addressed to the Clerk to the Council, Council Offices, Cudworth, on or before Monday, March 4th, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

W. T. LYNAM,
Surveyor.

Council Offices,
Cudworth.
February 20th, 1912.

### GAINSBOROUGH URBAN DISTRICT COUNCIL.
ANNUAL CONTRACTS, 1912-13.

The Urban District Council are prepared to receive Tenders for the Supply and Delivery of the undermentioned Materials, as may from time to time be ordered, during the year ending 31st March, 1913:—

1. Broken Granite, Syenite, or Whinstone Macadam.
2. Granite, Syenite, or Whinstone Setts.
3. Broken and Block Slag, Slag Chippings and Dust.
4. York Setts, Kerbs, Channels and Flags.
5. Concrete Flags.
6. Stoneware and Earthenware Pipes, Gullies, &c.
7. Cast-Iron Pipes.
8. Tar-Macadam.
9. Pitch and Creosote Oil.
10. Portland Cement.

Specification and Forms of Tender may be obtained by written application, addressed to the undersigned.

Sealed Tenders, endorsed, "Tender for ——," accompanied by Samples of the Materials to be supplied (except Nos. 4, 7, 8, 9, 10), to be delivered at the Office of Mr. Decimus M. Robbs, Clerk to the Council, 6, Lord-street, Gainsborough, not later than Friday, 15th March next.

The Council do not bind themselves to accept the lowest or any Tender.

SAM W. PARKER,
Engineer and Surveyor.

Council Offices, Gainsborough.
21st February, 1912.

### TOTTENHAM URBAN DISTRICT COUNCIL.
TO CONTRACTORS.

The Council invite Tenders for the Supply of the following:—

1. Road Materials.
2. Lime and Cement.
3. Disinfectants.
4. Brooms.

} For one year.

5. Forage for six months.

Specifications and Form of Tender can be obtained on application to the undersigned, at the Council Buildings, The Green, Tottenham, any day during office hours.

Persons tendering will be required to deposit with the Treasurer, when handing in their Tenders, in a Bank of England Note or cash, the sum of £5 in respect of each Tender, which will be forfeited by the person whose Tender is accepted if the contract be not executed within seven days from the date he is informed it is ready for signature, otherwise it will be repaid. This deposit will be repaid to the parties tendering who are unsuccessful.

The Contractor will be required to pay all workmen on the Council's work the rates of wages, and observe the hours of labour, recognised by the Trades Unions. A schedule of such wages will be inserted in the contract, and a copy of the schedule must be exhibited on the Pay Office at the Works.

Canvassing Members of the Council is strictly prohibited, and if any members, agents or representatives of firms tendering for this work interview or canvass Members of this Council, Tenders sent in from such firms will be immediately disqualified.

Sealed Tenders, on the form supplied, endorsed "Tender for ——" (as the case may be), to be delivered to me by 12 o'clock noon, on Tuesday, the 5th March, 1912.

No other Form of Tender will be received.

Security will be required for the due performance of the contracts.

The Council will not be bound to accept the lowest or any Tender, and reserve the right to accept a part only of any Tender received.

(By order)
E. CROWNE,
Clerk of the Council.

Tottenham.
February 23, 1912.

### DENBY AND CUMBERWORTH URBAN DISTRICT COUNCIL.

Wanted, by the above Council, an experienced Working Road Surveyor, able also to superintend the Waterworks and Sewerage Undertakings of the Council. Applications, in candidate's own handwriting, endorsed "Surveyor," enclosing copies only of two testimonials of recent date, and stating salary required, will be received by me, the undersigned, up to 7 o'clock p.m. on Wednesday, March 13th, 1912.

The person appointed will be required to keep in proper order and date all the accounts prescribed by the Orders of the Local Government Board relating to his departments, and must if required be able to produce evidence of his ability to do so.

Canvassing the members of the Council for this appointment, either personally or by deputy, will be deemed a disqualification.

(By order)
WILFRID BARNES,
Clerk to Council.

Denby Dale,
February 22nd, 1912.

### SEVENOAKS RURAL DISTRICT COUNCIL.
STEAM-ROLLER AND SCARIFIER.

The Rural District Council of Sevenoaks invite Tenders for the supply of a Steam Roller and Scarifier.

Copy of Specification and full particulars may be obtained from the Council's Surveyor, Mr. J. Randerson, Leigh, near Tonbridge

Sealed Tenders, endorsed "Tender for Roller," to be delivered to me not later than 10 a.m. on Wednesday, the 6th March, 1912.

(By order)
F. H. VIBERT,
Clerk of the Council.

Bank Chambers,
Sevenoaks.
21st February, 1912.

## SEVENOAKS RURAL DISTRICT COUNCIL.

*TENDER FOR MATERIALS, STEAM ROLLING, TEAM LABOUR, ETC., IN CONNECTION WITH THE REPAIR OF HIGHWAYS.*

YEAR ENDING 31st MARCH, 1913.

The Rural District Council of Sevenoaks invite Tenders for:—

(1) The Supply of Chert, Flints, and Ragstone on to the various roads in the district. (2) The Supply of Granite, Quartz, &c., Basalt or other approved Hardstone to various stations in the district. (3) Steam Rolling. (4) Team Labour and Cartage. (5) Haulage from Stations and Quarries for the year ending 31st March, 1913.

Specifications, Conditions of Contract, Schedule of Quantities, with Form of Tender, may be obtained on application at my office, or from Mr. R. Bailey, Sundridge, Sevenoaks, and Mr. J. Randerson, Leigh, Kent, Surveyors to the Council. Persons applying for form should state which they require.

The Council do not bind themselves to accept the lowest or any Tender, and they reserve to themselves the right to accept such part of any Tender as they may deem proper.

Samples of material to be delivered, carriage paid, at this office, Sevenoaks, and sealed Tenders, marked "Tenders" on the outside of the envelope, to be returned, with the conditions intact, to me, on or before Friday, the 15th day of March.

(By order of the Council),
F. H. VIBERT,
Clerk of the Council.

Bank Chambers.
82 High-street, Sevenoaks.
21st February, 1912.

## EAST SUFFOLK COUNTY COUNCIL.

Wanted, several competent men as Working Foremen of gang employed on Pitch-grouting Macadam Work.

Apply by letter, not later than 6th March, stating experience in the maintenance of roads, laying of macadam, surface tarring, kerbing, &c., and giving age, wages required, and references, to Chief Surveyor of Main Road, County Hall, Ipswich.

## WEST SUFFOLK COUNTY COUNCIL.
### BALLINGDON BRIDGE RECONSTRUCTION.

The above Council is prepared to receive Tenders (from licensed Contractors) for the Construction of a new Ferro-concrete Bridge on the Hennebique system at Sudbury, Suffolk.

Contractors wishing to tender should send in their names to the undersigned.

Plans may be seen, and Specification and Form of Tender obtained, on application to the County Architect.

Tenders, sealed and endorsed, are to be delivered on or before Wednesday, the 6th of March, 1912, at 10 a.m.

The Council do not bind themselves to accept the lowest or any Tender.

A AINSWORTH HUNT,
County Architect.

51 Abbeygate-street.
Bury St. Edmunds.
February 21st, 1912.

## COUNTY BOROUGH OF WEST HAM.
### TO BUILDING CONTRACTORS.

The Council hereby invite Tenders for the Erection of a Building to contain 12 Slipper Baths, with Waiting Room, &c., in Fen-street, Tidal Basin.

Specification, Form of Tender, and further particulars may be obtained at the office of Mr. John G. Morley, Borough Engineer, Town Hall, West Ham, E., upon payment of One Pound, which will be returned upon receipt of a *bona-fide* Tender.

Note.—No Tender will be considered unless the same is received at the office of the Town Clerk, Town Hall, West Ham, E., in the envelope supplied, by post or otherwise not later than 4 o'clock p.m. on Tuesday, 12th March, 1912.

The Council do not bind themselves to accept the lowest or any Tender. The Contractor will be required to enter into a bond with one surety, for the due performance of the contract, and no work will be ordered under the contract until such bond has been duly executed.

The Contractor whose Tender is accepted, and with whom a contract is entered into, will be required to pay the whole of his workmen such rate of wages, and observe such hours of labour, as are recognised by the Workmen's Trade Unions, and shall not assign, nor under-let, or make a sub-contract with any person or persons for the execution of any part of such work. In the event of any breach of such agreement the Council will enforce the penalty clause in its entirety.

(By order of the Council)
FRED. E. HILLEARY,
Town Clerk.

Town Hall,
West Ham, E.
February 23, 1912.

## BOROUGH OF WENLOCK.

*MUCH WENLOCK SEWERAGE AND SEWAGE DISPOSAL WORKS.*

CONTRACT NO. 1.

The Wenlock Sanitary Committee of the Borough of Wenlock invite Tenders for the Provision Laying, and Jointing of about 4,400 yards of 12-inch and 9-inch Stoneware Pipe Sewers, together with Manholes and Lampholes, also the construction of Liquefying Tanks, Bacteria Beds, Humus Tank, Sludge Beds, and other incidental Works, in accordance with the Drawings and Specification prepared by the Engineers.

Drawings and Specification may be seen, and Bills of Quantities and Form of Tender obtained, at the Offices of the Engineers, Messrs. Willcox and Raikes, 63 Temple-row, Birmingham, on or after the 26th day of February, 1912, on payment of a deposit of Three Guineas, which will be refunded on receipt of a *bona-fide* Tender and the return of all documents to the Engineers.

Sealed Tenders in envelope supplied, endorsed "Sewerage and Sewage Disposal Works—Contract No. 1," to be delivered at my office not later than 12 o'clock noon on the 21st day of March, 1912.

The Committee do not bind themselves to accept the lowest or any Tender.

(By order)
F. H. POTTS,
Town Clerk.

Town Clerk's Office,
Much Wenlock.
21st February, 1912.

## TO CONTRACTORS AND OTHERS.

THE COUNCIL of the METROPOLITAN BOROUGH OF WANDSWORTH is prepared to receive Tenders for the making-up and paving of Normanhurst-road, Streatham.

The Specification and Drawings may be seen, and Forms of Tender obtained, of the Borough Engineer, at the Office of the New Streets Department, No. 56 East-hill, Wandsworth, S.W., between the hours of 10 and 4 (Saturdays 10 and 12), upon payment of a deposit of Five Guineas.

Tenders, enclosed in sealed envelopes and endorsed "Tender for paving Normanhurst-road," must be delivered at the Council House, East-hill, Wandsworth, S.W., and may be placed by the person tendering in the box provided for the purpose not later than four o'clock in the afternoon of Monday, the 11th March next.

Persons tendering must in the case of all workmen employed by them in and about the execution of the contract pay wages at not less, and observe hours of labour not greater, than the rates and hours recognised by the Associations of Employers and Employees and in practice obtained in the district where the work is to be executed.

No Tender will be received unless it be made upon one of the forms provided for the purpose. The Council does not pledge itself to accept the lowest or any Tender. If required the Contractor must provide two sureties for the due execution of the contract.

HENRY GEORGE HILLS,
Town Clerk.

Council House,
Wandsworth, S.W.
21st February, 1912.

## DAILY WEATHER FORECASTS.

### THE PROGRESS OF THE MOVEMENT.

As will be seen from the following communications which have reached us, the Association of Water Engineers, the Dublin Sanitary Association, the Gloucester City Council and the Ruislip-Northwood Urban District Council have passed resolutions in support of the proposals of the deputation which waited on Dr. W. N. Shaw, Director of the Meteorological Office, relative to the daily telegraphing of weather forecasts to municipal and county offices:—

BERKSHIRE.—Mr. J. F. Hawkins, county surveyor, writes: "I will bring the matter before my committee."

EALING.—Mr. Geo. E. Brydges, town clerk, states that the Ealing Town Council have decided to take no action in the matter.

TWICKENHAM.—Mr. F. W. Pearce, F.S.I., surveyor to the urban district council, writes that his authority propose to take no action in the matter.

SURREY.—Mr. A. Dryland, county surveyor, states that he will take an opportunity of laying the matter before his Highways and Bridges Committee.

HAMPTON.—Mr. S. H. Chambers, surveyor to the urban district council, has promised to bring the matter before his authority for their instructions.

NEW MALDEN.—Mr. R. H. Jeffes, the engineer and surveyor to the urban district council, states that his council are unable to take any action in the matter.

INSTITUTION OF WATER ENGINEERS. Mr. Percy Griffith, secretary, is instructed by his council to state that they will be pleased to support the movement.

CUMBERLAND.—Mr. William Finch, county surveyor and bridgemaster, writes that the subject will be brought before the Highways and Bridges Committee.

TEDDINGTON. Mr. Marshall Hainsworth, surveyor to the urban district council, says he hopes to obtain the adoption by his authority of the resolution suggested.

INSTITUTION OF MECHANICAL ENGINEERS.—Mr. Edgar Worthington, secretary, reports that the council of this body are unable to take any action in the matter.

TWICKENHAM.—Mr. F. W. Pearce, surveyor to the urban district council, states that the subject will be submitted to his Highways Committee for their consideration.

MERTON. Mr. G. Jerram, ASSOC.M.INST.C.E., surveyor to the urban district council, intimates that he will have pleasure in bringing the matter before his council in due course.

COUNTY COUNCILS ASSOCIATION.—Mr. G. Montagu Harris, secretary, writes that the Highways Committee and Executive Council of his association are of opinion that it is doubtful whether the practical benefit of the system proposed would be sufficient to justify the expense.

GLOUCESTER.—Mr. G. S. Blakeway, town clerk, states that at a recent meeting of the General Purposes Committee of the corporation a resolution was passed recommending the council to support the proposal. That recommendation was on the 31st ult. adopted at a special and quarterly meeting of the council, a copy of which has been sent to Dr. Shaw.

RUISLIP-NORTHWOOD. Mr. Edmund R. Abbott, clerk to the urban district council, writes: "This council, at their meeting held on January 15th, passed a resolution in support of the proposals of the deputation which waited upon Dr. Shaw, relative to the daily telegraphing of weather forecasts to municipal and county offices. A copy of such resolution has been forwarded to Dr. Shaw."

DUBLIN SANITARY ASSOCIATION. Mr. Isaac Yeates, hon. secretary, reports that the following resolution was unanimously adopted at a recent meeting of the council of this body: "That the council of the Dublin Sanitary Association are of opinion that facilities should be provided whereby the weather forecasts issued by the Meteorological Office, South Kensington, London, W., should be made available for conveying the earliest information to persons concerned with the public health, with trade, and with agriculture."

WILLESDEN.—Mr. O. Claude Robson, M.INST.C.E., engineer to the council, writes: "The subject of the circular has been under my consideration for some time, and I have been intending to recommend my council to obtain the necessary information from the Meteorological Office, even if payment is to be made for it. I shall be glad, however, to co-operate with other surveyors in the county with reference to a memorial being sent to the Meteorological Office for the information to be supplied gratis, and for that purpose will place your communication before the Works Committee of my council at their next meeting."

ROYAL SANITARY INSTITUTE.—Mr. E. White Wallis, F.S.S., secretary and director, writes: "The letter asking the institute to pass a resolution in support of the proposal that weather forecasts should be telegraphed daily to municipal and county surveyors' offices has been laid before the council of this institute. The council have carefully considered the proposal, and they have directed me to reply that, in their opinion, the information available as to meteorological conditions is not of sufficient local application to make it of much practical value to municipal and county surveyors. The council would suggest that the committee which is now dealing with the matter should endeavour to arrange for observations to be taken in additional districts, so that the Meteorological Office may be able to reduce the size of the areas for which the forecasts are now given."

## NEW YORK WATER SUPPLY.

### THE CATSKILL MOUNTAINS SCHEME.

The completion of the Hudson River tunnel works at New York in connection with the supply of water which is being brought from the Catskill Mountains—more than 100 miles distant—is reported. This marks the final definite assurance of the practicability of the colossal waterworks scheme for which New York will spend £36,400,000 before work ceases on it.

The tunnel has been blasted through solid rock, and in its present condition, without a cement lining, which is to be put in later, is watertight. The tunnel is 3,022 ft. in length, and extends between two shafts 1,150 ft. deep, sunk on either side of the river. The work for sinking these shafts was done by the city, but the contract for boring the tunnel has been executed by a private contracting firm.

The city had great difficulty in finding a suitable location for passing under the river, as it was necessary to find a solid stratum of rock without a break through which the tunnel could be carried. The tunnel is 18 ft. in diameter and cylindrical. The diameter will be reduced to 14 ft. when the concrete lining is in place.

While the tunnel itself is a tremendous work, the entire waterworks system, taken as a whole, is an epochal one.

An army of 16,000 workers are distributed over the work to the new collecting works at the Ashokan reservoir, where a huge dam will bottle up the waters of the mountain streams. The entire work of constructing the high-level concrete aqueduct from the heart of the Catskills to the sea is being carried on simultaneously over the entire line by more than thirty of the largest construction firms in the world.

The danger of a serious water famine in New York was foreseen by investigators many years ago. The present system is barely able to meet the demands now made upon it, but the new system will be able to supply an entire city of 10,000,000, which it is estimated New York will have by 1930. Also the general plan of it is such that its capacity can be doubled by the construction of additional dams in the Catskills that would require less than a year's work to build.

**New Thames Subway.** The new subway for foot passengers under the Thames between North and South Woolwich is nearing completion, and will probably be opened in July or August.

**Sewage Disposal and Water Supply.**—Sir William Ramsay, speaking at a public dinner recently, said the Royal Commission on Sewage Disposal would shortly issue their final report. The principal recommendation would be that there should be formed a permanent body—a sort of central board—which should regulate not merely the disposal of sewage, but also the cognate subject of the water supply of the country.

## VANCOUVER.

### THE SUNSET DOORWAY OF THE DOMINION.

Although the Hudson's Bay Company was founded so long ago as 1670, it was not until 1867 that the Dominion of Canada was formed, nor was British Columbia admitted to the confederation until 1871. In 1881 the first sod was turned on the Canadian Pacific Railway, and that line, of which Vancouver became the Western terminus two years later, was practically finished in 1885. In the following year (1886) Vancouver was incorporated, but the civic life of the city was, in the first place, destined to be a short one, for on June 13th of the same year, the very day upon which the first through train left Montreal, Vancouver was—practically within one hour—burnt to the ground, only four houses remaining standing. The city hall, as it appeared after the fire, is depicted in one of our illustrations, another of which shows the present fine building.

A Unique City Hall.
(The first meeting of the City Council of Vancouver after the great fire of June 13, 1886.)

A year and a day after the date of the great fire the first steamer from Japan arrived in Vancouver, which is now the headquarters of the Trans-Pacific "Empress" line, is the eastern terminus of the Mail steamers running to the Sandwich Islands, New Zealand and Australia, and is the home port for the Canadian-Pacific Steamship Company's vessels which ply north and south along the coasts.

After the great conflagration Vancouver rapidly arose from its ashes, and now has a population of some 40,000. The land-locked harbour, in which the whole British Navy could ride at anchor, the sheltering mountains, the mild, and for the most part somewhat humid, climate, which is favourable to the growth of timber and to agriculture, are natural advantages, promising a great future to the city, which is likely to keep its lead over Victoria, the capital of Vancouver, situated at the south end of that island. An ordinary annual export of timber from British Columbia is well over 50,000,000 cub. ft., and in a favourable year over 1,000,000 cases of tinned salmon are exported.

The town itself is very favourably situated from a municipal as well as from a commercial point of view. The land falls gradually towards the sea, which is accessible to good drainage, and the situation allows of any amount of expansion in two directions. The water supply, which is inexhaustible, is brought from a ravine in one of the neighbouring mountains, while the principal streets are paved with asphalte and provided with electric tramways. There is also an electric tramway to New Westminster on the Fraser river, a distance of about 12 miles. The city is laid out on a magnificent scale, and is being built in a style which does justice to the plan.

The citizen of Vancouver has opportunities for recreation which those of almost any other town might envy. Besides the more obvious facilities for enjoyment in such a locality, it may be mentioned that the town possesses a great area of wild forest land, Stanley Park, and that mountaineering may be indulged in within 10 miles of the city.

The Present City Hall, Vancouver.

## CREOSOTED WOOD PAVING.

### NEW LOAN PERIOD.

The Local Government Board have intimated in a letter to the Improved Wood Pavement Company, Limited, 46 Queen Victoria-street, London, E.C., that they are now prepared to allow a period of ten years for the repayment of loans sanctioned by them for soft-wood creosoted block paving.

**Valuation of Land and Buildings.** A paper dealing with some principles in the valuation of land and buildings will be read at a meeting of the Surveyors' Institution on April 29th next by Mr. G. T. Loban, F.S.I.

**Municipal Engineering** (Edited by Sydney G. Turner, Assoc.M.Inst.C.E. Price 3s. 6d. nett. London: St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, E.C.).—This volume consists of model answers to questions set at recent examinations of the Institution of Municipal and County Engineers, and is the second edition. It is practically identical with the first issued. It is not suggested that it should take the place of recognised text-books, but it provides useful summaries of various subjects, as well as indications as to how different types of questions may be answered. Every effort has been made to render the answers as accurate and comprehensive as possible, though they contain more than a candidate would be expected to supply. The answers are founded upon examinations held in Birmingham, London and Manchester. The appendix contains examples of questions on sewerage, sewage disposal, tramway construction, bridges, water supply, road construction, buildings, sanitary science as applied to towns and buildings, drainage, and other matters. It will be seen, therefore, that the book is comprehensive, practical and exhaustive.—*Local Government Journal.*

# London Traffic Problems.

## A BROAD VIEW OF THE CONSIDERATIONS INVOLVED.

**London traffic problems will be well to the fore this year, and it is, therefore, worth while calling to mind what are the main ideas underlying proposals for improving the means of getting into and out of London, and what, too, are the dominating conditions to be taken into account, either as affecting definite proposals or as guiding the trend of improvement generally. In the following paragraphs some of the chief of these main ideas are briefly outlined.**

Traffic problems are, of course, closely bound up with changes in the distribution of population, and need to be studied in relation to such changes, including that of a steady growth in numbers. The four most important considerations seem to be: First, that the City of London and other parts of the Metropolis are being more and more devoted to business premises, with corresponding displacement of residents; secondly, that residential areas of the "Garden City" type are being rapidly created at various distances from London; and, thirdly, that many of the towns near London are growing rapidly, many of the new inhabitants being employed in London. The last consideration to which, under this head, attention must be drawn is the steady growth of wayside places on the main roads leading out of London, and, indeed, of the population generally within a radius of 30 to 50 miles.

### THE "BAZAARS" OF LONDON.

Turning now to the principal elements of the subject, we may notice first the important fact that many London streets are essentially what would in Oriental cities be called "bazaars." This fact is of importance for two reasons. We must not make changes which would tend to diminish the value of the great mart; and, on the other hand, we must bear in mind that if we create broad thoroughfares, which will also be business streets, we may fail to get a satisfactory thoroughfare, regarded as an inlet and outlet, and, at the same time, its value as a business area may be far less than that of a smaller space filled with narrow streets. On the subject of London as a mart see THE SURVEYOR, September 1, 1911, p. 266; also August 11, 1905, p. 206, and July 28, 1905, p. 146.

### THE SPEEDWAY IDEA.

This leads up to the speedway idea, the creation of special routes, with only sufficient connection with existing streets to be effective as inlets and outlets. It may be suggested that if thoroughfares of this kind are to be made, the scheme, in some cases, should include the acquisition, a little way outside the central part of London, of small areas to be developed as shopping centres and served by these thoroughfares. The most promising type of special thoroughfare of this kind seems to be the plain road type, without tramways or specialised surfaces of any kind, and merging into the country highways. There should, however, be a division between fast and slow traffic, as well as between up and down traffic, and such routes should be properly designed by engineers. The matter was discussed in THE SURVEYOR, August 25, 1905, p. 266, though at that date it was necessary to regard such routes as including a provision for tramways.

### RING ROADS AND RAILWAYS.

Several different proposals have been made for the construction of a circular or elliptic road around London, and one of the earliest of these is noted in THE SURVEYOR, the issue of August 4, 1905, p. 177, the scheme of Mr. R. W. Perks. Such a road might be very useful if designed to fit in with a scheme of radial roads, and it should be a thoroughfare of the same kind. In order that it might serve as an effective aid to ingoing and outgoing traffic, it should not be too far out; but even if it had a radius of only some 10 miles, it would take a considerable time for a passenger to traverse any but the smallest arcs connecting radial roads. A radius of 10 miles would give a distance of 8 miles on a one-eighth arc, or — compared with direct entry along one radial road — 18 miles of main route against 10 miles of main route, and some 2 or 3 miles in the central area. Further in the road would cost too much to build; further out the interchange from one radial road to another would take too long. The idea is not, however, confined to roads, and a railway built and equipped for high speeds, the trains stopping only at intersections with radial lines and important main roads, might serve a useful purpose. Possibly a better scheme would be the construction, admittedly at high cost per mile, of three branches to each of the main radial roads in the last 5 miles or so approaching London, and branches at the other ends to spread the traffic of these trunk roads on to the main country highways. The trunk portions of the radial roads would be about 10 miles long, and the total cost might hardly exceed that of somewhat longer radial roads together with an elliptic of 60 or 70 miles total length.

### BY-PASS ROADS.

An important matter is the provision of by-pass roads, more especially as it is one that can be taken in hand at once, and is being taken in hand. Although there is no essential difference between a short by-pass to ease congestion of traffic and a longer by-pass skirting the same place, the latter tends to affect the general road system to a much greater extent. Near London a fairly liberal provision of long by-pass roads would, on some routes, be nearly as costly as the building of complete new routes; but elsewhere this would not be the case, and the character of a through route could be preserved by the making of a moderate mileage of by-pass roads. In some places, as has been suggested in THE SURVEYOR, a by-pass for light vehicles could be made cheaply, with bridges over other roads; while elsewhere suitable optional diversion could be arranged by the use of road signs, existing roads being utilised.

In the issue of August 25, 1905, p. 265, it was urged that "the principle of the intact roadway is . . . a very important one, and goes far towards justifying the construction of subways . . ."—that is, subways for pipes and cables under some of the main streets of London. This consideration is one that must not be allowed to slip out of sight when London's traffic problems are being studied. The construction of such subways would largely reduce the cost of upkeep of the pavements, and the gain from the traffic point of view would be very great, for not only would the local advantage be important itself, but greater speed in getting across London means less need for costly schemes for transfer of traffic a little way out from the central area.

### ATTACKING THE PROBLEM IN DETAIL.

The consideration first brought forward illustrates the importance of attacking the problem in a manner such as that suggested in an article in the *Morning Post*, to which reference was made in our issue of September 1, 1911, working steadily at whatever seems to offer a chance of effecting an improvement, however small. It is important, from this point of view, to make some attempt in each case to forecast the effect which an improvement to one facility is likely to have upon other facilities for transport. For instance, the provision of subways and an increase in the average speeds of vehicles might considerably reduce the importance of projects for effecting an interchange of passengers either in a great exchange station or at strategic points on the outskirts of London.

### CHANGING CONDITIONS.

There remains to be noted the important fact that conditions are changing of themselves. Congestion in the streets of London is eased by the change from horse cabs to motor cabs, and from horse omnibuses to motor omnibuses. There are times when a small, but perhaps not inconsiderable, proportion of the holiday and half-holiday traffic is cab traffic, relieving the suburban trains and omnibuses. A considerable amount of goods transport is now carried on by delivery vans from the London stores. No doubt a part of this is new traffic, increasing the quantity of goods taken into and out of London, but some of it probably replaces railway transport from London warehouses to railway stations within a 50-mile radius. It is difficult to form any estimate of the future rate of growth of this distribution of goods and passengers as well; but its present growth is an example of how the problem goes ahead without any large concerted measures being carried out. The provision of radial through routes, for through traffic only, would probably result in a large increase in this kind of traffic.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

### FORTHCOMING MEETINGS.

The following meetings are reported as fixtures: June 7th and 8th, Scottish meeting at Stirling; Eastern District, June 15th, at East Ham; Eastern District meeting on June 22nd, at Lowestoft.

A West Midland District meeting will be held at Stourbridge, April 13th, the Paris meeting at Whitsun, and the annual meeting will probably be held July 11th, 12th and 13th.

Provincial members who propose to take part in the visit to Paris will, in cases where the journey exceeds a distance of 30 miles, be able to obtain return tickets to London at a single fare and a quarter.

Members desirous of submitting a paper at the forthcoming annual meeting are requested to give early information of their desire.

Premiums not exceeding 30 guineas are awarded by the council for the best papers read by members and associate members during the year.

Thomas Cole,
*Secretary.*

11 Victoria-street,
London, S.W.

## INSTITUTION OF MUNICIPAL ENGINEERS.

### MEETING IN LONDON.

A general meeting will be held in the Committee-room, No. 4 Southampton-row, London, W.C., to-morrow (Saturday), at 6 o'clock, when a paper, "Superannuation and Security of Tenure: the National Association of Local Government Officers and its Bill," by A. Winter Gray, member of council of the institution, will be read.

Mr. L. Hill, secretary of the association, and, it is hoped, some of its prominent members, will be present and take part in the discussion, which will be an open one.

The building, No. 4 Southampton-row, is almost opposite the Holborn Station of the Great Northern and Piccadilly Tube, and within a minute of the British Museum Station of the Central London Railway.

### SOUTH-EASTERN DISTRICT.

A discussion evening will be held in the council room of the institution, 39 Victoria-street S.W., on Wednesday, March 6th, at 7 p.m., when there will be an open discussion on "Methods of Inviting Public Tenders": The advantages and disadvantages of stipulating that: (1) The lowest tender will be rejected; (2) the tender next above the lowest will be accepted.

Another discussion evening has been arranged for Tuesday, March 19th, the subject for consideration being "The Size and Design of Street Gullies, Grates and Weirs."

Bernard Partridge,
*Hon. District Secretary.*

Town Hall,
Walthamstow.

### NORTHERN DISTRICT MEETING.

A meeting of the Northern District of the institution was held on Saturday last at the Town Hall, Newcastle-on-Tyne. Mr. J. Davison, chairman of the district, occupied the chair, and among those present were Messrs. J. T. Pegge (Durham), H. G. Kaines (Durham County), W. Wade (Northumberland), J. H. Mole (Chester-le-Street), J. H. Gardner (Willington), W. J. Coulson (Cramlington), G. Symon (Blaydon-on-Tyne), Geo. Gregson (Durham), G. W. Ayton (Chester-le-Street), W. R. Plews (Sedgefield), J. R. MacMillen (Easington), J. W. Moncur (Sunderland), H. V. Strong (Gateshead), L. Simpson (Middleton-in-Teesdale), John Robinson (hon. district secretary), and B. Wyand (secretary of the institution).

Mr. Davison presented some notes on "The Present System of Repayment to District Councils by County Council for Maintenance of Main Roads," and a lengthy and well-illustrated discussion followed.

### EXAMINATIONS.

The next examination will be held in May, 1912, at centres to be arranged. The papers set at the November examinations may be obtained in book form, price 1s., post free.

B. Wyand,
*Secretary.*

39 Victoria-street, S.W.

## ROYAL SANITARY INSTITUTE.

### MEETING AT MANCHESTER.

At a meeting of the Royal Sanitary Institute, to be held at Manchester, on Friday, March 8th, discussions will be opened on "The Application of the Housing and Town Planning, &c., Act, to the Development of Suburban Areas now in Process of Transition," by Mr. F. W. Platt, building surveyor, Salford, and on "The Quantity of Water Available from Upland Drainage Areas," by Prof. J. Radcliffe, M.Sc. On the following day visits will be made to places of local interest.

## INSTITUTE OF SANITARY ENGINEERS.

### FORTHCOMING MEETINGS.

A sessional meeting will be held at Caxton Hall, Westminster, on Monday next, when a lecture on "Sanitary Building Construction" will be given by Prof. Henry Adams, M.Inst.C.E., M.I.Mech.E. Mr. Edwin T. Hall, F.R.I.B.A., F.R.San.I., will take the chair at 8 p.m.

A sessional meeting will be held at Caxton Hall, Westminster, on Monday, March 11th, when a paper on "The Modern Home" will be read by Mr. Percival M. Fraser, A.R.I.B.A. The chair will be taken at 8 p.m.

## SOCIETY OF ENGINEERS.

### PAPER ON RAILLESS TRACTION.

On Monday, March 4th, at a meeting of the Society of Engineers at the Institution of Electrical Engineers, Victoria Embankment, W.C., Mr. Henry C. Adams, Assoc.M.Inst.C.E., M.I.Mech.E., A.M.I.E.E., will read a paper entitled "The Trolley Vehicle System of Railless Traction," the following being a synopsis:—

Introduction—The system abroad—Historical *résumé* of progress in this country—Bills in Parliament—The Brighton Bills—Anticipated legislation—Conditions under which the system is suitable—Subsidiary sources of revenue—Description of "Max Schiemann" system—Description of "Mercedes-Stoll" system—Description of "Lloyd-Köhler" system—Description of "Filovia" system—Description of "R.E.T." system at Leeds and Bradford—Capital cost of construction—Cost of overhead equipment—Cost of vehicles—Repayment of loans—Cost of running—Passengers carried—Fares—Double-deck vehicles—Trailers—Wear of Tyres—Wear of roads—Conclusion.

The chair will be taken at 7.30 p.m.

## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned* (*No. 1359 Holborn*), *subject to later confirmation by letter.*

Roller Gang Foreman.—February 27th.—Berkshire County Council. 30s.—35s. per week.—County Surveyor.

Road Foreman.—March 1st.—Uckfield Rural District Council. 25s. per week.—Mr. E. W. Ray-Johnson, Highway Surveyor's Office, Buxted.

Surveyor.—March 4th.—Tyldesley Urban District Council. £200 per annum.—Mr. W. J. Matthews, clerk.

Inspector and Assistant Highway Surveyor.—March 6th.—Steyning East Rural District Council. £80 per annum.—Mr. Arthur Flowers, clerk.

Assistant in Surveyor's Office.—March 7th.—£2 per annum.—Messrs. Tweed, Stephen & Co., clerks.

Surveyor and Inspector.—March 9th.—Llanidloes Town Council. £75 per annum.—Mr. A. Davies, town clerk.

Assistant Engineers.—May 1st.—Indian Public Works and State Railway Departments.—Secretary, Judicial and Public Department, India Office, London, S.W.

## MUNICIPAL COMPETITIONS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned* (*No.* 1359 *Holborn*), *subject to later confirmation by letter.*

CLONAKILTY.—March 1st.—Schemes for a water supply, to cost £800, for the rural district council.—Mr. W. H. Spiller, clerk.

WINDSOR.—March 5th.—Designs for an iron foot-bridge, for the corporation.—Mr. E. A. Stickland, borough surveyor.

ST. HELENS.—March 13th.—Designs for a park conservatory, for the corporation. Chairman, Parks and Public Buildings Committee.

HARROW-ON-THE-HILL.—March 16th.—Enlargement of public offices, for the urban district council. Cost not to exceed £4,500. Premiums of 30, 20 and 15 guineas are offered.—Mr. J. P. Bennetts, engineer and surveyor.

PORTLAND.—April 4th.—Designs and plans for council offices, for the urban district council. Premiums of £50 and £10 are offered.—Mr. R. A. Colenutt, clerk.

WOMBWELL.—May 1st.—Designs for public swimming bath, for the urban district council.—Prizes of £40, £30 and £20 are offered.—Mr. W. Quest, surveyor.

HALE.—June 28th.—Designs for a town planning scheme for the urban district council. Premiums of £50 and £25 are offered.—The Clerk.

DUSSELDORF.—July 1st.—Plan for the extension of the city. Premiums of £1,000 and £375 are offered.—The Chief Burgomaster.

## MUNICIPAL CONTRACTS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned* (*No.* 1359 *Holborn*), *subject to later confirmation by letter.*

### Buildings.

CROYDON.—February 24th—March 2nd. For the erection of an elementary school, for the Education Committee.—The Clerk.

BRADFORD.—February 24th.—For alterations to tramway offices, for the corporation.—Town Clerk.

WEST RIDING.—February 26th.—For the extension of the county hall, Wakefield, for the county council. Mr. J. V. Edwards, county architect, Wakefield.

DEWSBURY.—February 26th.—For additions to a public school, for the Education Committee.—Mr. S. G. Bibby, secretary, Town Hall.

DUBLIN.—February 26th.—For the erection of forty-five cottages, for the corporation. Improvement Committee, City Hall.

SWANSEA.—February 26th.—For the erection of 103 houses, for the corporation.—Mr. H. Laug Coath town clerk.

HALIFAX.—February 26th.—For the erection of a shelter and underground convenience, for the corporation.—Mr. B. Saunders, clerk.

MINEHEAD.—February 26th.—For the erection of conveniences and shelters, for the urban district council.—Mr. L. C. Webber-Incledon, clerk, Minehead, Somerset.

LOWESTOFT.—February 26th.—For the erection of a school, for the Education Committee.—Town Clerk.

NORTHUMBERLAND.—February 26th.—For the erection of an infants' school, for the county council.—Mr. C. Williams, secretary, The Moot-hall, Newcastle-upon-Tyne.

THEDWASTRE.—February 27th.—For the erection of workmen's cottages, for the rural district council.—Mr. H. E. Wilkes, clerk.

BASINGSTOKE.—February 27th.—For lining with white glazed tiles the walls and floor of bathing pond, for the corporation.—Mr. F. R. Phipps, borough surveyor.

WANDSWORTH.—February 27th.—For the construction of public conveniences, for the borough council.—Mr. Henry George Hills, town clerk.

SHEFFIELD.—February 27th.—For alterations to power station, for the corporation.—City Architect.

DARTFORD.—February 27th.—For the extension of the electricity works, for the urban district council.—Mr. W. Kay, clerk.

BLACKBURN.—February 27th.—For extensions of the town hall, for the corporation.—Mr. L. Beard, town clerk.

MANCHESTER.—February 28th.—For the erection of corrugated iron buildings, for the Education Committee.—Accountant, Education Offices, Deansgate.

GLAMORGAN.—February 28th.—For building a ferro-concrete bridge and alterations to certain existing bridges, for the county council.—Mr. W. E. R. Allen, deputy clerk, Westgate-street, Cardiff.

SOMERSET.—February 28th.—For the erection of a school, for the Education Committee.—Mr. C. H. Bothamley, secretary, Weston-super-Mare.

COVENTRY.—February 29th.—For the erection of a pavilion and alterations to mortuary, for the corporation.—Town Clerk.

HOOLE.—February 29th.—For the erection of a park-keeper's lodge, bowl-house and public conveniences, for the urban district council.—Mr. A. E. Caldecutt, clerk.

ASHFORD.—February 29th.—For the construction of dressing-room at swimming bath, for the urban district council.—Mr. J. Creary, clerk.

PAISLEY.—February 29th.—For the erection of a coal store, for the corporation.—Mr. Geo. R. Heslop, engineer and surveyor.

BIRMINGHAM.—February 29th.—For alterations at a police station, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

NELSON.—March 2nd.—For the erection of public baths at Bradley, for the corporation.—Mr. J. H. Boldwick, town clerk.

LLANDUDNO.—March 2nd.—For the erection of a governor-house and alterations to meter-house, for the urban district council.—Mr. T. W. Scott, clerk.

ESSEX.—March 2nd.—For the erection of certain buildings, for the Education Committee.—Mr. F. H. Bright, 53 High-street, Maldon.

OXFORD.—March 2nd.—For the erection of a school, for the Education Committee.—County Surveyor, 9 New-road, Oxford.

DEVIZES.—March 4th.—For the construction of a convenience, for the urban district council.—Mr. F. G. Billingham, borough surveyor.

STEPNEY.—March 4th.—For structural alterations at a public library, for the borough council.—Mr. G. W. Clarke, town clerk.

READING.—March 4th.—For additions to swimming bath, for the corporation.—Mr. J. Bowen, borough engineer and surveyor.

SALFORD.—March 4th.—For the erection of a secondary school, for the Education Committee.—Mr. Henry Lord, 42 Deansgate, Manchester.

BIRMINGHAM.—March 4th.—For the erection of an electric sub-station, for the Electric Supply Committee.—Mr. R. A. Chattock, electrical engineer.

HAYES.—March 6th.—For laying out site and building fifty-one houses, for the urban district council. Mr. D. C. Fidler, engineer and surveyor.

HOVE.—March 6th.—For building boundary walling, shedding stores, and other work, for the corporation.—Mr. H. Endacott, town clerk.

BANGKOK.—March 15th.—For the erection of an electric power station, for the municipality.—Mr. F. B. Shaw, engineer-in-charge, Municipal Electric Power Station, Local Sanitary Department, Bangkok.

### Iron and Steel.

RUNCORN.—February 28th.—For the supply of spigot and socket pipes, sluice valves and covers, and laying water mains, for the urban district council.—Mr. E. Marshall, secretary to the Water Committee.

NOTTINGHAM.—March 2nd.—For the supply of steel rails, for the Tramways Committee.—Mr. J. H. Green, town clerk.

LLANELLY.—March 4th.—For the supply of iron fencing, for the urban district council.—Mr. H. W. Spowart, clerk.

IPSWICH.—March 7th.—For the supply of cast-iron pipes, for the corporation.—The Chairman, Waterworks Committee.

BIRMINGHAM.—For the purchase of the machinery and plant at the Bournbrook generating station from the corporation.—Mr. Alfred Baker, general manager, Tramway Department.

### Roads.

SOUTH SHIELDS.—February 24th.—For laying *in situ* concrete for footways, for the corporation.—Mr. L. Roseveare, borough engineer and surveyor.

Edinburgh.—February 24th.—For the execution of road work, for the corporation.—Mr. T. Hunter, town clerk.

Billesden.—February 24th.—For the supply of granite and chippings, for the rural district council. —Mr. W. E. Richardson, clerk, 18 New-street, Leicester.

Ouseburn.—February 24th.—For the supply of whinstones, limestones and slag, for the rural district council.—Mr. H. S. Thompson, solicitor and clerk, Borough Bridge.

Belvoir.—February 24th.—For the supply of materials and labour, for the rural district council.—Mr. A. E. Pearson, 4 St. Peter's-hill, Grantham.

St. Annes-on-Sea.—February 24th.—For the supply of road materials, for the urban district council.—Mr. T. Bradley, clerk.

Sibsey.—February 24th.—For the supply of granite and slag, for the rural district council.—The Clerk.

Nelson.—February 24th.—For making up certain streets, for the corporation.—Mr. W. Shackleton, borough engineer and surveyor.

Huyton.—February 24th.—For making up a roadway for the urban district council.—Mr. G. W. Swift, clerk.

Epsom.—February 26th.—For the supply of road materials and cartage, for the rural district council.—Mr. A. R. Cotton, clerk.

Oxenden.—February 26th.—For the supply of road materials, for the rural district council.—Mr. C. Burgoine, clerk, Exchange Buildings, Market Harborough.

Southampton.—February 26th.—For the supply of broken granite, for the corporation.—Town Clerk.

Fylde.—February 26th.—For the supply of a steam road-roller, for the rural district council.—Mr. Fred. H. Brown, clerk.

Penarth.—February 26th.—For the supply of mountain limestone road metalling, gravel, and basalt, for the urban district council.—Mr. Edgar J. Evans, surveyor.

Surbiton.—February 26th.—For the supply of Guernsey granite, concrete flags, cast-iron goods, Devonshire limestone, tar paving, granite kerbing, granite paving setts, flints, tarred macadam, and quarrite, for the urban district council.—Mr. Frederick W. Wood, clerk.

Bradfield.—February 26th.—For works of road repair, for the rural district council.—Mr. R. E. Rawstorne, clerk, 4 Bridge-street, Caversham, Reading.

Torpoint.—February 26th.—For making up a street, for the urban district council.—Mr. A. N. F. Goodman, clerk, 11 St. Aubyn-street, Devonport.

Tynemouth.—February 27th.—For laying cement-concrete footpaths, for the corporation.—Mr. John F. Smillie, borough surveyor.

Maidenhead.—February 27th.—For the supply of tarred macadam, for the corporation.—Mr. P. Johns, borough surveyor.

Sowerby Bridge.—February 27th.—For the supply of road materials, for the urban district council.—Mr. L. Rhodes, clerk, Commercial Bank Chambers, Halifax.

Smallburgh.—February 27th.—For the supply of road materials, for the rural district council.—Mr. F. Davies, clerk.

Diss.—February 27th.—For the supply of granite, for the urban district council.—Mr. Alfred Cooper, surveyor.

Bootle.—February 27th.—For the execution of private street works, for the corporation.—Mr. J. H. Farmer, town clerk.

Gateshead.—February 27th.—For paving work in certain streets, for the corporation.—Mr. W. Swinburne, town clerk.

Barnstaple.—February 27th—March 12th.—For repairs to main and district roads, for the rural district council.—Mr. A. A. Richards, district highway surveyor.

Hazel Grove.—February 27th.—For the supply of road materials, for the urban district council.—Mr. G. S. Doncaster, surveyor.

Pershore.—February 27th.—For the supply of stone and chippings, for the rural district council.—Mr. A. E. Baker, clerk.

Winchester.—February 27th.—For the supply of road materials, for the corporation.—Mr. T. Holt, town clerk.

Edmonton.—February 27th.—For making up certain streets, for the urban district council.—Mr. W. F. Payne, clerk.

Salisbury.—February 27th.—For the supply of stones and gravel, for the rural district council.—Mr. W. H. Jackson, clerk.

Woodford.—February 27th.—For the supply of road materials, for the urban district council.—Mr. W. Farrington, surveyor.

Ashton-upon-Mersey.—February 27th.—For making up certain streets, for the urban district council.—Mr. J. W. L. Foulkes, clerk.

Foleshill.—February 27th.—For the supply of granite, for the rural district council.—The Surveyor.

Harwich.—February 28th.—For the supply of granite, for the corporation.—Mr. H. Ditcham, borough surveyor.

Lanark.—February 28th.—For the supply of road materials, for the Lower Ward District.—Mr. W. H. Hill, district road clerk, 15 West George-street, Glasgow.

Dulverton.—February 28th.—For the supply of roadmen's tools, implements, and granite, for the rural district council.—Mr. J. Johnson, district surveyor.

Durham.—February 28th.—For alterations to main road, for the county council.—Mr. W. Crozier, county surveyor, Shire Hall, Durham.

Prestwich.—February 28th.—For making up several streets, for the urban district council.—Mr. Lewis A. Orford, clerk.

Belfast.—February 28th.—For the construction of 7 miles of double-track permanent tramway, for the corporation.—Mr. R. Meyer, town clerk.

West Sussex.—February 28th.—For surface tarring on main roads, for the county council.—Mr. H. W. Bowen, County Offices, Horsham.

Newburn.—February 28th.—For the supply of road materials, for the urban district council.—Mr. G. Wilkinson, clerk.

Stonehaven.—February 29th.—For laying tar-grouted macadam, for the corporation.—Burgh Surveyor.

Sale.—February 29th.—For making up certain roads, for the urban district council.—Mr. D. Hallewell, clerk.

Hampton.—February 29th.—For the supply of hand-broken granite, chippings, broken Kentish brown flints, Derbyshire limestone marple, tar-paving material, tar, forage, coal and brooms, for the urban district council.—Mr. Sidney H. Chambers, surveyor.

Hetton-le-Hole.—February 29th.—For making up a certain street, for the urban district council.—Mr. G. Young, clerk, William-street, Houghton-le-Spring.

Erith.—March 1st.—For the supply of road materials, for the urban district council.—Mr. J. K. Allerton, clerk.

Bognor.—March 1st.—For making up certain streets, for the urban district council.—Mr. O. C. Bridges, surveyor.

Inverness.—March 1st.—For the execution of road work, for the First District Committee.—Mr. R. Black, 39 Union-street, Inverness.

Staines.—March 1st.—For the supply of road stone and Kentish flints, for the rural district council.—Mr. G. W. Manning, surveyor, London-road, Ashford, Middlesex.

Cannock.—March 1st.—For the supply of granite, chippings, tarred granite and chippings, kerbs, setts, and slag, for the urban district council.—Mr. C. A. Loxton, clerk.

Denbighshire.—March 1st.—For the supply of road stone, for the county council.—Mr. Ellis W. Jones, county surveyor, Wrexham.

Brierley.—March 1st.—For paving two streets, for the urban district council.—Mr. B. Halstead, surveyor.

Riccall.—March 2nd.—For the supply of road materials, for the rural district council.—Mr. E. Townend, clerk.

Chesterton.—March 2nd.—For the supply of team labour and granite, for the rural district council.—Mr. John F. Symonds, clerk.

Driffield.—March 2nd.—For the supply of whin stone, broken slag, sea cobbles, sea gravel and tarred chippings, for the rural district council.—Mr. T. Cosser Beaumont, surveyor.

ESSEX.—March 2nd.—For reconstructing Askingford Bridge, for the county council.—Mr. Percy J. Sheldon, county surveyor.

ESSEX.—March 2nd.—For widening Town Bridge, Halstead, for the county council.—Mr. Percy J. Sheldon, county surveyor.

EAST RIDING.—March 2nd.—For the supply of stone, for the county council.—Clerk, County Council Offices, Beverley.

BELPER.—March 2nd.—For the supply of road materials, for the rural district council.—Mr. R. C. Cordon, surveyor, Duffield, near Derby.

STOCKTON.—March 4th.—For the supply of whinstone and slag, for the rural district council.—Mr. T. H. Faber, clerk, Stockton-on-Tees.

SAWBRIDGEWORTH.—March 4th.—For work of street watering, for the urban district council.—The Clerk.

EAST RETFORD.—March 4th.—For the supply of slag and broken granite, for the rural district council.—Mr. C. B. Smith, clerk.

LICHFIELD.—March 4th.—For the supply of granite and slag, for the rural district council.—Mr. John Derry, clerk.

CHEPPING WYCOMBE.—March 4th.—For the supply of flints, for the corporation.—Mr. T. J. Rushbrooke, borough surveyor.

HIGH WYCOMBE.—March 4th.—For the supply of flints, for the corporation.—Mr. T. J. Rushbrooke, borough surveyor.

GLASGOW.—March 4th.—For paving certain streets with rock asphalte, for the corporation.—Mr. A. W. Myles, town clerk.

EAST GRINSTEAD.—March 4th.—For the supply of road materials, for the rural district council.—Mr. F. S. White, clerk.

HUNTS.—March 4th.—For the supply of granite and slag, for the county council.—Mr. Herbert Leete, county surveyor.

CASTLE WARD.—March 4th.—For the supply of materials and road-making work, for the rural district council.—Mr. G. Wilkinson, clerk, 1 Mosley-street, Newcastle-upon-Tyne.

CHERTSEY.—March 4th.—For the supply of highway materials, for the rural district council.—Mr. H. Beeney, surveyor, High-street, Chobham.

ROCHFORD.—March 4th.—For the supply of road materials, for the rural district council.—Mr. H. T. Sidwell, Rayleigh, Essex.

SLEAFORD.—March 4th.—For the supply of granite and slag, for the urban district council.—The Clerk.

PORTLAND.—March 5th.—For the supply of granite or basalt, for the urban district council.—Mr. R. S. Henshaw, engineer and surveyor.

ELHAM.—March 5th.—For the supply of granite, for the rural district council.—The Clerk, 54 High-street, Hythe, Kent.

BARTON-UPON-IRWELL.—March 5th.—For the supply of road materials, for the rural district council.—Mr. A. H. Mountain, surveyor, Union Offices, Patricroft, Lancs.

LEWISHAM.—March 5th.—For works of road making, for the borough council.—Borough Surveyor.

POTTERSPURY.—March 5th.—For the supply of granite and slag, for the rural district council.—Mr. W. R. Parrott, clerk, High-street, Stony Stratford.

DUMBARTON.—March 6th.—For the supply of whinstone metal, for the Eastern District.—Mr. J. F. Robertson, clerk, 179 West George-street, Glasgow.

DESBOROUGH.—March 6th.—For the supply of granite, for the urban district council.—Mr. G. E. Marlow, surveyor.

HOVE.—March 6th.—For carrying out paving and other works, for the corporation.—Mr. H. Endacott, town clerk.

BINGHAM.—March 6th.—For the supply of team labour, for the rural district council.—Mr. R. H. Beaumont, clerk.

WANSTEAD.—March 6th.—For the widening of High-street and making up part of Belgrave-road, for the urban district council.—Mr. Bruce Blewitt, clerk.

ERPINGHAM.—March 7th.—For the supply of materials and labour, for the rural district council.—Mr. T. Ling, clerk, Northrepps, Norwich.

EASTBOURNE.—March 7th.—For the supply of road materials, for the rural district council.—Mr. T. E. V. Kirtlan, clerk.

LOUGHBOROUGH.—March 7th.—For the supply of broken granite, for the corporation.—Town Clerk.

HASTINGS.—March 9th.—For the supply of unbroken bluestone, for the rural district council.—Mr. D. Paine, district surveyor, Stonelynk Farm, Fairlight, Hastings.

BURNLEY.—March 9th.—For the supply of granite macadam, limestone, shovels, brooms, sewer pipes, kerbs, &c., for the rural district council.—Mr. J. S. Horn, clerk.

LEYLAND.—March 9th.—For the supply of road materials, for the urban district council.—Mr. M. H. Wilkinson, surveyor.

HORSHAM.—March 11th.—For the supply of granite, team labour, hire of two steam rollers, and two tar boilers, for the rural district council.—Mr. A. C. Coole, clerk.

BILLERICAY.—March 11th.—For the supply of granites, flint, and gravel, for the rural district council.—Mr. C. E. Lewis, clerk, New-road, Brentwood.

DARTFORD.—March 11th.—For the supply of road materials, maintenance, and steam rolling, for the rural district council.—Mr. Eustace J. Hobbs, clerk.

KENT.—March 11th.—For laying tar-paving, for the county council.—Mr. F. W. Crook, secretary, Caxton House, Westminster.

NEWARK.—March 11th.—For the supply of granite, slag and tar-macadam, for the rural district council.—Mr. A. J. Franks, clerk.

WING.—March 11th.—For the supply of granite, slag, sand and gravel, for the rural district council.—Mr. W. W. B. Calcott, clerk.

MAIDSTONE.—March 12th.—For the supply of road materials, for the corporation.—Mr. S. Lance Monckton, town clerk.

MOUNTAIN ASH.—March 12th.—For the supply of broken mountain limestone, gravel and haulage, for the urban district council.—Mr. H. P. Linton, clerk.

STROOD.—March 13th.—For the supply of road materials, for the rural district council.—Mr. J. E. Povey, clerk.

NELSON.—March 16th.—For the supply of granite macadam, limestone macadam, limestone paving chippings, Barns flags, Yorkshire flags, grit setts, kerb, Portland cement, and oil for the corporation.—Mr. J. H. Boldwick, town clerk.

KING'S LYNN.—March 18th.—For the supply of road materials, for the corporation.—Mr. Alfred J. Smith, borough surveyor.

## Sanitary.

BROMLEY.—February 24th.—For the removal of refuse, for the rural district council.—Mr. E. Haslehurst, clerk.

MANSFIELD-WOODHOUSE.—February 26th.—For the removal of nightsoil and refuse, for the urban district council.—Mr. J. E. Alcock, clerk.

NORWICH.—February 26th.—For flushing cisterns and water-closet pans, for the corporation.—Mr. A. E. Collins, city engineer.

STEYNING WEST.—February 27th.—For the removal of house refuse, for the rural district council.—Mr. A. Flowers, clerk, Union Offices, Shoreham.

FOLESHILL.—February 27th.—For the removal of house refuse, for the rural district council.—Mr. A. P. Oswin, clerk.

HORBURY.—February 28th.—For the construction of sewage disposal works, for the urban district council.—Mr. T. Barker, clerk.

CHELSEA.—February 28th.—For barging slop, dust, and refuse, for the borough council.—Mr. T. Holland, town clerk.

BATH.—February 28th.—For laying sewage pumping main, for the corporation.—Mr. F. D. Wardle, town clerk.

CHELMSFORD.—February 28th.—For sewerage work, for the town council.—Mr. W. Smith, town clerk.

HACKNEY.—February 29th.—For the removal of house refuse, for the borough council.—The Town Clerk.

EAST WESTMORLAND.—March 1st.—For constructing sewer, tank and manhole, for the rural district council.—Mr. W. Hewitson, clerk.

TADCASTER.—March 1st.—For carrying out a sewerage scheme, for the rural district council.—Mr. G. A. Bromet, clerk.

ROTHERHAM.—March 2nd.—For the removal of nightsoil, for the rural district council.—Messrs. Oxley & Coward, clerks, 6 Westgate.

DRIFFIELD.—March 2nd.—For scavenging work, for the rural district council.—Mr. H. Botterill, clerk.

ARDSLEY.—March 2nd.—For scavenging work, for the urban district council.—Mr. J. Morley, surveyor, Stairfoot, near Barnsley.

AUCKLAND.—March 4th.—For the construction of sewage disposal works, &c., for the rural district council.—Mr. Sam Adams, clerk.

TANGIER.—March 4th.—For the construction of a drain, for the Special Committee of Public Works.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

SUNDERLAND.—March 4th.—For the removal of nightsoil, refuse, &c., for the rural district council.—Mr. J. C. Wilson, clerk.

COULSDON.—March 4th.—For work of scavenging, for the rural district council.—Mr. E. J. Gowen, clerk.

ROCHFORD.—March 4th.—For the supply of disinfectants, and scavenging work, for the rural district council.—Mr. F. Gregson, clerk, Southend.

CROYDON.—March 5th.—For the collection and removal of refuse, for the rural district council.—Mr. E. J. Gowen, clerk.

WALLINGTON.—March 7th.—For scavenging work, for the rural district council.—Mr. E. J. Gowen, clerk.

NEATH.—March 9th.—For the construction of sewage disposal works, for the rural district council.—Messrs. Cuthbertson and Powell, clerks.

ALNWICK.—March 11th.—For cleaning out ashpits, for the rural district council.—Mr. H. W. Walton, clerk.

CARSHALTON.—March 13th.—For work of scavenging, for the urban district council.—Mr. C. P. Lovelock, clerk.

## Stores.

NEWTON-IN-MAKERFIELD.—February 24th.—For the supply of steam tubes and fittings, main cocks, plug stop-cocks, sheet iron and steel, disinfectant powder, iron main pipes, hydrants, valves, gas meters, Portland cement, retorts, granite macadam, setts, concrete flags, kerbs, &c., for the urban district council.—Mr. C. Cole, clerk.

HEREFORD.—February 24th.—For the supply of fodder, haulage, horse hire, sewer pipes, cement, gullies, brooms, iron castings, oils, &c., for the corporation.—Mr. Arthur Holt, town clerk.

BROMLEY.—February 24th.—For the supply of timber, ironmongery, builders' materials, tools, paints, tar-paving, and steam road-rolling, for the corporation.—Mr. Fred. H. Norman, town clerk.

FINSBURY.—February 26th.—For the supply of fodder, blacksmiths' work, castings, granite patent stone, cement, stoneware goods, wood-paving blocks, leather hose, brushes, brooms, tools, &c., for the borough council.—Mr. George Whitehead Preston, town clerk.

LEEDS.—February 26th.—For the supply of bolts nuts, washers, brushes, chemicals, electrical sundries, iron and steel, ironmongery, springs, coal, river sand, cement, &c., for the Tramways Committee.—Mr. J. B. Hamilton, general manager.

WESTMINSTER.—February 26th.—For the supply of ballast and sand, boots, bricks, brooms, asphalte, macadam, granite, and wood carriage and footway repairs, cement, coal, disinfectants, flags, granite, granite setts, harness, gullies, sewerage works, shovels, steam road roller hire, stoneware goods, &c., for the city council.—Mr. John Hunt, town clerk.

SOUTHEND-ON-SEA.—February 26th.—For the supply of stoneware pipes, flints, bricks, timber, ironmongery, paints, cement, team labour, tar paving, tar-macadam, iron castings, road materials, harness, brooms, &c., for the corporation.—Mr. H. J. Worwood, town clerk.

HOLBORN.—February 27th.—For the supply of coal, disinfectants, stone, gravel, iron castings, cement, street orderlies' and sewermen's clothing, &c., for the borough council.—Mr. Lionel Walford, town clerk.

WINCHESTER.—February 27th.—For the supply of broken granite, chippings, brooms, Portland cement, coal, coke, stoneware pipes, and concrete paving slabs, for the corporation.—Mr. Thomas Holt, town clerk.

BIRMINGHAM.—February 27th.—For the supply of slack, iron, steel, belting, timber, brushes, and miscellaneous stores, for the Refuse Committee.—The Clerk, Montagu-street Wharf.

HEATON NORRIS.—February 28th.—For the supply of stone, granite, and sanitary pipes, for the urban district council.—Mr. F. W. Brooke, clerk.

SWANSEA.—February 28th.—For the supply of stores, stone, and ironwork, for the corporation.—Town Clerk.

AUCKLAND.—February 29th.—For the supply of road metal, creosoted fencing, timber, cement, sanitary pipes, brooms, tar, &c., for the rural district council.—Mr. Sam Adams, clerk.

CARDIFF.—February 29th.—For the supply of stores, street surface covers, jobbing mason's work, and cast-iron scrap (for sale), for the corporation.—Mr. J. L. Wheatley, town clerk.

MIDDLETON.—March 2nd.—For the supply of setts, flags, sanitary tubes, granite, macadam, manholes, covers, street grids, waste-water closets, lime, brooms, &c., for the corporation.—Mr. Frederick Entwistle, town clerk.

SOUTH SHIELDS.—March 2nd.—For the supply of road materials, cement, cast-iron work, brooms, disinfectants, sanitary pipes, tar, oils, &c., for the corporation.—Mr. Leslie Roseveare, borough engineer.

CHEPPING WYCOMBE.—March 4th.—For the supply of cast-iron pipes, surface boxes, manhole covers, stop and bib cocks, tubes, and fittings, for the corporation.—Mr. T. J. Rushbrooke, water engineer.

EALING.—March 4th.—For the supply of limes, pipes, cement, ironmongery, iron castings, paints, oils, granite, gravel, sand, tarred macadam, tar, wood-paving repairs, &c., for the corporation.—Mr. Geo. E. Brydges, town clerk.

READING.—March 4th.—For the supply of granite, setts, gravel, cement, stoneware pipes, gullies, coal, brooms, ironmongery, &c., for the corporation.—Mr. John Bowen, borough engineer and surveyor.

CAMBRIDGE.—March 14th.—For the supply of timber, stoneware pipes, cement, gravel, brooms, horses, carts, &c., for the corporation.—Mr. J. E. L. Whitehead, town clerk.

GUILDFORD.—March 6th.—For the supply of broken granite, chippings, Durax cubes, cast-iron pipes, brooms, flints, disinfectants, horse hire, cartage, iron castings, oils, pitch, tar, Portland cement, &c., for the corporation.—Mr. A. D. Jenkins, town clerk.

TWICKENHAM.—March 13th.—For the supply of ballast, shingle, granite cubes, cement, coal, street gullies, drain pipes, broken granite, &c., for the urban district council.—Mr. H. Jason Saunders, clerk.

LANARK.—March 15th.—For the supply of tools and implements, fencing materials and drain pipes, for the District Committee of Middle Ward.—Mr. W. E. Whyte, district clerk, Hamilton.

BARNES.—For the supply of Guernsey or Alderney granite, flints, Thames ballast, horses, carts, disinfectants, ironmongery, Portland cement, forage, granite kerb and channel, paving slabs, oils, and stoneware pipes, for the urban district council.—Mr. G. Bruce Tomes, engineer and surveyor.

## Miscellaneous.

BOLTON.—February 26th.—For the supply of ironmongery, brushes, timber, lighting materials, oils, overhead materials, painting materials, trolley-pole sundries, coal, &c., for the corporation.—Mr. Samuel Parker, town clerk.

WILLESDEN.—February 27th.—For the supply of jobbing sewer works, mason's and pavior's work, artificial slab paving, tar-paving, horses, carts, drivers, gravel, granite, cement, oils, ironmongery, &c., for the urban district council.—Mr. Stanley W. Ball, clerk.

WANDSWORTH.—March 2nd.—For the purchase of disused slop vans, slop carts, water carts, and other carts from the borough council.—Mr. P. Dodd, borough engineer.

ST. PANCRAS.—March 4th.—For the supply of horse forage, for the borough council.—Mr. C. H. F. Barrett, town clerk.

ALSAGER.—March 7th.—For an experimental boring for water supply purposes, for the urban district council.—Mr. John J. Nelson, clerk.

WESTMINSTER.—March 15th.—For the supply of tip vans, for the borough council.—Mr. John Hunt, town clerk.

MALVERN.—Offers wanted for fire appliances, including two-horse tender, with 50-ft. escape, small manual engine and fire-escape.—Mr. W. Osborne Thorpe, surveyor and chief officer.

# TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BANBURY.—For the supply of hand-picked and broken granite and gravel, for the rural district council.—Mr. H. Gander, surveyor:

| Hartshill Stone. | Per ton. s. d. |
|---|---|
| Jees, Limited, Hartshill | 7 6 |
| C. Abell, Hartshill | 7 6 |
| Makins, Limited, Hartshill | 7 6 |
| Hartshill Granite Company, Hartshill | 7 6 |
| Midland Quarry Company, Hartshill | 7 6 |
| Rowley Regis Quarry Company, Rowley Regis, Birmingham | 8 0 |
| Pxy Granite Company, Malvern | 8 2 |

BUCKINGHAM. For the supply of granite and slag, for the rural district council. - Mr. B. C. Cordon, surveyor:—

Granite. W. L. Ireland, 1,200 tons; Mountsorrel Granite Company, 501 tons; B. J. Forder & Co., 671 tons; Ellis & Everard, 235 tons; Jees Granite Company, 240 tons; C. Abell, Limited, 240 tons; Judkins, Limited, 240 tons. Whitwick Granite Company, 58 tons.
Slag.—Exors of P. Phipps, 300 tons.
Steam Rolling. Oxford Steam Plough Company.

CLAPHAM. — For adapting the Ponton - road Industrial School, Clapham, as a place of detention, for the London County Council. —

| | |
|---|---|
| Lathey Brothers, Battersea-park | £1,849 |
| Rice & Son, Stockwell-road | 1,847 |
| J. Garrett & Son, Balham-hill | 1,822 |
| G. Munday & Sons, Eastcheap | 1,419 |
| J. & C. Bowyer, Limited, Upper Norwood | 1,473 |
| W. Johnson & Co., Limited, Wandsworth common | 1,392 |
| Triggs & Co., Clapham † | 1,319 |

Architect's estimate, £1,500.

EPPING.—For the construction of sewage disposal works, for the rural district council. - Messrs. Tooley & Foster, Engineers:—

| | |
|---|---|
| W. Jackson, Forest Gate | £4,777 |
| T. Adams & Son, Wood Green | 3,819 |
| Wilson, Border & Co., Romford | 3,410 |
| Kemp Brothers, Rainham, Kent | 3,304 |
| P. Watson, Dunstable | 3,085 |
| Manders & Hill, Leyton | 3,148 |
| D. P. Jackson, Barking | 3,054 |
| P. R. Pain, Waltham Abbey | 2,932 |
| T. W. Pedrette, Enfield | 2,850 |
| W. French & Co., Buckhurst Hill | 2,587 |
| G. Porter, Hackney | 2,819 |
| Middleton & Hopper, Woburn Sands | 2,840 |

FORFAR.—For the supply of road materials to the Forfar district of the county.—Mr. Donald Ross, surveyor:

| | |
|---|---|
| G. Wishart (Inverarity contract), Forfar | £232 |
| G. Wishart (North Forfar contract), Forfar | 218 |
| T. Mitchell, Bassie and Newtyle contracts), Kirkwich, Meigle | 180 |
| A. Sergeant (Strathmore contract), Lintrathen, Kirriemuir | 180 |
| D. Chrystie (South Forfar contract), Forfar | 174 |
| Mrs. Smith (Glenisla contract), Alyth | 148 |
| T. Newton (South Kirriemuir contract), Kirriemuir | 143 |
| T. Alexander (Ruthven and Airlie contract), Forfar | 142 |
| D. Alexander (Kescobie contract), Forfar | 140 |
| D. Callander (Dunnichen contract), Forfar | 125 |
| P. Clark (North Kirriemuir contract), Forfar | 122 |
| T. Newton (Glenisla and Cowie contracts), Kirriemuir | 97 |
| D. Clark (Kingoldrum contract), Kirriemuir | 77 |
| A. Callander (Kinnettles contract), Forfar | 60 |
| J. Beaton (Inverquiech contract), Kirriemuir | 55 |

LIMEHOUSE. For enlarging and improving the Northey street Infants' school, Limehouse, for the London County Council:—

| | |
|---|---|
| W. Harris, North Woolwich | £3,097 |
| Fridd & Lee, Erith | 2,944 |
| Griggs & Son, Ciborn town | 2,812 |
| Mclaughlin & Harvey, Limited, Brecknock road | 2,770 |
| H. Graves, Greenwich | 2,626 |
| F. & T. Thorne, Isle of Dogs | 2,501 |
| A. E. Symes, Stratford | 2,501 |
| H. Kent, Hither green | 2,499 |
| H. L. Holloway, Deptford | 2,407 |
| F. H. Lenz, Deptford | 2,403 |
| E. A. Rosser & Co., Bassinghall street | 2,381 |
| J. and C. Bowyer, Limited, Upper Norwood † | 2,168 |

Architect's estimate, £2,450.

LONDON. -For recubbling the School of Photo Engraving and Lithography, City of London, for the London County Council:—

| | |
|---|---|
| E. Lawrance & Sons, Limited, City road | £1,420 |
| W. H. Gaze & Sons, Limited, Oxford street | 1,260 |
| G. Weston & Sons, Limited, Pentonville | 1,224 |
| W. J. Fryer & Co., Paddington | 1,135 |
| G. E. Taylor & Co., Bushbane | 999 |
| Tilley Brothers, Kingsland-road | 998 |
| A. Newbald, Sutton | 884 |
| A. Hawkins & Sons, Southwark | 879 |
| Pinching & Watten, Cannon street | 684 |
| Tredegar & Co., Westminster | 612 |

Chief engineer's estimate, £712

LONDON.—For the supply of pressure tanks required for the new section of the central repair depot for the County Council tramways system:—

| | |
|---|---|
| Howard Pneumatic Engineering Company, Limited, Eastbourne | £400 |
| | 447 |
| (alternative tender, not to specification) | 361 |
| Globe Pneumatic Engineering Company, Limited, Queen Victoria street † | 111 |

Estimate of the chief officer of tramways, £500.

LONDON.—For the supply of a self-acting, sliding, surfacing and screw-cutting lathe, for use in the repairing shop in the tramways department of the county council:—

| | |
|---|---|
| Sir W. G. Armstrong, Whitworth & Co., Limited, Manchester | £161 |
| Greenwood & Batley, Limited, Leeds | 160 |
| Dean, Smith & Grace (1912) Limited, Keighley | 92 |
| Tangyes, Limited, Birmingham | 76 |
| G. Hatch, Limited, Questbridge | 71 |
| less 2½ per cent. discount. | |
| C. W. Burton Griffiths & Co., Ludgate square | 66 |
| less 2½ per cent. discount. | |
| Buck & Hickman, Limited, Whitechapel-road | 58 |
| Selson Engineering Company, Limited, Queen Victoria street † | 54 |
| less 2½ per cent. discount. | |

The estimate of the chief officer of tramways was £55 for a machine with 40-in. centres, but it is not comparable with the tenders which are for a lathe with 6ft. centres.

MILFORD HAVEN.—For the supply of granite for road metal, for the urban district council.—Mr. J. P. Morgan, surveyor:—

| | Penton. Broken. s. d. | Unbroken. s. d. |
|---|---|---|
| Ackmans Basalt Company, Portrush | 9 0 | – |
| United Stone Firms Limited, Bristol. Pontypridd granite † | 7 6 | 6 3 |
| F. Thomas, Johnston | – | 4 9 |
| W. Devonald, Johnston | 5 7 | 4 5 |
| T. Devonald, Johnston | 5 6 | 4 4 |
| T. Warlow, Haverfordwest (limestone) | 4 6 | 3 7 |

* Accepted for 700 tons unbroken and 300 tons broken.

NEWPORT (Mon.).—Accepted for surface tarring 100,000 yds. of roadway, for the corporation.—Mr. H. Tremelling, borough engineer:—

Fothergill Brothers, Exeter, £168.

NORTHAMPTON.—Accepted for the supply of granite, slag and gravel, for the rural district council:—

Granite.—Midland Quarry Company, Nuneaton; Enderby & Stoney Stanton Company, Narborough; Judkins, Limited, Nuneaton.
Gravel. F. Ray, Bedford; J. Waldhams, Nether Heyford.
Slag.—P. Phipps's Executors, Northampton.

SKIPTON.—Accepted for the supply of granite, for the urban district council.—Mr. A. E. W. Aldridge, surveyor:—

Threlkeld Granite Company, Limited, Keswick, Cumberland.

SUTTON-IN-ASHFIELD.—Accepted for the supply of tar-macadam slag, for the urban district council.—Mr. W. Burn, surveyor:—

J. Oakes & Co., Alfreton.

TIPTON. For the erection of new sanitary conveniences, paving of playgrounds, and other work in connection therewith, at the Burnt Tree and Dudley Port Council Schools, in the parish of Tipton, for the urban district council. Mr. W. H. Jukes, surveyor:—

| | Burnt Tree Schools. | Dudley Port Schools. |
|---|---|---|
| W. A. Kendrick, Tipton | £324 | £187 |
| J. Sisman, Tipton | 349 | 216 |
| E. & W. Bennett, Tipton | 364 | 228 |
| W. Smith, Tipton | 334 | 201 |
| W. Thompson & Co., Tipton | 322 | 196 |
| J. Owens, Wolverhampton | 372 | 208 |
| S. W. Moore, Tipton | 456 | 259 |
| Jakeman & Round, Dudley | 348 | 199 |
| J. Edwards, Dudley | 345 | 210 |
| M. Round & Sons, Dudley | 355 | 215 |
| G. P. Trentham, Birmingham | 425 | 249 |
| J. Malin, West Bromwich | (tender not fully completed.) | |
| Surveyor's estimate | 328 | 197 |

UCKFIELD.—For the supply of broken granite, broken Kentish ragstone, broken Sevenoaks stone, broken flints, and compo sand or chippings, for the rural district council.—E. W. Ray Johnson, surveyor:

Accepted for Three Years.

Quenast Granite.—Lennon Granite Company, 1,850 tons to various stations.
Cornish Granite.—St. Keverne Stone Company, 1,310 tons to various stations.
Jersey Granite.—Croft Granite Company, 1,410 tons to various stations.
Mountsorrel Stone.—Read & Son, 500 tons to various stations.
Sevenoaks Stone.—Arnold & Sons, 800 yards to various roads. Chittenden & Simmons, 550 yards to various roads.
Kentish Ragstone.—Hudsons Limited, 500 tons to various stations.
Portslade Flints.—Hudsons Limited, 3,700 yards to various stations.
Steam Rolling.—Sheppard Limited.

Accepted for One Year.

Flint Grit for Tar Binding.—W. Pearce, to various stations.
Concrete Hardcore.—Hudsons Limited, to Uckfield Station.
Distilled Tar.—Forbes, Abbot & Leonard, 10,000 gallons to various stations.

The Surveyor was authorised to experiment with Tarvia.

VAUXHALL. For the erection of sub-station buildings, for the tramways department of the London County council:—

| | |
|---|---|
| Lawrence & Co., Limited, Kennington | £7,643 |
| Scott, Lee & Sons, Camberwell | 7,337 |
| Higgs & Hill, Limited, South Lambeth | 7,290 |
| H. L. Holloway, Deptford | 7,076 |
| E. Lawrance & Sons, Limited, City road | 6,932 |
| J. & C. Bowyer, Limited, Upper Norwood | 6,895 |
| A. Dowsett, Walworth | 6,882 |
| Holloway Brothers (London), Limited, Belvedere-road | 6,830 |
| C. Wall, Limited, Loyds avenue | 6,785 |
| Patman & Fotheringham, Limited, Islington † | 6,743 |

Architect's estimate, £6,808.

WEST HAM.—Accepted for the supply of paving materials, broken granite and chippings, road flints, sand, tar and pitch ironmongery, iron castings, &c., for the corporation.—John G. Morley, borough engineer:—

Paving Materials.—W. Griffiths & Co., Limited; The Tilbury Contracting & Dredging Company, Limited.
Broken Granite. W. Griffiths & Co.; A. & F. Marinelli.
Granite Chippings.—Groby Granite Company, Limited.
Road Flints.—J. Wall.
Sand.—J. Byford & Son, Limited.
Iron Castings.—H. Edie & Co., Globe Foundry, Limited.
Ironmongery. F. Bird & Co.; Young & Marten, Limited; J. Gibb & Co., Limited; Pryke & Palmer; Rowntree, Drew & Clydesdale, Limited.
Domestic Articles.—Middleton Brothers; Pryke & Palmer; Rownson, Drew & Clydesdale.
Hardwood.—Hutton & Sons; W. Marshall & Son.
Oils and Colours.—F. & W. Farmiloe, Limited; Middleton Brothers; Holford Oil Company; Pearce & Adler, Limited; Grindley & Co.; E. How & Co., Wiggins & Ridll; Rownson, Drew & Clydesdale; Pryke & Palmer.
Brooms and Brushes.—Co-operative Bass Dressers, Limited; Pryke & Palmer.
Lead, Zinc and Solder.—G. Farmiloe & Son, Limited.
Lime, Plaster.—Young & Son.
Roofing and Tarpaulins.—J. U. Davis, Limited; S. Lomas.
Cement.—J. Byford & Son.
Stoneware Pipes.—Young & Son.
Tar and Pitch.—J. Smart & Son.
Sanitary Articles and Disinfectants.—A. C. Young & Co.
Soaps.—Ambora Soap Works; G. Enser; Middleton Brothers; Pryke & Palmer.
Clothing.—J. & B. Pearce & Co.; North British Rubber Company.

WANDSWORTH.—For making up a portion of Rochampton lane, for the borough council. Mr. P. Dodd, borough engineer
J. Mowlem & Co., Limited, £1,052.

WEALDSTONE.—For making up work, for the urban district council.—Mr. H. Walker, surveyor:—

| | |
|---|---|
| Wheeler & Co., Blackfriars | £94 |
| A. Wooster, Wealdstone | 75 |
| F. G. Brummell, Willesden | 75 |
| W. & C. French, Buckhurst Hill | 70 |
| Clarke & Co., Edgware | 62 |

## MEETINGS.

*Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.*

FEBRUARY.

23.—Junior Institution of Engineers: Mr. G. L. Morty on "Breakdown Experiences."
24.—Institution of Municipal Engineers: Council Meeting. 3 p.m.
24.—Institution of Municipal Engineers: General Meeting in London: discussion on "Superannuation and Security of Tenure: the National Association of Local Government Officers and its Full."
26.—Institute of Sanitary Engineers. Prof. Henry Adams, M.INST.C.E., M.I.M.E., on "Sanitary Building Construction." Caxton Hall, Westminster. 8 p.m.

MARCH.

1. Institution of Civil Engineers (Students' Meeting): Mr. H. J. F. Gourley on "The Design and Construction of Masonry Dams." 8 p.m.
4.—Society of Engineers: Mr. Henry C. Adams on "The Trolley Vehicle System of Railless Traction," Institution of Electrical Engineers. 7.30 p.m.
6. Institution of Municipal Engineers: Discussion on "Methods of Inviting Public Tenders." Institution Offices, 7 p.m.
11.—Institute of Sanitary Engineers: Mr. Percival M. Frazer, A.R.I.B.A. on "The Modern Home." Caxton Hall, Westminster, 8 p.m.
19.—Institution of Municipal Engineers: Discussion on "The Size and Design of Street Gullies, Grates and Weirs."

## APPOINTMENTS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned* (**No. 1359 Holborn**), *subject to later confirmation by letter.*

AGENTS required in unrepresented districts for the Imperial Accident Insurance Co., Ltd. Est. 1878. Horses Insured against Death from Accident or Disease, Mares for Foaling and Loss of Foals; Farmers' Liability for Accidents to Labourers, Servants, and Workmen's Compensation. Claims paid, £500,000. Address Agency Manager, 17 Pall Mall East, London, S.W.

ASSISTANT.—The Corporation of a Borough in the neighbourhood of London require the services of an Indoor Assistant in the Building Inspector's Office. A knowledge of building plans, Model By-laws, and shorthand and typewriting is essential. Salary £70 per year. Applications, in candidate's own handwriting, stating age, and giving particulars of experience, and accompanied by copies of three recent testimonials, to be addressed to Box No. 1,132, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

TYLDESLEY WITH SHAKERLEY URBAN DISTRICT COUNCIL.

APPOINTMENT OF SURVEYOR.

The above Council invite applications for the post of Surveyor from persons with practical experience in a similar capacity. Salary £200 per annum. The person appointed will be required to reside in the District and devote his whole time to the duties.

Applications on the official form, which may be obtained on receipt of stamped addressed envelope from the undersigned, must be delivered at the Council Offices on or before the 4th March.

Canvassing in *any* form will bar appointment.

(By order)
W. J. MATTHEWS,
Clerk to the Council.

Council Offices, Tyldesley.
February 14, 1912.

STEYNING EAST RURAL DISTRICT COUNCIL.

INSPECTOR OF NUISANCES AND ASSISTANT HIGHWAY AND DISTRICT SURVEYOR.

Wanted, at once, an Inspector of Nuisances and Assistant Highway and District Surveyor, for the above District.

Parishes, 7. 11,678 acres. population (estimated), 2,900. salary for the combined offices, £80 per annum, together with an allowance of £10 per annum for travelling expenses. Books, stationery and postages will be provided by the Council.

Candidates must not exceed 30 years of age, and must hold a certificate of competency as Inspector of Nuisances of the Sanitary Institute.

The person appointed must devote the whole of his time to his duties, and agree to reside in or near to the district—the place of residence to be approved by the Council.

The duties as Inspector of Nuisances will be those prescribed by the Public Health Acts, the Orders of the Local Government Board and the By-laws, and will include the inspection of Dairies, Cowsheds and Milkshops, and all the duties of inspection under the several Acts and Orders relating to Rural District Councils.

As Assistant Highway and District Surveyor, the duties will be such as are allocated by the Highway and District Surveyor. Must have a knowledge of surveying, and have had experience in the execution of the several duties of the combined offices, and of the construction and repair of highways.

Applications, giving full particulars as to age and experience, and accompanied by copies of not more than three testimonials of recent date, to be received by me not later than noon on Wednesday, the 6th day of March, 1912, endorsed "Inspector and Assistant Surveyor."

The appointment of Inspector of Nuisances will be subject to the approval of the Local Government Board.

Dated this 20th day of February, 1912.

ARTHUR FLOWERS,
Clerk to the Council.

Union Offices, Shoreham-by-Sea,
Sussex.

SKEGNESS URBAN DISTRICT COUNCIL.

The above Council are prepared to receive applications for the post of Assistant in the Surveyor's and Waterworks Department. Commencing salary £52 per annum.

Applications, stating age and previous experience, together with copies of not more than three testimonials of recent date, and endorsed "Surveyor's Assistant," must be sent to Mr. Ralph Hudson, the Surveyor to the Council, not later than Thursday, March 7th, 1912.

(By order)
TWEED STEPHEN & CO.,
Clerks to the Council.

Council Offices,
Skegness.
February 20, 1912.

## APPOINTMENTS WANTED.

GENTLEMAN, with established business in North of England, who has a good connection with Borough Engineers, Contractors, &c., is open to work a few additional agencies: Paving Material, Tar, Pitch, &c.—Replies to Box 1,134, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

## EXAMINATIONS.

ADVERTISER, passed Inst. Mun. and County Engineers' Exam., wishes to dispose of Preparatory Notes, &c., for same.—Box 1,133, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

## TENDERS WANTED.

DULVERTON RURAL DISTRICT COUNCIL.

MAIN ROADS.

The above Council invite Tenders for the Supply of Granite (block and broken) for the year ending March 31st, 1913, delivered at Dulverton Station.

Specification and Tender Forms may be obtained from the District Surveyor on receipt of an addressed envelope.

Tenders, endorsed "Tenders for Granite," to be sent to the Clerk to the above Council (R. Sowton Barrow, Esq.) not later than February 28th, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

J. JOHNSON,
District Surveyor.

Surveyor's Office,
Dulverton.
February 6, 1912.

## WILLESDEN DISTRICT COUNCIL.

### ANNUAL CONTRACTS.

The Willesden District Council are prepared to receive Tenders from persons willing to enter into contracts to Execute the following Works or to Supply the following Materials for certain periods, commencing April 1st, 1912 *viz.*:—

1. Jobbing Works in Construction of Sewer, &c.
2. Jobbing Works, Mason and Pavior.
3. Supply of Artificial Slab Paving.
4. Supply of Tar-Paving and Execution of Tar-Paving Works.
5. Supply of Horses, Carts and Drivers, for cartage of various descriptions.
6. Supply of Gravel, Flints, Burnt Ballast, &c., for repair of roads, &c.
7. Supply of Broken Granite, for repair of roads, &c.
8. Supply of Lime, Cement, Stoneware Pipes, &c.
9. Supply of Lamp Columns and Fittings complete.
10. Supply of Oils and Chandlery.
11. Supply of Coal and Coke.
12. Barging of Road Slop, &c., from Fermoy Wharf.
13. Supply of Horse Provender (six months).
14. Supply of Ironmongery and Tools.
15. Supply of Timber.
16. Maintenance of Council's Telephones and Wires.
17. Wood Paving Works.

Specifications and Forms of Tender may be obtained upon receipt of 5s. for each Tender form, on and after Monday, February 19th, 1912, upon application to Mr. O. Claude Robson, M.INST.C.E., Engineer to the Council, Public Offices, Dyne-road, Kilburn, N.W. The deposit for Tender form will be returned upon receipt of *bona-fide* Tender.

Tenders to be delivered to the undersigned not later than 4 p.m. on Tuesday, February 27th, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
STANLEY W. BALL,
Clerk of the Council.

Public Offices, Dyne-road,
Kilburn, N.W.
February 13, 1912.

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On the West Side of Kingsway, between Kemble and Keeley streets—a leasehold frontage of 60 ft., with a freehold site in rear.

THE METROPOLITAN ELECTRIC SUPPLY CO., LTD., being the owners of the Freehold Site above mentioned, and being in a position to offer a County Council building agreement and lease of the leasehold site mentioned above, hereby invite Tenders for the purchase of their interests in both properties.

### PARTICULARS.

The leasehold site has a frontage of 60 ft. to Kingsway, and a depth of 69 ft. 10 in., and comprises 4,193 sq. ft.

It is midway between Kemble and Keeley streets, and joins the freehold site in the rear, forming an access thereto.

The freehold site has a frontage to Kemble-street of 119 ft. 2 in., and to Keeley-street of 145 ft. 5 in., and comprises 20,905·2 sq. ft.

Copies of the Form of Building Agreement and Lease, and of the Conveyance of the Freehold Site and Plans, can be seen at the offices of Company, and Forms of Tender, with Conditions of Sale, can be obtained there on payment of the sum of One Guinea per copy.

Tenders must be sent in on or before the 1st day of April, 1912, addressed to

THE SECRETARY

Metropolitan Electric Supply Co., Ltd.,
16 Stratford-place, W.
January, 1912.

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## RURAL DISTRICT COUNCIL OF DARTFORD.

### ROAD MATERIALS, MAINTENANCE, AND STEAM ROLLING.

The Rural District Council of Dartford invite Tenders for the Supply of the under-mentioned Materials, and for the Maintenance and Repair and the Steam Rolling of the District Roads under their jurisdiction for One Year, from the 1st April, 1912, to the 31st March, 1913, as follows:—

#### (1) MATERIALS.

(*a*) The Supply and Delivery to Wharves and Railway Stations, as required, of about 4,220 tons of Broken Hard Stone of one of the following kinds: Rhenish Basalt, Guernsey Granite, Clee Hill Basalt, Leicestershire Granites, Cornish Granites, Penmaenmawr, or other North Wales Granite, Quartzite, Quenast, or other durable material.

The Hard Stone to be supplied must be of the best description, and samples of the same must be deposited with the Tenders. Each sample to be marked with the name of the Contractor and the description of the material.

(*b*) The Supply and Delivery to roadsides of about 7,000 cubic yards of Unbroken Flints, about 1,000 cubic yards of Broken Kentish Ragstone or Sevenoaks Rock, and about 500 yards of Gravel. The Ragstone or Rock and Gravel to be squared ready for measurement.

#### (2) MAINTENANCE AND REPAIR.

(*a*) All Labour in connection with the proper Scavenging and Removal of Mud, &c., Water Tabling with Removal of Silt Sidings, &c., Breaking and Yarding of Flints, and Spreading of all the Material, and all other Labour in connection with the proper Maintenance of the Roads and the Footpaths adjoining them.

(*b*) The Haulage of Broken Hard Stone from the Wharves and Stations, and other Materials from the Depots to the required places in the District.

(*c*) The Tar-painting of Roads, Paths, and Channels where required at per superficial yard.

#### (3) STEAM ROLLING.

The Steam Rolling and Setting of the above-mentioned quantities of materials (more or less). Tenders to include the providing of Rollers, Water, Coals, Engine Driver, and Attendant.

Contractors must provide an approved surety for the due performance of the contract.

Forms of Tender, with Specification (which will show the Sub-Division of the District), can be obtained upon application to the Surveyor, Mr. John Hookins, "Gartly," Dartford.

Sealed Tenders, endorsed "Tender for Highways," must be sent to the undersigned (upon the prescribed form), not later than 12 o'clock noon, on Saturday, the 16th day of March, 1912.

The Council do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to accept the whole or any portion of a Tender.

(By order)
EUSTACE J. HOBBS,
Clerk to the Council.

Sessions House, Dartford.
February 20, 1912.

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## BOROUGH OF MAIDSTONE.

### URBAN DISTRICT COUNCIL.

### TO STONE MERCHANTS, QUARRYMEN, AND OTHERS.

The above authority is prepared to receive Tenders for the Supply of Road Materials, &c., according to the Schedule mentioned below.

Specifications, Forms of Tender, and all other particulars may be obtained on application at the office of the Borough Surveyor, Mr. T. F. Bunting, at the Fairmeadow, Maidstone.

Sealed Tenders, which will only be accepted on the forms supplied, endorsed "Tender for the Supply of ——," must be delivered at my office not later than Tuesday, the 12th day of March, 1912.

Samples of the Materials which it is proposed to supply must be sent to the office of the Borough Surveyor by the same date, carriage paid.

The Council do not bind themselves to accept the lowest or any Tender.

S. LANCE MONCKTON,
Town Clerk

Maidstone.
February 20, 1912.

#### SCHEDULE OF MATERIALS.

Guernsey Granite.
Cornish Elvan, or Stone of similar nature.
Cherbourg Quartzite.
Portland Cement.
Ballast (Thames or Brightlingsea).
Tarred Ragstone Concrete and Macadam.

## DESBOROUGH URBAN DISTRICT COUNCIL.

### TENDERS FOR GRANITE.

Tenders are invited by the above Council for the Supply of Granite delivered at Desborough (Midland Station) required for the year ending March 31st, 1913.

Forms of Tender may be obtained on application to the undersigned.

Tenders, sealed and endorsed "Tenders for Granite," together with samples of stone, to be delivered to me on or before March 6th, 1912. The Council do not bind themselves to accept the lowest or any Tender.

G. E. MARLOW,
Surveyor.

Council Offices,
Desborough,
Northants.

## THE URBAN DISTRICT COUNCIL OF BARNES.

### ANNUAL CONTRACTS.

The above Council is prepared to receive Tenders for the supply of the following for the twelve months ending 31st March, 1913:—

1. Broken Guernsey or Alderney Granite.
2. Broken Pit Flints and Thames Ballast.
3. Horses and Carts on Hire.
4. Disinfectants.
5. Ironmongery, &c.
7. Portland Cement.
8. Forage and Litter.
9. Granite Kerb and Channel.
10. Paving Slabs.
11. Oils, Paints, &c.
12. Stoneware Pipes, &c.

Particulars and Forms of Tender may be obtained of the Engineer and Surveyor at the Council House, where Tenders, sealed and endorsed "Tender for Granite," &c., must be sent in not later than twelve o'clock noon on Monday, the 11th day of March, 1912. No Tender will be considered except on the prescribed form.

The Council will not be bound to accept the lowest or any Tender.

(By order)

G. BRUCE TOMES, Assoc.M.Inst.C.E.,
Engineer and Surveyor.

The Council House,
High-street, Mortlake, S.W.
February 14, 1912.

## CHESTERTON RURAL DISTRICT COUNCIL.

### CONTRACTS FOR TEAM LABOUR.

The Council will, at their meeting to be held at the Board Room, at Chesterton, on Thursday, the 14th day of March, receive Tenders for Carting Materials in the District for Twelve months, from Lady Day next.

Persons willing to contract are requested to send their Tenders (sealed up) to my office before 6 o'clock p.m. on Saturday, 2nd day of March.

The Council do not pledge themselves to accept the lowest or any Tender.

Forms of Tender or information respecting the same may be had upon application to the Surveyor, Mr. J. Dunn, Brunswick House, Cambridge.

(By order)

JOHN F. SYMONDS,
Clerk.

9 Benet-street, Cambridge.
February 20, 1912.

## CHESTERTON RURAL DISTRICT COUNCIL.

### CONTRACTS FOR GRANITE.

The Council will, at their meeting to be held at the Board Room, at Chesterton, on Thursday, the 14th day of March, receive Tenders for [illegible] tons of Broken Granite and 2,000 tons of Slag.

Persons willing to contract are requested to send their Tenders (sealed up) to my office before 6 o'clock p.m. on Saturday, 2nd day of March.

The Council do not bind themselves to accept the lowest or any Tender.

Forms of Tender may be had upon application to the Surveyor, Mr. J. Dunn, Brunswick House, Cambridge, to whom all communications must be addressed.

(By order)

JOHN F. SYMONDS,
Clerk.

9 Benet-street, Cambridge.
February 20, 1912.

## NEATH RURAL DISTRICT COUNCIL.

*SEWERAGE AND SEWAGE DISPOSAL WORKS.*

### TO CONTRACTORS AND OTHERS.

The Council are prepared to receive Tenders from Persons desirous of Contracting with them for the Construction of Detritus Tanks, Settling Tanks for Continuous-flow Treatment, Storm-Water Tanks, Effluent Tanks, Bacteriological Filter-Beds, Automatic Mechanical Distributors of the Sewage over the Beds, the Laying of about 224 yards of 12-in. Sewer, 1,052 yards of 9-in. Sewers, and 3,317 yards of 7-in. Sewers, together with the necessary Manholes, Flu-hing Chambers, Vent Shafts, and other appurtenances.

Plans and Specifications, Bills of Quantities, Schedule of Prices, Form of Tender, and Conditions of Contract may be obtained of the Engineer, Mr. W. E. Clason Thomas, A.M.I.C.E., Engineer and Surveyor to the Council, District Council Offices, Orchard Street, Neath, on deposit of a Five Pound Bank of England Note, which will be returned to the tenderer on receipt of a *bonâ-fide* Tender, and return of all documents and the prices completely entered in the Bills of Quantities, &c.

The Contractor must agree to pay all employees in carrying out these works the recognised rate of wages of the respective trades, and, further, he shall insure at his own expense such employees against accidents under the Workmen's Compensation Acts in a substantial Insurance Office.

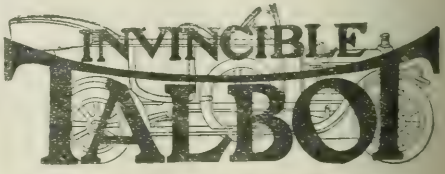
The Contractor to state what works of a similar character he has carried out.

Sealed Tenders, on the forms supplied, endorsed "Tender for Resolven Sewerage Works," are to be delivered at our office at 58 Water-street, Neath, not later than 12 o'clock noon on Saturday, 9th March.

The Council do not bind themselves to accept the lowest or any Tender.

CUTHBERTSON & POWELL,
Clerks.

58 Water-street, Neath.
February, 1912.


**The car that is named INVINCIBLE by proved right.**

Specifications and full particulars on request

**CLEMENT TALBOT, Ltd.**

Automobile Engineers,

BARLBY ROAD, LADBROKE GROVE, W.

Send for a copy of the booklet containing the opinions of the press on the Invincible Talbot.

# The Surveyor

And Municipal and County Engineer.

Vol. XLI. MARCH 1, 1912. No. 1,050.

## Minutes of Proceedings.

**Road Surfacing Trials.**

We are glad to be able to put before our readers the description of three trials of road surfacing, with bituminous binder in two cases and water in one case, as carried out by Mr. G. Belson Chilvers, engineer and surveyor to the Oundle (Northants) Urban District Council. Who gives quickly gives twice, and although the comparisons as to results are not yet at an end, we are glad to record them at the present stage, and we trust that surveyors will not hesitate to give us the results of trials of this kind whenever they can spare the time, and without waiting till comparisons are fully worked out. Waiting sometimes means that the matter does not get recorded at all, while whatever has appeared in THE SURVEYOR is so much to the good and can always be turned up, and further results can be recorded in the light of what has already appeared.

Mr. Chilvers has provided a basis for a comparison of a very interesting kind, and if we had a few more such we should be able to put before our readers some valuable generalisations. It is unfortunate that the work with the gasworks tar was not carried out as intended, but we note that Mr. Chilvers thinks that had this been done the result would have been quite satisfactory. We may, therefore, point out that, allowing a slightly higher cost in the case of the work done with the gasworks tar, say 1s. 3d. per square yard, and knocking off the odd ¾d. as a possible saving in the other case if the work were done on a larger scale, we have the mean cost of 1s. 4½d. per square yard, against a cost of 1s. per square yard with the water-bound surfacing. This difference amounts to about 2s. 6d. per yard on a 21-ft. road, or £220 per mile. If the surfacing lasts for three years we have the liberal figure of £70 per mile per season to cover the cost of watering and extra sweeping in order to keep the water-bound surface as dustless as the other surfaces, and at the same time to prevent it from becoming loose through drought in the summer. We suggested, on page 98 of our Special Annual Issue, that the balance might turn in favour of watering in those situations in which roads remain damp for periods which are considerably longer than the average. If the surfacing only lasts two years the annual sum, on the above figures, available for watering and sweeping would be over £100 a year, and, on the other hand, if the traffic were light, and the surfacing lasted, say, five years, the sum of £44 a year would probably be sufficient for such a road. We do not suggest that the parts to be watered should be short lengths of the dampest places, but rather that the extra allowance for watering, sweeping, and petty, constant repair should be allotted to reasonable lengths of comparatively shady roads, or roads not exposed to wind.

As regards the method adopted by Mr. Chilvers, we should be glad to have an opportunity of comparing it, as regards costs, with a method in which more strenuous efforts are made to get over the primary difficulty referred to on page 96 of our issue of January 26th. If binder is put in, the tar can hardly be made to go in also; but if the chips are only applied on the surface, some of the tar has to do its work by itself unless the rolling is continued long enough, or the stone is soft enough, for the stones to be really jammed tightly together. Mr. Chilvers' method to some extent gets over the difficulty, because the main part of the rolling is done after the tar has been applied, and we hope to learn that surveyors are succeeding in doing this in thin layers in building up thick crusts so that the stone part of the binder is fairly well distributed throughout the mass of the crust. Generally, it may be strongly urged, to revert to the matter of comparisons, the soundest comparisons are to be found, not by setting cost against cost, but by *making the total costs the same* for the life of the surfacings by allowing what is saved in first costs to be spent in extra maintenance.

* * *

**The Road Question in Ireland.**

Some of the difficulties of road improvement in Ireland are dealt with in the *Freeman's Journal* in an article on the work of the Road Board in that country. It has been intimated to the County Councils of Kerry and Mayo that, provided they subscribe a "nominal contribution"—in both instances it is put at 10 per cent—the Road Board would undertake to be responsible for a considerable scheme of road making in each county. In Kerry some 30 miles would be dealt with, at a cost of £12,000. The estimated cost of the Mayo scheme is £16,500, and of this sum the county authorities would be called upon for £4,125. "In any county in Ireland," the *Freeman's Journal* comments, "the

latter sum would hardly be described as a merely nominal contribution, and in the case of a county like Mayo it means a burden which sufficiently explains the delay of the council in closing with the offer of the Road Board. The case of Kerry is exceptional. The 'Kingdom' was wont to boast of its excellent roads, but the motor coaches introduced in connection with the tourist traffic wrought havoc with them. Sir George Gibb and his colleagues indulged in the reasonable expectation that the promoters of these services would come forward with an offer to defray in part the cost of repairing the damage they had done, but so far the expectation has not been realised. It is probable that the same feeling is entertained by the Kerry Councils in considering an offer which, on the face of it, is liberal."

It is, of course, pitiful enough this plea of poverty, but it is manifest that it may be pushed too far, especially when the circumstances point to over-reticence on the part of trading companies which are carrying on what is probably a flourishing business at the expense of the public highways. They, in common with others, have duties to discharge, as well as rights to maintain, especially in view of the necessity for road improvement in Ireland, which the *Freeman's Journal* insists upon in these terms: "The most pressing need in this country is that existing bad roads should be rendered sound and safe, even at a cost much in excess of the amounts heretofore paid for maintenance. With the wider adoption of the steam-rolling system it is more generally recognised that it is true economy to provide a surface which will endure, say, for seven or eight years; and that the old 'darning' system is more expensive as well as less satisfactory. The introduction of motor traction has, of course, had the effect of increasing the urgency of the question confronting the councils. Motor cars and motor coaches came, as it were, to complete the destruction caused in so many districts by the lumbering traction engine."

* * *

**The Dust Nuisance in Switzerland.**

In last week's issue we printed a specially-prepared translation of a recent paper by Dr. Guglielminetti on "Proposals for Dust Suppression and Road Improvement," and the matter has, we venture to hope, proved of some little interest to road engineers generally, as well as to those who know something of the country which is more particularly the subject of Dr. Guglielminetti's present study—namely, Switzerland. The chief object of the paper is to bring about, at the earliest possible moment, a meeting of those concerned, in order that, by taking prompt measures to meet the present difficulties, it may be possible to embark on a liberal policy of road improvement and dust abatement instead of the ultra-conservative policy of partial or complete exclusion of motor cars from Switzerland which is now threatening, owing to the embittered state of public feeling in that country. In this matter the doctor, with his fine record of achievement in the Riviera and elsewhere, is a host in himself. Not only is he capable of attacking the physical difficulties of the subject, but he has a grasp of financial matters which should, in the present case, go far to provide a solution of the difficulty of expense. On the engineering side it is significant that Dr. Guglielminetti by no means confines his remarks to matters directly affecting road surfaces, but regards the improvement of road crusts generally, and especially the extension of steam rolling, as important elements in the work of dust abatement. As regards the reduction of tractive effort by improvements in the road crust it is only fair, however, to point out that this reduction is of less importance in hilly countries than in flat countries. On a dead level the elimination of half the rolling resistance reduces the average effort by something approaching 50 per cent, exactly 50 per cent for slow vehicles on calm days; but in a hilly country, where a large part of the work done by a horse, for instance, is done against gravity, the saving is much less important. Similarly, with motor cars running in a hilly country, the total resistance when going up hill is usually hardly more, if the driver goes slowly, than is the resistance on the level at a high speed; and in level countries the air resistance comes in to dilute the relative advantage gained by decreasing the rolling resistance. We draw attention to this matter not by way of depreciating the value of crust improvement, and certainly not by way of a criticism of Dr. Guglielminetti's statement of fact, but rather as an aside, and in order to mark our sense of the relative importance of each element of the total resistance to a vehicle. What is true of the ox-cart on the plains of India is not necessarily true in amount of the horsed vehicle and the motor car in Switzerland. We trust that Dr. Guglielminetti will be successful both in his immediate object and in his further aim.

* * *

**Sewage Sludge and its Disposal.**

The paper read by Dr. J. Grossmann before the Manchester section of the Society of Chemical Industry deals with a subject which is generally admitted to be of greater importance at the present time than the purification of liquid sewage. As the result of many years' careful work and experience, it may be said that the problem of purifying sewage to any required degree has been solved, but there yet remains the problem of the disposal of the solid matters present in sewage, and it is to this subject that the future work of scientists and engineers must be devoted. Dr. Grossmann's paper, therefore, is particularly valuable as being an effort in the right direction, and the information and figures given in the paper will form a very valuable basis for future work. The various methods by which sludge is treated, and the findings of the Royal Commission upon the subject are discussed at considerable length, and it is clearly proved that none of the methods described is really satisfactory; but, on the other hand, Dr. Grossmann does not appear to have taken into account one method by which at any rate a considerable proportion of the sludge present in sewage can be dealt with—*viz.*, the Dibdin slate-bed system. Of course, this system does not actually get rid of the whole of the sludge, but it certainly gets rid of a very large proportion of its objectionable constituents, and the omission of mention of the Dibdin system in this paper is to be regretted, because it certainly is, up to the present, the only method which attempts to purify the sludge with the sewage. In all other systems the elimination of sludge as a preliminary is an essential feature. Dr. Grossmann's paper is given in full elsewhere in these pages, so that any detailed description is unnecessary here. At the conclusion of the paper the author suggests a new method for which economy is claimed, and by which the sludge is treated with superheated steam, and is thus sterilised and dried, and reduced to a condition in which it can be safely and satisfactorily dealt with on the land. It is claimed that this system has none of the objections which from an economical, engineering, commercial or hygienic point of view form a part of the systems at present in use. We propose shortly to give the details of this system.

* * *

**Municipal Trading.**

The Sheffield Corporation have just had judgment given against them in an action at the suit of a mechanical engineer, who claimed an injunction to restrain them from trading as electrical con-

tractors in competition with private traders. It appears from the evidence that the corporation were carrying on the trade of erecting and installing electric light fittings and wires and electric bell fittings and wires in houses within their area. This was not confined to persons taking their supply of electricity. The corporation had also in similar circumstances supplied wires and other apparatus necessary for domestic or indoor telephones and had supplied and installed lightning conductors. They had a showroom and depot for the sale of electric lamps and fittings to the public, and had executed repairs and entered into contracts for the cleaning, maintenance, and supervision of arc lamps in use by consumers of their electric current. They had also supplied *outside* their area electric motors and accessories, and had erected and installed electric light and bell fittings and wires in houses not supplied by them with electricity.

The principle which must be applied to cases of this kind is that a corporation, being a purely statutory body, can only lawfully do things which are authorised by their statutes. It was stated in the course of the proceedings that an appeal is to be made to the House of Lords unless the corporation succeed in securing the passage through Parliament of a Bill legalising what they are doing.

* * *

**Superannuation and Security of Tenure.**

Although the questions of superannuation and security of tenure affect all classes of local government officials, they have a special interest for municipal engineers, who are frequently underpaid, and whose duties often lead them into conflict with individual members of their authorities. It was not inappropriate therefore that these kindred topics should have been selected for discussion at a meeting of the Institution of Municipal Engineers—a full report of which appears elsewhere in this issue. Mr. Winter Gray's paper, upon which the discussion took place, consisted very largely of an appeal to the members to join the National Association of Local Government Officers, and an account of the practical steps which are being taken by that organisation to secure the passage through Parliament of a superannuation Bill. We have always advocated equality of treatment for all classes of officials in the public service as regards superannuation instead of the illogical tangle of piecemeal legislation which at present exists. The Civil Service and the Poor-Law are provided for; school teachers have a scheme of their own; certain municipalities have private Acts of Parliament; and there is a permissive statute applicable to municipal officers in the Metropolis. The principle of superannuation has therefore been conceded over and over again, and we cannot conceive that the claims of local government officers, if clearly presented, can very much longer be denied.

* * *

**Alkali and Cement.**

The failure of the Austin dam has given rise to many theories, among them being some well worthy of further consideration. Mr. E. T. Tannatt, a former professor of civil engineering at the Montana State College, suggests that a contributory cause of the failure may have been the destructive effect of alkali that was present in the water. In the course of his extensive research work on this subject Mr. Tannatt has investigated a considerable number of concrete failures, among which was that of a large concrete dam. Examination of a portion of the structure which remained intact showed every indication of the action of alkali for a considerable distance along the dam. With the naked hand he was able to remove what had once been solid concrete to a depth and width of over a foot, and he was able to do this for several feet horizontally along the face of the dam. The researches of Mr. Tannatt and others have proved conclusively that alkali in any abundance has a most deleterious effect on Portland cement. Even if the percentage of alkali in the impounded water is small, it may become sufficiently concentrated to be harmful in the concrete by seepage, capillary action, and evaporation. The question of the harmful action of alkali on cement is very important, and is well worthy of further investigation at the hands of those responsible for works in connection with which its action may be looked for.

* * *

**A National Health Week.**

We recently drew attention to the proposal that a Health Week should be organised in the borough of Kingston-upon-Thames, with the object of drawing public attention during that time to all matters connected with health and hygiene, both public and private. Last week we received a communication from the National Health Week Committee, which has been constituted for the purpose of organising this work on national lines. In commending the proposals of the committee to the favourable consideration of our readers, we would again point out that they are in no way antagonistic to the work which is at present being done by the various public health authorities in the country. Such authorities generally find that ignorance of the most elementary matters of personal hygiene is the chief enemy to the success of their efforts. The National Health Week will thus naturally co-ordinate with the work of the sanitary authorities by stimulating the people themselves to take a more rational interest in their own welfare. The idea of the Health Week is an excellent one inasmuch as it will provide a centre upon which a public opinion, which at present is rather vague and nebulous, may crystallise, with far-reaching and beneficent results.

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**Road Foreman or Surveyor.**

An appointment to which a salary of £100 per annum is attached is one which, in the present state of competition, would, in the ordinary course of events, be keenly sought after by many fully qualified young municipal engineers. We are surprised to learn, therefore, that a rural district council recently thought fit to give such an appointment—that of assistant *surveyor*—to one who had hitherto been employed as their road foreman. Such an appointment is entirely unjustifiable in our view, inasmuch as the council, acting as trustees of public funds, are bound to endeavour to get the best possible value for money. This kind of thing is not very encouraging to those who have served articles and passed examinations, but nothing can at present be done except to draw public attention to each case of jobbery as it occurs.

* * *

**Main Road Maintenance.**

As long ago as the year 1889 the County Council of East Suffolk adopted a resolution that no street in a town should be accepted as a main road. In view of the provisions of the Acts of Parliament relating to the matter this certainly seems rather a sweeping resolution, and it is not surprising that the time has come for the council to be advised that it is *ultra vires*. When the resolution was passed the total length of main roads in urban areas was comparatively trifling, but the condition of affairs now is entirely different. The whole question of main road maintenance has assumed a fresh importance since the advent of mechanically-propelled traffic, and equity demands that highways which largely bear through traffic should not be maintained entirely at the expense of the local ratepayers.

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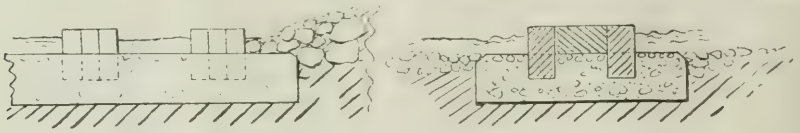
# Preliminary Studies in Bridge Design.

By REGINALD RYVES, Assoc.M.Inst.C.E.

*(Fourth Article.)*

It sometimes happens that a costly bridge is built when a much more simple crossing would be more in keeping with the resources of the neighbourhood and the nature and amount of traffic. More often it happens that serious inconvenience is suffered for many years because it is assumed that the only way to make an improvement is to build a costly bridge. Yet in many cases a very small expenditure would provide a crossing which would be an important improvement.



FORDS.

A good many fords would be much improved by a little work with spades and potato forks. Here the pooling principle applies. The scour above the ford should be deepened so that it may check the current from above, distribute the water better, and spill it gently over the upper edge of the ford. The stones should be spread so as to get an even depth, and those large enough to be stumbling-blocks should be buried. There are many fords which themselves offer no great obstruction, but have very steep or rough approaches. These may often be eased a little and made harder, but they should not be carried into the ford so as to narrow it. On the contrary, many fords could be improved by a little widening.

The next step is to recognise the principle of the smooth spill. If the biggest stones are all placed together along the downstream edge of the ford they will tend to keep the whole bottom at the same level, and if well arranged will allow the water to pass between their gaps, over stones at a slightly lower level, during dry weather. This is better than the simple stepping-stone idea. This principle, a little further developed, brings us to a cheap and simple work, suitable for crossings of village streams, and one which is self-clearing, or can be easily cleared by passers-by (see Fig. 18), in which the idea of built ramps is also brought in. Another way, suitable where materials for making concrete are at hand, is suggested by the type diagram (Fig. 19). The place is roughly prepared, and the first layer of concrete brings it up to the overflow level. Drain pipes are then placed on the concrete, and more concrete is rammed over them. A row of single pipes suffices for pedestrians and cyclists, and the smallest size will usually do. For greater lengths it is better to use pipes of larger diameter, which will be less likely to choke. Sometimes a single pipe would carry the dry-weather flow of a village stream, but it is not used, on account of the difficulty of keeping it from choking. This may

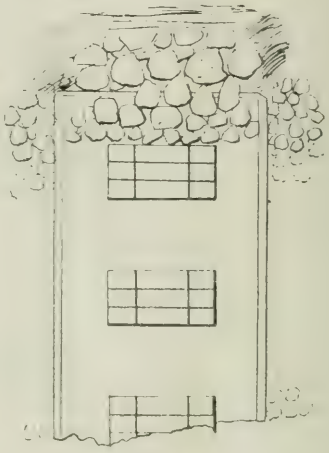


Fig. 18.

a ford during freshes, this device may be developed into the inverted syphon type for dry-weather flow, providing a drinking trough for cattle or a dipping place for the inhabitants of neighbouring cottages. (Fig. 20.)

THE "IRISH BRIDGE."

A good cart crossing is provided by that development of a ford which is sometimes called an "Irish bridge." The outline may be that of a segment of a circle for quite small streams (dotted in Fig. 21),

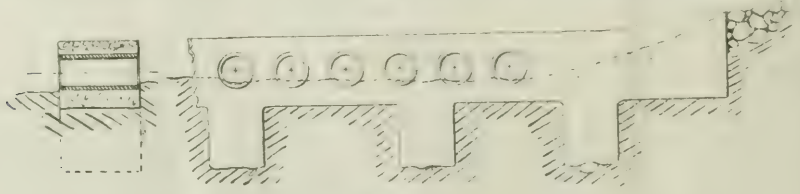


Fig. 19.

or where there is no footbridge, because it is then easier to step across the stream in dry weather; but for somewhat larger streams, and generally where there is a footbridge, the form shown by the full line in Fig. 21 is preferable, since it gives a smaller maximum depth. The largest stones should be placed at the downstream edge, lengthwise with the stream, and it may be necessary to build a small retaining wall, and to provide random blocks or stones to receive the water as it pours over the edge.

THE ROAD DAM.

Where a road embankment crosses very flat lands liable to floods, the "road dam," as it is called in India, may be an economical means of providing waterway, and, anyhow, be a very reliable safety overflow in case culverts are choked. When the difference of water levels on the two sides of the road is small, which is often the case, the water has only a short way to fall, and it may not be necessary to pitch more than a little of the embankment near the top. If suitable stone is scarce, and the road dam is not likely to be needed except in unusual floods, it may only amount to this, that the level place in the road is also made the strongest, the road margins as well as the crust being made up with broken stone and binder, well rammed. Usually the road is definitely depressed for a foot or so, and sometimes both approaches to a bridge which may prove insufficient for the discharge are made as shown in Fig. 22. Posts should be provided to mark the edges, especially if the water is likely to reach the level of the road on the down-stream side, which is often the case. The length is usually much greater than shown in Fig. 22.

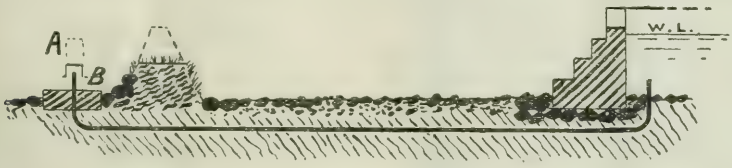



Fig. 20.

A "perforated road dam," as it is sometimes called, is really a series of culverts through an embankment. If there is no embankment the structure is a bridge or causeway. This type of crossing is a very useful one, and ought often to be brought into competition with other types. If the embankment is pitched, so as to serve as an overflow in case of need, the capacity of the culverts may be made barely sufficient to pass ordinary floods (Fig. 23). If the earth of which the embankment is made will not stand except at a very flat slope, the bottom of the embankment is wide, and culverts

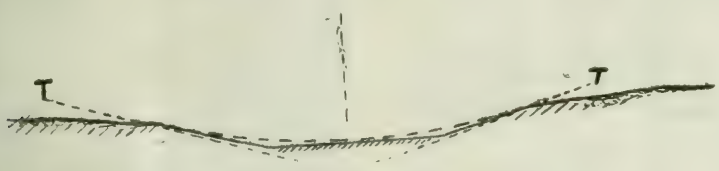



Fig. 21.

relatively expensive. In such a case the kind of crossing shown typically in Fig. 24 may be an economical alternative. The slabs may be of stone, or ferro-concrete, or they may be spans of I-beams supporting a ferro-concrete or trough floor, according to the loads to be carried and the relative costs of different materials. If such a crossing is found to be too costly as a dry-shod crossing, it may be put back to an earlier stage of its evolution, and, while playing the part of a bridge proper at ordinary times, it may become in times of flood a ford relieved by under-vents. Supposing that the maximum discharge requires an aggregate opening

200 ft. wide and 4 ft. deep, it may be good enough to make the twenty vents 2½ ft. high, instead of twenty vents 4 ft. high, designing the platform to withstand floods. This will give us a ford about 18 in. deep if the maximum flood is equalled, and fords of less depth on occasions, the number of which can be easily estimated by local inquiries or data as to floods.

The extra depth of slab that is needed at the edge of the floors may, in the case of a ferro-concrete slab, be gained by developing it into a beam, the depth of which is given by making it a part of the blocking course, so as not to reduce the area of the vent or add to the heights of the piers. It is worth noting that in the case of a crossing which consists of an earthen embankment pierced by culverts the cost is often needlessly great because it is forgotten that the necessary thickness for the slabs or arches which form the roofs of the culverts is very much less than it would have to be if these slabs or arches were just under the crust of the road. The load on a slab roof buried under 10 ft. or so of earth is that due to the depth of earth—say half a ton per square foot—and another 3 cwt. or so per square foot due to the heaviest possible axle-load on the road. Only a small proportion of the whole is live load, and there are no appreciable shocks. The thickness is a matter not of strength but of the minimum consistent with stability. Corrugated iron culverts will last a considerable time, and may do good service when the money for solid work cannot be found.

THE INVERTED SYPHON.

A device which deserves more attention than it receives is that of the culvert or pipe connecting a pair of wells. A great deal of damage to road embankments is caused sometimes by the rush of water into a culvert at one end and the rush out of the other end. We can get over the rush into the culvert by the plan of raising the sill, when the water is drawn from a shallow pool which checks the rush and scour. This does not help us at the outlet, however. Here the best plan is to make a well up which the water will rise, falling harmlessly over the edges, or, if the edges are below water level, bubbling harmlessly upward and flowing away in the general sheet of water without scour (Fig. 25).

This type is not much used, though it seems to be

Fig. 22.

of great antiquity, since it is the traditional type of outlet through tank bunds in India. The writer has strongly advocated it for drops on canals, and believes that the two basic ideas are more applicable to bridge design than is usually supposed. The basic ideas are (1) that when the water flows from a higher to a lower level we should deliver it vertically, either upward or downward, and (2) that

Fig. 23.

while it is passing our masonry work the water should flow at the highest velocity which the materials will stand, because that means that it flows in the smallest possible stream. When we build a bridge which fully spans a stream and hardly interferes with its flow, these principles do not come in. But they come in in many other cases; and where

Fig. 24.

it is allowable to head up and attain a high velocity, we may be able to economise in masonry if we can get over the ill effects of scour.

Supposing that we find a place in a natural stream where there is a fall of 5 ft., or where that fall can be imposed. If the stream is one of high velocity we may gain little or nothing by increasing

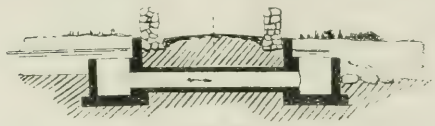


Fig. 25.

it, because we must not subject our masonry to more than a certain velocity. But if the stream is a sluggish one we may perhaps, within the allowable velocity, increase its speed to double or treble and reduce its actual controlled size to a half or a third that of the natural stream.

This method, belonging to our fifth primary

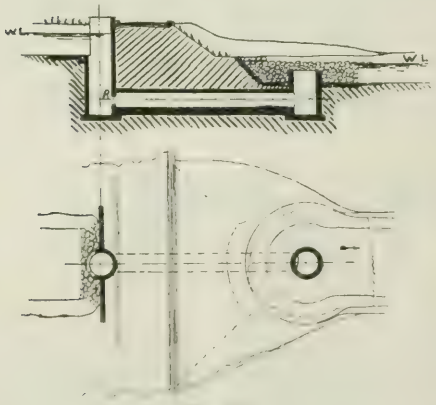



Fig. 26.

type, is not usually applicable except to canals or to streams with regulated flow. It may, however, be applied to streams which are liable to floods if there are other outlets for such floods, or it may be developed as a bridge for ordinary occasions, and, in addition, as a weir over which flood waters may pass. Fig. 26 is a diagram of the type as adapted to suit an embankment crossing; not necessarily with pooling up, for advantage may be taken of a natural fall in the bed of the stream. In other cases pooling up may be allowed, as in the case shown typically in Fig. 16.

The diagram Fig. 27 shows the type we are now considering carried out in masonry. The problem is regarded as that of providing a stilled approach, a rapid passage for the water, and a seething delivery with no definite set of current. A bridge of,

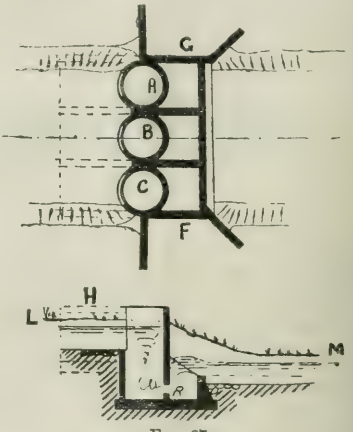



Fig. 27.

in this case, three spans may be made from F to G, by making this part a little wider; or it may be made with shallow foundations, shown by the dotted lines in the figure, in addition to the work regarded as a fall.

The estimates would compare thus: (A) the cost of a simple bridge, with foundations to resist scour,

Fig. 28.

and with more or less protection of the banks above and below it; and (B) the work as suggested, with whatever additions may be needed for a bridge of the required width. The narrower the bridge needed, the more chance has (B) of competing with a bridge of an ordinary type, but it must be clearly understood that while the elements of this method

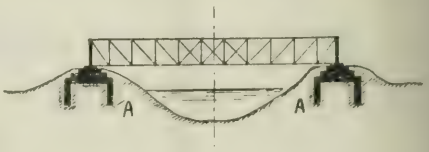



Fig. 29.

may be found in various designs, the method itself is only directly applicable in special circumstances. In the Figs. 26 and 27 the openings at R are made of such a size that they will just pass the maximum flow with a head up to the maximum allowable water level above them.

### The "Overall" Span.

It remains to consider here one other matter of principle which is not always grasped by beginners. This is that it is sometimes an economy to make a

long span with very small abutments rather than a short span for which high abutments with deep foundations would be required (see Figs. 28 and 29). In the case shown the canal will be under regular supervision, and any extraordinary happening at the foundations, A, would be noticed. For moderate loads the cost of the large girder and small foundations may be less than that of the small girder and heavy abutments. This does not, of course, apply to spans of more than some 60 ft. to 100 ft., according to the nature of the traffic, because for longer spans than this every additional foot counts heavily in the cost, except for very light loads

*(To be continued.)*

## THE MICRO-STRUCTURE OF ROCKS.

The micro-structure of a rock may sometimes be shown more distinctly in a sketch than in a photograph, in which, colour differences being lost, similarity in light value often leads to blurring. Some years ago our contemporary the *Engineer* published a successful series of sketches of engine-rooms. It was found that the mass of detail, and difficulties in lighting a perspective, prevented the presentment in a photograph of a true picture of such an "interior." In the case of a thin slice of rock there are no difficulties of perspective or of lighting, but the mass of detail often makes it difficult to see clearly what are the constituents of the rock. In such cases the sketch has not only a value as in itself depicting the structure of the specimen, but it may be used alongside a photograph, preferably on the same scale of enlargement, serving as a guide in the recognition of the different constituents.

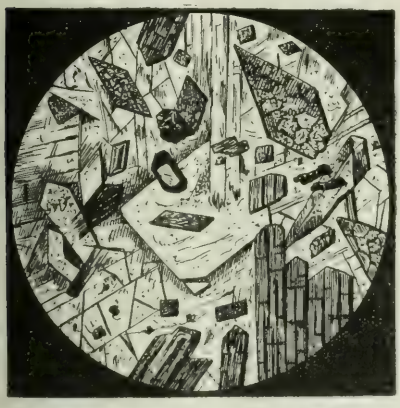


Fig. 1.—A Magnified Pinhole View of a Section of Hornblende Granite.

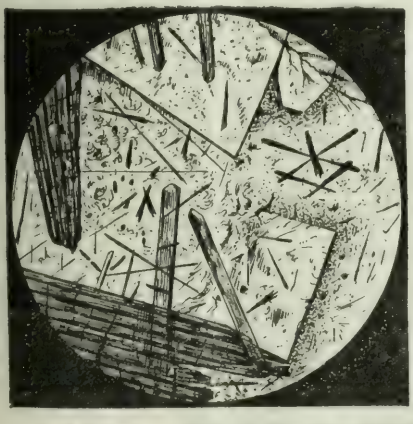


Fig. 2.—A Magnified Pinhole View of a Section of Micro-Granite.

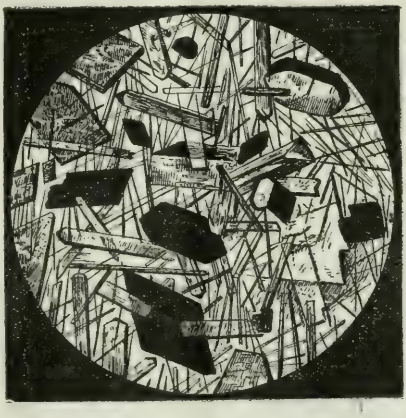


Fig. 3.—A Magnified Pinhole View of a Section of Basalt.

The three accompanying illustrations are from pinhole views, and are the work of Mr. James Scott.

## ROADS IMPROVEMENT ASSOCIATION.

### OPPOSITION TO TRAMWAY TRAILER-CARS.

The following resolution was unanimously passed at the council meeting of the Roads Improvement Association last week:—

"That this meeting having considered the provisions of the London County Council (Tramways and Improvements) Bill, 1912, in regard to the use of trailer-cars, strongly opposes the granting to the council of such powers in respect that the congestion of traffic in the streets of the County of London is largely due to the existing tramway traffic, and that the use of trailer-cars would, in the opinion of the council of the Roads Improvement Association (Incorporated), very seriously aggravate such congestion. That Colonel R. E. Crompton, Mr. H. Percy Boulnois, Mr. Edward Manville, and Mr. E. Shrapnell Smith be deputed to give evidence on behalf of the council of the Roads Improvement Association against the said provisions of the Bill."

Various suggestions respecting the proposed new western approach road to London, from the Middlesex centre of the association, were received by the council, and a small sub-committee was appointed to confer with the Middlesex centre upon the subject and draw up a memorandum to the Road Board.

The gritting question was again considered, and the report of the special inspection by the association's expert was received. The secretary was requested to take action in regard to those authorities who are still using unsatisfactory material. A number of other matters were also dealt with.

**Housing in London.** The Housing of the Working Classes Committee of the London County Council have submitted a return showing the nett additional amount of working-class accommodation provided in the County of London and in the adjacent districts during 1910. The total number of rooms provided was 25,179, and of rooms demolished 4,268, making a nett addition of 20,911.

**The Testing of Materials.**—On Thursday evening next, at a meeting of the Society of Architects to be held at 28 Bedford-square, W.C., Mr. A. Alban H. Scott, M.R.SAN.I., will read a paper on the subject of the testing of materials. The paper will deal principally with the materials used in reinforced concrete work, such as aggregate, sand, cement and steel, and their combination, including the question of voids and ultimate strength.

D*

# Sewage Sludge and its Disposal.*

By J. GROSSMANN, M.A., PH.D., F.I.C.

From an economic point of view the present mode of sewage disposal by water carriage is wasteful. In the course of sewage purification the solids are separated by settling or precipitation processes at sewage works, to be further dealt with on the spot or elsewhere, while the liquid part ultimately finds its way into the streams and the sea. This part of the sewage, which contains valuable manurial constituents, is at present entirely wasted. If it could be advantageously used, it would represent a value of about £40,000,000 per annum in this country. This, however, is distributed over a quantity of 3,000,000,000 tons, and even if it were possible to recover the total amount of valuable constituents without any expense, each ton would only produce 3d. With a liquid of such complex nature as sewage, the recovery of its chemical constituents by chemical methods would be a hopeless task.

When the system of water carriage was adopted in this country, it was pointed out by Liebig that the system was economically wrong; but it was recognised that from a hygienic point of view it should be superior to any other system if properly carried out. So far as the liquid part of sewage is concerned, all anticipations can now be realised, but as regards the solid part of it, which has to be separately dealt with, the system has proved most disappointing from a hygienic point of view. A great point has been made of the fact that, although those solids which constitute the sludge may not be all that can be desired from an æsthetic point of view, yet pathogenic germs are but rarely found in it, and it has been argued that this proved that sewage sludge was not dangerous to health.

This seems to me one of the fallacies which have crept into the consideration of the sludge disposal question. It is well known that the sampling of a substance for the purpose of analysis is even more important than the analysis itself. For chemical purposes an average sample is sufficient; but in the case of a bacteriological examination of sludge an average sample taken in the ordinary way is of no use. In a town of 100,000 inhabitants, in which one person is afflicted with a zymotic disease, the infection from that person will be contained probably in the accumulation of a couple of months' sludge, say in from 5,000 to 10,000 tons, and then only present in a very limited area, and in taking samples of the sludge it is highly improbable that one would find pathogenic germs in the sample used for testing. In our present state of knowledge it is impossible to separate a small bacterium-bed from its surroundings. The fact that pathogenic germs have ever been found appears to me a proof that they must be far more prevalent than is at present accepted, and the same reasoning appears to me to apply to pathogenic germs which may find their way into the atmosphere from septic tanks, or from wet or dry sewage, or sewage sludge.

In choosing a problem for research, especially one in connection with working up of by-products, the technical chemist has to consider the intrinsic value of the ingredients of the waste products, and whether their value as commercial products would be likely to leave a profit on the working expenses. When, however, it becomes a question of public health that a by-product should be rendered innocuous, expense should become a secondary consideration, and even if a method for the hygienic disposal of sewage sludge were to add to the expenses of sewage treatment, it would still leave a valuable asset in the improved health of the population.

### SEA DISPOSAL.

The cheapest and simplest way of getting over the difficulty of sludge disposal is that of carrying the sludge, which may contain from 87 per cent to 92 per cent of water, out to sea in specially constructed boats and dumping it there. There appears to be always a danger that the tide may bring the sludge back to the nearest coasts, as is shown by the fact that it has occurred at Southend and other places on the estuary of the Thames, Llandudno, and other places; it has certainly been established that fish, including shellfish, may become contaminated and carry disease through coming in contact with sewage and sludge. In fact, it has become necessary to issue special Government regulations controlling the working of oyster beds. This method of disposal can therefore not be recommended. The cost of dumping into the sea, calculated on the dry substance contained in the sludge, is given in the Royal Commission's Report as follows:—

| | Per cent dry substance. | Tons dry substance per annum. | Calculated on dry substance or sludge. |
|---|---|---|---|
| Glasgow ... | (13·2%) ... | 40,000 tons at | 40·9d. per ton. |
| Salford ... | (21%) ... | 28,600 ,, | 45·1d. ,, |
| Dublin ... | (10%) ... | 11,500 ,, | 50·2d. ,, |
| London ... | ( 8%) ... | 200,000 ,, | 56·9d. ,, |
| Manchester ... | (14%) ... | 23,600 ,, | 68·9d. ,, |
| Southampton | (10%) ... | 1,395 ,, | 169·0d. ,, |

It thus appears that Salford, which is smaller than Manchester, is sending out more sludge, containing, moreover, 21 per cent of solids, a very large percentage; possibly Salford is not only disposing of the sludge it makes, but is also removing quantities of old sludge which in years past has been dumped on land and become concentrated through exposure to the air, but there is nothing in the commissioners' report to show whether such be the case. It is to be regretted that the report does not state the amount of sludge which may be obtained per 1,000 or per 100,000 inhabitants, and which at present is not known.

### PRESSING.

Probably in the majority of towns the process used consists in filter-pressing the settled sludge, and it is here where I found the greatest difficulties in ascertaining the actual cost of that process. If it is desired to dispose of the sludge by filter-pressing, it would be necessary to know the costs of producing and disposing of a quantity of pressed cake equivalent to 1 ton of actual sludge. However, it is customary to state the results in quite a different manner, and in such a way as to render them useless for comparison.

From my point of view, the quantity of water contained in a sludge cake is not the only thing to be considered, and going into the question on these lines we find discrepancies which have not appeared before, and which have in many cases led to the adoption of fallacious views. To give an instance of this I may refer to the paper on "Sewage Sludge and its Disposal," read by Mr. A. B. Ogden in 1910 before the Association of Managers of Sewage Disposal Works. Starting with sludge containing 10 per cent of solid matter and 90 per cent of water, he states that in his work the average proportion of liquid sludge to 1 ton of cake is 2·73 to 1, and that the resulting cake contains 50 per cent of water. On the figures given, however, it appears impossible to obtain a cake of 50 per cent; the proportion of 2·73 to 1 corresponds to a cake containing 27·3 per cent of sludge, and even allowing 4 per cent for lime added before pressing, we can only account for 31·3 per cent of solid matter in the cake, which brings the percentage of water to 68·7, instead of 50 per cent. To obtain such a cake, he calculates that it costs about 2s. per ton. This, in the 50 per cent cake which he assumes is obtained, would work out at 4s., and with a 31 per cent cake at 6s. 5d. per ton of dry matter, including the added lime. To compare the cost with other processes the calculations must be based on the 27·3 per cent of actual sludge, which corresponds to 7s. 4d. per ton of actual sludge. In this is not included the cost of the power used for filter-pressing, and instead of 4s. per ton on the dry material it would therefore cost more than 7s. 4d. to remove 1 ton of actual sludge by filter-pressing, whereas the actual cost of removal by steamer is stated to be 5s. 9d. per ton.

The above instance is not an isolated one, and should prove how important it is to reduce the calculations to dry sludge as a basis. Pressed sludge cake nearly always contains lime and, in many cases, other ingredients which have been added in the settling tanks, and which by increasing the bulk of the solid matters and apparently decreasing the amount of water are liable to lead to erroneous conclusions. The Royal Commissioners have also overlooked the importance of reducing facts to a common basis. The costs for pressing given in their report vary from 1s. 11d. to 6s. 4d. per ton of sludge cake in different localities; some of the sludge has been obtained from sedimentation tanks without the addition of chemicals, some with the addition of chemicals, some from septic tanks; the proportion of lime added for pressing varies from 1·3 per cent on the sludge to 20 per cent

* Paper read before the Manchester Section of the Society of Chemical Industry on January 15th.

In no case is the amount of water in the original sludge or the amount of water and added chemicals and lime in the finished pressed cake given. The primary object for which filter-pressing was introduced seems to have been lost sight of. That object was to lessen the cost of removal by reducing the bulk and weight of sludge which would be obtained from the settling tanks, and which on an average contained 9 tons of water to every ton of dry substance. It is, however, quite feasible to obtain a sludge containing 4 tons of water to every ton of dry substance by settling and draining, and if a sludge cake after addition of chemicals does not show a very decided increase over 20 per cent in the percentage of actual sludge, there appears to be no advantage in going to the expenses involved in the processes connected with filter-pressing.

THE CENTRIFUGAL DRYING PROCESS.

The same principle will apply in the examination of other processes which aim at the reduction of the bulk of the original settled sludge. In one of these the water is separated from the solids by centrifuging in a highly ingenious machine constructed by Schäfer ter Meer. A report of the results obtained is to be found in the "Communications from the Royal Testing Institution of Berlin for the Supply of Water and for the Removal of Sewage and Waste Liquors in Berlin"* At the request of that institution, one of their building inspectors, Mr. Reichle, and Prof. Dr. Thiesing, carried on a series of experiments, in which the cost of filter-pressing is given at 2s. 4d. per ton and that of centrifuging at 3s. 5d. per ton, but as they do not state the amount of water in finished products, nor the amount of foreign substances added (in the case of filter-pressing it appears that fine coal was added) it is impossible to determine the relative costs of the two processes calculated on the dry sludge. It appears clear that after centrifuging the mass only contains from 26 per cent to 30 per cent of dry substance. Assuming that the pressed cake contained the same amount of actual sludge, say 28 per cent., then the relative costs, calculated on dry sludge, would come to 8s. 4d. by filter-pressing and 12s. 2d. by centrifuging.

Apart from the increased expense, a drawback to the centrifugal method is that only about 60 per cent of the sludge passing through the machine is effectively dealt with, and the rest has to be settled again, and to be passed through the machine a second time, and so on. It has been contended that the sludge leaving the centrifugal machine can be stored for any length of time without causing a nuisance, or put on the land without further manipulation, but I am informed that in Frankfort, where several of these machines are working, it has been found necessary to put down a drying machine, which will add still more considerably to the expense of centrifuging. In any case, the local circumstances in this country are such as would render it unlikely that this centrifugal machine would be generally adopted.

HEAT-DRYING PROCESS.

In the course of these investigations it occurred to me to calculate what would be the cost of producing the same result as in a filter-press or centrifugal machine by means of heat. There is no difficulty in obtaining a sludge of 20 per cent solid actual sludge and 80 per cent of water by settling. Taking the sludge obtained by centrifuging or filter-pressing to contain 33⅓ per cent of solids and 66⅔ per cent of water, I calculated how much water would have to be removed from the 20 per cent settled sludge in order to convert it into a sludge with 33⅓ per cent of solids and 66⅔ per cent of water. In order to obtain 3 tons of 33⅓ per cent sludge one would have to evaporate 2 tons of water from every 5 tons of the 20 per cent sludge.

I had previously found that in a drying machine for sludge which I constructed for the purpose, and a description of which is to be found in Eng. Patent No. 28,516 of 1909, I could evaporate nearly 6 lb. of water per 1 lb. of low-grade coke or coke breeze, and as the price of this material varies from 5s. to 7s. 6d. per ton, a reduction in bulk of sewage sludge which had been previously settled down to 20 per cent to the consistency of the cake obtained by filter-pressing can be obtained at a cost in fuel of from 1s. 8d. to 2s. 6d. per ton, calculated on the dry material; to obtain the same result by filter-pressing or centrifuging costs more than from 8s. 4d. and 12s. 2d. per ton, so that, so far as the reduction in bulk goes, the method of evaporation by heat is cheaper than any other. Of course, other expenses have to be added to this for labour, capital charges, &c.; but even then the partial desiccation by heat is cheaper than filter-pressing or centrifuging in Schäfer ter Meer's machine.

DISPOSAL ON LAND.

The disposal of sludge by shallow burial in the ground can only be resorted to in cases where large tracts of land are available close to the sewage works, and even then there is a residue left which, sooner or later, may have to be dealt with if the land is not to remain worthless, and also there is a possible danger to health from pathogenic germs.

LAGOONING.

As regards lagooning, the same considerations apply, and there is probably no case in which lagooning does not produce a nuisance and possible danger to the neighbourhood. I will therefore for the present confine myself to the processes which are most in vogue for the further manipulation of the sewage sludge after it has been pressed.

DUMPING.

The course generally adopted is that of dumping the pressed sludge on land which has been bought for the purpose. But in many towns land suitable for that purpose is nearly filled up, and it is becoming a serious question what will have to be done when there is no more land available for dumping. In some cases, farmers will cart the stuff away for nothing; in some they will even pay a small sum for it, but even then it will only be removed during winter and spring, and left at the sewage works in summer, when it is most desirable that it should be shifted.

MANURIAL VALUE OF SLUDGE.

Experiments on the value of sludge as a manure have been made at the instigation of the Royal Commissioners, and published in a special report, in which it is distinctly stated that no sludge is worth 10s. per ton on the dry matter in it. This shows that sewage sludge can never become a marketable article which will pay the producer. Small works situated in the centre of a large farming district may be able to dispose of their sludge to farmers who may find that the sparing use of sludge on their land pays for the cost of cartage; but, in the majority of cases, it would be necessary to distribute the sludge at a considerable distance from the works, and in that case the cost of cartage, commission to salesmen, and other items would, on an average, far exceed the value of the sludge. The evidence given by sewage engineers before the Royal Commission shows that they recognise the fact that sludge is worthless as a commercial product for agricultural purposes, and the general opinion appears to be that practically the only constituent in the sludge which is valuable to farmers is the lime which is added to the sludge before pressing, and which often amounts to a considerable percentage of the sludge.

In Appendix VIII., which treats with the manurial value of sewage sludge, these points are clearly set out, and one would have expected that the Commissioners would endeavour to find some reason why the results obtained with sewage sludge on land should be out of proportion to the amounts of nitrogen, potash, and phosphates which it contains; but I cannot find that they have done so, and what appears to be the most natural reason for it has been overlooked altogether. It is well known that every sludge contains fatty matter, arising from soapsuds and other domestic refuse. Notwithstanding this, the amount of grease contained in the sludges used for the experiments on land was not determined. Had this been done, it would have been found that it is the grease which interferes with the action of the manurial constituents of the sludge. Fatty substances mixed with mineral and organic matter will produce a kind of magma impervious to rain and air, and the deleterious effect of the presence of grease in manures has been recognised before.

In the article on artificial manures, in "Thorpe's Dictionary of Applied Chemistry," Warington says, on p. 504, vol. 2, 1891 edition, with regard to fish manure: "The practical value of the manure depends to some extent on the quantity of oil present; the smaller the quantity of oil the more readily does the manure decompose in the soil." Now, fish manure contains more than five times the nitrogen, and nearly twenty times the amount of phosphates, which sewage sludge contains, so that if its proportion of grease were to render inoperative such an amount of nitrogen and phosphates as is contained in sewage sludge, there would still be a large amount of these constituents available to act on the plants, and though of less value than a similar manure which contained no grease, fish manure would

* Mittheilungen aus der Königlichen Prüfungsanstalt für Wasserversorgung und Abwasserbeseitigung zu Berlin. Heft 10.

still produce good results; in sewage sludge, however, the grease predominates to such an extent as to render the manurial constituents practically inoperative.

VALUE OF DRYING.

In the experiments carried out by the Royal Commission, it was found that nothing was gained by drying sludge before applying it on land; in fact, it is stated that dried sludge produces worse results than wet sludge. Mr. Ogden, however, in the paper referred to above, evidently does not accept these facts, and values the dried sludge manufactured at the Manchester sewage works at £1 per ton, or double the amount which has been found to be its utmost value by the Royal Commission. The cake which is obtained from the filter-presses is compressed into blocks 9 in. cube, and these blocks are dried on iron plates heated from waste steam from the engine.

Even if it were possible to establish a market value of 20s. for the dried sludge, which, in the face of the Royal Commission's Report, is not probable, it would not pay to produce dry sludge in the manner which he has adopted. There is comparatively little steam required in a sewage works for the purposes of power, and the quantity of sludge which could be dried with waste steam would only be on a small fraction of the total production. Sludge is a bad conductor of heat, and in his mode of drying, which is one of the least economical, it would be impossible to get the heat to penetrate into the centre of the cubes, so that neither a sufficiently dried cake would be obtained, nor would any germs contained in the sludge be sterilised. If the coal had to be paid for in the drying it would add at least 3s. 6d. per ton for fuel, and the several items which he enumerates will stand as follows:—

| | s. | d. |
|---|---|---|
| Pressing ... ... ... ... ... ... ... ... | 6 | 5 |
| Cutting cakes, &c. ... ... ... ... ... ... | 3 | 6 |
| Drying ... ... ... ... ... ... ... ... | 3 | 6 |
| Bags ... ... ... ... ... ... ... ... | 4 | 0 |
| Total ... ... ... ... ... ... | 17 | 5 |

The total cost would come to 17s. 5d., leaving 2s. 7d. to pay for carriage, cartage, commission to salesmen, and general charges and bad debts. Thus there is the certainty of a substantial loss on each ton of dry sludge sold. Mr. Ogden mentions in his paper that the dried sludge which he obtains is pyrophoric, and thus liable to spontaneous combustion, and for that reason it is ground shortly before dispatch; that fact may lead to difficulties with the insurance and railway companies.

PRESSING WITH COAL AND GASIFICATION.

It appears from Mr. Ogden's paper, and from the annual report for the year ending March 29, 1911, of the Rivers Department of the City of Manchester, that experiments have been made with the Manchester pressed sludge cake with a view to gasifying it in a generator. Four tons of sludge cake containing 50 per cent of water were mixed with 1 ton of coal and gasified in a producer, and the report which Messrs. Crossley Bros. have given (Rivers Department Report, p. 20) is as follows:—

"We are pleased to inform you that we have succeeded in gasifying this material up to a moisture content of 50 per cent to 55 per cent. Our yield shows 80,000 cub. ft. of gas of a calorific value of 112 B.T.U.'s nett at N.T.P., and the equivalent of 61 lb. of ammonium sulphate per dried ton gasified, when dealing with material of nitrogen content 1·46 per cent. Our only difficulty consisted in thoroughly cleaning the fire with such a material containing 40 per cent of ash, for dealing with which our small experimental plant is indifferently equipped."

Practically the same figures are given in Mr. Ogden's paper, with the following further particulars: One ton of coal equals 160,000 cub. ft. of gas, 28¼ tons of gasified coal equals 1 ton sulphate of ammonia. Calorific value 154·6 B.T.U.'s per cubic foot, combustible gas 40·3 per cent.

On the strength of these data, the following comments are made in the annual report of the Manchester Rivers Department (p. 20): "With specially-designed plant and a larger proportion of coal, the above results indicate that where use exists for power, the pressing of the sludge with small coal and subsequent gasification may afford a satisfactory means of its disposal."

I have calculated the actual facts from the figures given, and I find that the actual amount of gas due to the sludge comes to 26,000 cub. ft. of a calorific value of 28·5 B.T.U.'s, and the sulphate of ammonia per dried ton of sludge would only amount to a little over 20 lb., which is less than that of coal by the ordinary process of dry distillation, and one-fourth that which would be obtained in the production of Mond gas from coal.

The calorific value of the gas obtained being absurdly low shows that more than 5 tons of sludge cake would be required to give the equivalent of the available thermal value produced by 1 ton of coal, and including the removal of the clinkers more than 6 tons of material would have to be handled to obtain the same results as could be obtained from 1 ton of coal. The generator part of the plant also would have to be proportionately larger and more expensive. Reducing the whole to money values it means this, that one would have to pay probably five times the amount that an ordinary gas producing plant would cost, and that one would have to pay about £2 for fuel in the shape of sludge against 8s. 6d. per ton for which coal can be bought at the Manchester Sewage Works. There is nothing said about the commercial side of this question in Messrs. Crossley's report, which quite properly only states that there appears to be a likelihood that the purely engineering difficulties of the problem might be overcome, and I fail to see what useful purpose can be served by stating, as is done in the Manchester report, that this method may yield satisfactory results. A calculation based on the thermal value of sludge would have shown that it is hopeless to gain a satisfactory yield in power or heat from sludge cake with 50 per cent water in a generator, and the results obtained by Messrs. Crossley Bros. fully confirm this.

Quite recently the plan of gasifying sludge in gas retorts, which I advocated more than thirteen years ago in a paper read before this society, has been resuscitated in Germany. I stated then that if the engineering difficulties could be overcome, there was a prospect of that method being practicable. I have since come to the conclusion that though from a purely technical point of view my statement was correct, it would be out of the question that a process of that kind could be worked in this country, in which the gasworks are in nearly every case owned by corporations, and in which the profit from the gasworks helps to relieve the rates. The plant for the dry distillation of sewage sludge would be far more expensive than that used in the case of coal. The quality and quantity of the gas would be varied and uncertain, and its distribution would entail additional expense and inconvenience, as sewage works are generally at a considerable distance from the towns. Again, it might cost nearly £2 to obtain a quantity of sludge equivalent to 1 ton of coal. I have finally, after serious thought, abandoned the idea on which I first started in connection with the disposal of sewage sludge, and devoted my endeavours to my process of distillation with superheated steam, which I have found has none of the objections either from an economic, engineering, commercial, or hygienic point of view, which the other method has.

A NEW METHOD.

The hygienic disposal of sewage sludge is the keystone of sewage purification, and the most rational mode of sludge disposal is that of putting it back on the land. But to use it in the shape of sludge, wet, pressed, or dried, for farming purposes, is nearly always impracticable and always open to serious objections on hygienic grounds. There will always be a suspicion that it may disseminate disease among cattle and human beings; it should never be used where cattle is grazing, and not where the plant shoots have appeared above ground; its use in the latter case is, I understand, forbidden by law in France. Ordinary drying of sludge is no guarantee of sterilisation. To make the sludge available for farming purposes it must be deprived of its grease, and the residue exposed to such a temperature as will be a guarantee that it is thoroughly sterilised. It is these considerations which I have borne in mind in working out my process for the disposal of sludge by means of distillation with superheated steam in such manner as will comply with the severest requirements of hygiene.

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**The Highway.** A correspondent draws our attention to a periodical called "The Highway," and asks if it is likely to prove helpful to road engineers. We think it is hardly likely to be of direct utility, as it is the organ of the Workers' Educational Association. Its title is a little misleading to Surveyor readers.

**Suggested London Traffic Board.** The London County Council have adopted a recommendation of the General Purposes Committee that the Prime Minister should be asked whether the Government proposed, as the result of representations made by the council in 1907, to introduce legislation on the lines of the report of the Royal Commission on London Traffic to establish a Traffic Board for London.

# Institution of Municipal Engineers.

## GENERAL MEETING IN LONDON.

A general meeting of the Institution of Municipal Engineers was held at No. 4 Southampton-row on Saturday evening last for the consideration of a paper by Mr. A. Winter Gray dealing with superannuation and security of tenure. Those present included:

Messrs. E. A. Stickland, president of the institution (in the chair), Henry C. Adams (vice-president of the institution), W. F. Taylor (London), H. E. Gilkes (Birmingham), H. Shepard (Mile End), P. Gerald Cocks (Balham), H. B. Cooper (Wandsworth), A. H. Jennings (Erith), A. J. Meeson (Brentwood), J. T. James (East Suffolk), E. W. Veale (Farnham), A. R. Bleazard (Clitheroe), A. Winter Gray (Lambeth), E. W. Whitwell (Abersychan), R. C. Aldous (Nottingham), F. E. Ennals (Billericay), A. C. Brown (Chatham), W. Louis Carr (Ruislip-Northwood), and B. Wyand (secretary of the institution). Among the visitors were Messrs. J. T. White (Birmingham), G. H. Buckett (Lambeth), A. A. Dimmock (Fulham), C. Chambers-Smith (Westminster), C. H. W. Biggs (London), and Captain D. F. Campbell (London). Mr. L. Hill, secretary of the National Association of Local Government Officers, also was present.

### SUPERANNUATION AND SECURITY OF TENURE: THE NATIONAL ASSOCIATION OF LOCAL GOVERNMENT OFFICERS AND ITS BILL.

By A. Winter Gray, M.Inst.Mun.E.

It was with considerable diffidence that I accepted the invitation of the council to read a paper on the all-important questions of "Superannuation and Security of Tenure." At the time of acceptance I was conscious of my inability to deal with the subject in an exhaustive and satisfactory manner, and while engaged upon the preparation of the paper my incompetence has become more and more apparent to me.

I submit that the institution's delegates (past and present) to the National Association of Local Government Officers, or some of the prominent leaders of that association, are far more qualified to discourse upon the questions under review, and would have welcomed the opportunity of so doing and of furnishing the fullest information respecting the work of such association and its efforts to secure, in particular, superannuation and security of tenure for local government officers.

I am, however, grateful for the privilege afforded me, by the council's invitation, of being able to attempt to focus attention upon the policy of the National Association, and if I am able to excite a greater interest in the association on the part of some of the members of the institution I shall be amply rewarded.

It should be stated that I have treated my subject mainly from the standpoint of the municipal engineer, but many of my remarks as to the lack of protection, inadequate remuneration, need of superannuation, &c., are not peculiar to municipal engineers, but apply with equal force to other branches of the local government service.

I desire, at this early stage, to acknowledge my indebtedness to Mr. Hill, the secretary of the National Association, for the very valuable assistance he has rendered me in the preparation of this paper.

#### THE HISTORY, OBJECTS AND SCOPE OF THE NATIONAL ASSOCIATION OF LOCAL GOVERNMENT OFFICERS.

I propose to preface my paper with a few brief notes on the history, since its inception in 1905, of the National Association of Local Government Officers (generally termed, and hereinafter referred to as, the "Nalgo"), and the objects and scope of the association.

On July 29, 1905, a conference, for the convening of which Mr. H. E. Blain, the tramways manager of West Ham, was mainly responsible, was held at the Inns of Court Hotel, London, and was attended by delegates from certain of the then existing local guilds and associations and a few professional and sectional societies; the outcome of this meeting was the birth of the "Nalgo." The scope, influence and future possibilities of such an organisation were readily recognised by many prominent members of the local government service, and it was realised that questions of national importance—such as superannuation, security of tenure, the safeguarding of the interests and the raising of the status of local government officers—could be dealt with by a national association with far greater hope of success than if considered separately by the existing local organisations.

At the end of the first year the association recorded a membership of about 5,000, comprising some twenty local guilds and associations and professional and sectional societies. The following table demonstrates the rapid increase of membership—*viz.*:—

| | |
|---|---|
| 1905-6 ... ... ... | 5,000 |
| 1906-7 ... ... ... | 12,657 |
| 1907-8 ... ... ... | 13,521 |
| 1908-9 ... ... ... | 16,600 |
| 1909-10 ... ... ... | 21,063 |
| 1910-11 ... ... .. | 28,079 |

At the present moment the number on the roll closely approximates 30,000, representing 146 affiliated associations.

The objects of the association are thus officially defined:—

> To further the interests of local government officers; to federate the various societies of local government officers; to deal with questions of superannuation, security of tenure, and others of national importance to local government officers; to promote legislation for these and other purposes; to render legal assistance to its members in cases where the National Council shall deem it necessary; and to encourage the formation and working of local or district associations for the furtherance of these objects.

Other admirable objects to which the association is also pledged are an examination scheme for those local government officers for whom the many professional societies do not cater, and a Benevolent and Orphans' Fund, to both of which I shall refer later.

One of the most satisfactory features of the "Nalgo" is the support given to, and spade work performed by, a very considerable number of the most eminent men in the local government service. There can be no more convincing testimony to the utility of the association, and no greater guarantee of its ultimate success, than the fact that these gentlemen have recognised the pressing need for such an association, and have identified themselves with its aspirations and labours.

#### THE INSTITUTION'S ATTITUDE TOWARDS SUPERANNUATION AND SECURITY OF TENURE.

From its inception, the institution has been cognisant of the necessity of superannuation and security of tenure for its members. One of its "objects," as defined by the by-laws, is "to take such steps as may be deemed expedient with a view to obtaining security of tenure and superannuation for municipal engineering officials." That these questions have always been kept in the foreground is evidenced by the fact that in 1909 the first president read before the institution a paper entitled "Municipal Superannuation," and each of his successors, in his presidential address, has referred at length to these all-important subjects. In the belief that "union is strength," the institution, in its early days, became affiliated to the "Nalgo," and is to be congratulated upon its wisdom in having chosen as its delegates for the current year the president and the two past-presidents. The selection of the three most important and influential members of the institution bears eloquent testimony to the vigorous action now being taken by the council towards the attainment of superannuation and security of tenure. From time to time reports as to the progress made have been furnished to, and discussed at, the meetings of the council.

#### THE NEED OF SUPERANNUATION AND SECURITY OF TENURE.

The duties performed by a municipal engineer or surveyor are of a special nature, in many instances carried out under difficult circumstances, and in the face of considerable opposition and prejudice; it is therefore of the utmost importance that adequate protection in the shape of security of tenure should be afforded every officer whose unpleasant duty it is to initiate proceedings against offenders. It is a regrettable fact that, in numerous cases, the municipal engineer or surveyor holds his office at the caprice of political or personal considerations. This lamentable state of

affairs is more marked in some of the smaller urban and rural districts, where the surveyors are at the mercy of men whose lack of education and ability precludes them from forming any conception (still less appreciation) of the value of a professional man's services. Generally speaking, the remuneration of municipal engineers compares unfavourably with that obtaining in other professions and commercial vocations, where a correspondingly high standard of training, skill and administrative ability is exacted. Invariably he is precluded from augmenting his income by supplementary effort, and the many calls upon his purse in maintaining a social position commensurate with the so-called dignity of his office, in numerous instances, precludes the making of adequate provision for his own future and that of his dependents; for these reasons, and for others, to which reference will later be made, the right of superannuation and security of tenure would appear to be incontestable. Only a few weeks ago attention was directed by a service journal to the case of a highways surveyor to an urban district council who was in receipt of the princely stipend of 22s. a week, and who, after considerable argument, was grudgingly granted an increase of 2s. per week, in order that the surveyor's salary might compare favourably with the weekly wage paid to the council's labourers.

It should be borne in mind that it is as much in the interest of the ratepayer as of the officer to establish a superannuation scheme for the latter The officer in possession of a superannuation scheme experiences a sense of security in times of stress and sickness, and this sense reacts to the advantage of the service.

In corroboration of this statement, it may be well to quote from a paper read in the summer of 1910 at the annual conference of the Urban District Councils' Association by the vice-president, Mr. J. Ogden Hardicker, on the subject of "Thrift and Superannuation Funds and their Advantages." He stated:—

> "The advantages of a thrift or superannuation fund, of course, are many, and for my purpose it will be quite sufficient to mention the following: (1) There is the assurance of some provision in case of illness, incapacity, old age, or death. (2) It avoids the necessity of making costly and uncertain provision for old age which very often fails when most wanted. (3) It has the advantage of preventing injudicious investment of savings. But besides the advantages accruing to the individual, there is an advantage to the local authority in case an official or employee becomes unable, by reason of old age or incapacity, to carry out the duties of the office to which he may be appointed. In this possible contingency it will not be necessary for the local authority to retain him in the same (or some other nominal) position and pay him what is to all intents and purposes a pension out of the rates. He will be entitled, as a matter of right, to a sum of money or a pension, and besides his independence being thus preserved, the local authority will be free to act with a single eye to the welfare of the ratepayers, feeling quite satisfied that proper provision has been made for their officials in their old age or infirmity. Another great advantage is that advancement will take place sooner among the staff owing to the earlier retirement of such officials. This is, to my mind, very desirable, for it is pitiable to see incompetent officials by reason of old age vainly endeavouring to do their work simply because no provision has been made for their retirement on a pension."

In the past, Parliament has been marvellously inconsistent in the treatment of public servants in regard to superannuation. It has shown itself exceedingly solicitous for the welfare of the State officials—*viz.*, civil servants—who get all their benefits without contribution, while the poor-law officers, the asylums officers, school teachers and others have been granted superannuation only upon a contributory basis; but there yet remains a large class—*viz.*, local government officers—who are denied the right of superannuation, although willing to pay for it.

### PRIVATE SUPERANNUATION SCHEMES.

It must be admitted that several authorities have obtained "private" Superannuation Acts, but there are grave practical objections to the adoption of local schemes, comparable with the establishment of a national scheme. A local scheme is necessarily based, to some extent at least, on the assumption that the employees of a council will remain permanently—*i.e.*, for a lifetime—in the same service. This may be true so far as the largest authorities are concerned, but does not obtain in the case of the smaller authorities. There is always a certain amount of coming and going in search of better posts and remuneration, and under a local scheme an official who has been contributing to such a scheme for years may find himself suddenly, upon obtaining a new post, exactly where he was at the start, so far as superannuation is concerned. No doubt local superannuation schemes are established in the hope that they will tend to permanence of service, but the migration of officials must continue so long as positions and salaries can thereby be improved. Another objection to the extension of separate local schemes is that adequate schemes are only financially practicable for the largest authorities with a considerable number of employees—*i.e.*, those authorities large enough to enable the law of averages to operate.

### THE "NALGO'S" BILL.

The desire to remedy the unsatisfactory conditions to which reference has been made should be a sufficient justification of the action which led the "Nalgo" in 1908 to draft a Bill for presentation to Parliament. As in certain quarters ignorance of the "Nalgo's" Bill has been professed, no excuse would appear to be necessary for furnishing particulars of the measure, of which the following is a digest—*viz.*:—

> The Bill has a wide definition of "local authority," which includes, amongst others, any council of a county or borough, urban district council, rural district council and education authority in England and Wales, and defines "officer" as "every officer in the service of the local authority designated an officer in an established capacity by resolution of council," and "servant" as meaning every servant or workman in the permanent employ of a local authority and appointed by them or by a committee or officer of the local authority duly authorised to make the appointment.
>
> By clause 3 the Bill provides for the superannuation of every officer or servant who shall become incapable of discharging the duties of his office with efficiency by reason of permanent infirmity of mind or body or of old age, or who shall have attained the age of sixty years and have completed an aggregate service of forty years or shall have attained the full age of sixty-five years, and that an officer or servant shall not be entitled to superannuation on the ground of old age unless he has completed the full age of sixty years. It also provides that where an officer or servant has attained the full age of sixty-five years he shall cease to hold his office or employment on payment to him of the superannuation allowance except that the local authority may by resolution and with his consent extend his period of service for one year and so from time to time.
>
> The scale of superannuation allowances provides that an officer or servant who has served for ten years but less than eleven years and has contributed for not less than five years shall be entitled to an annual allowance equal to ten-sixtieths of the average amount of his salary, &c., during the last five years of his service, with an addition of one-sixtieth of such average amount for every additional completed year of service until the completion of forty years' service, when a maximum allowance of forty-sixtieths shall be granted. All periods of service under any local authority or authorities are to be aggregated, whether the service has been continuous or not, and whether the whole time of such officer or servant has been devoted to service or not.
>
> In the event of a person being again employed by a local authority after superannuation only so much of the allowance is to be paid as with his wages is equal to the allowance to which he was previously entitled, but on such employment ceasing he reverts to his original allowance.
>
> Any officer or servant who is dismissed or resigns or otherwise ceases to hold office in consequence of any offence of a fraudulent character or of grave misconduct in relation to his service or employment, forfeits all claims to allowance or to return of contributions. An officer or servant who has not become entitled to superannuation and who loses his office or employment by reason of reduction of staff or abolition of office or otherwise ceases to be employed by reason of bodily injury (not occasioned by his own default) or of any other cause whatsoever other than his own misconduct or voluntary resignation is to be entitled to receive a sum equal to the amount of his contributions to the fund, and on subsequently obtaining employment under a local authority may reckon his previous service on repayment of contributions.
>
> In the event of any loss of office or employment as last mentioned, the local authority may out of the fund grant a gratuity not exceeding twice the salary, &c., paid during the previous year.
>
> In the event of the death of an officer or servant before becoming entitled to his superannuation, half his contributions are to be paid to his legal personal representative. Superannuation allowances are not to be assignable or chargeable with debts.
>
> The scale of contribution is as follows:—
>
> In the case of officers or servants with less than ten years' service at the passing of the Act, or appointed afterwards, 3 per cent. per annum of salary, &c.

In the case of officers or servants with ten and less than twenty years' service at the passing of the Act, 4 per cent. per annum of salary, &c.

In the case of officers or servants with twenty and less than thirty years' service at the passing of the Act, 5 per cent. per annum of salary, &c.

In the case of officers or servants with thirty and more than thirty years' service at the passing of the Act, 6 per cent. per annum of salary, &c.

Provided that any officer or servant with more than ten years' service at the passing of this Act may within six months state that he is desirous of paying a contribution in respect of a less number of years' service, in which case he would be entitled to superannuation accordingly.

Any officer or servant employed at the commencement of the Act may within six months declare his intention not to contribute. Power is given to the Local Government Board to decide all questions of difference arising under the Act except as regards any gratuity.

The Act also provides for the establishment and administration by the Local Government Board of the Superannuation Fund, to which all contributions are to be paid.

In the event of the fund not being sufficient to satisfy the claims, the Local Government Board are empowered by precept to demand from each of the Authorities concerned in proportion to the contributions made by their officers and servants during the preceding year such an amount as will in the aggregate approximately meet the deficiency. Power is also given to the Local Government Board to make regulations regarding certain matters therein mentioned including the nomination of qualified medical practitioners to report upon the condition of any officer or servant who or on whose behalf an application has been made for a superannuation allowance on the ground of permanent infirmity of mind or body.

The Bill also provides that no officer of the local authority shall be removed by such authority without the assent of the Local Government Board, or unless he be incapable of carrying out his duties by reason of permanent infirmity of mind or body, by evidence which the Local Government Board shall deem sufficient.

The local authority may suspend any officer and shall report the suspension to the Board who are empowered to remove the suspension.

Where any change in the duties or salary of any officer may be deemed necessary, and in which he declines to acquiesce, the local authority may with the consent of the Board, but not otherwise, and after six months' notice in writing, determine his office.

The Bill does not apply to members of a police force or of a fire brigade, to which the provisions of the Police Act, 1890, apply, nor does it apply to local authorities having a superannuation Act in operation, nor it empowers such authorities to contribute towards the Bill in lieu of their own Act or scheme.

The Bill follows the general lines of the Poor-Law Officers' Superannuation Act, 1896, but [illegible] of considerable importance [illegible] several directions.

The contributions to be made by officers are altered as follows:—

| Poor-Law Officers' Superannuation Act, 1896. | Local Government Officers' Bill. |
|---|---|
| Officers with less than 5 years' service at passing of Act or appointed subsequently, 2 per cent. | Officers with less than 10 years' service, 4 per cent. |
| Officers with more than 5 years and less than 15 years' service, 3 per cent. | Officers with 10 years' and less than 20 years' service, 5 per cent. |
| Officers with more than 15 years' service, 4 per cent. | Officers with 20 years' and more than 30 years' service, 6 per cent. |

In the preceding [illegible] Act of 1896 gave power for a number of [illegible] with the consent of the Local Government Board. This power is not repeated in the Nalgo's Bill.

The Act of 1896 provided that any officer ceasing to hold office owing to fraud or misconduct should forfeit all claim to superannuation, but also provided that the guardians might, if they thought fit, return to him the whole or part of his contributions. The Nalgo's Bill, on the contrary, provides definitely that fraud or misconduct shall forfeit any claim to any superannuation allowance or any return of contributions.

The Act of 1896 made *no* provision for the return of contributions to the relatives of an officer in the event of death. The "Nalgo's" Bill provides that *one-half* the contributions made by an officer who dies before receiving a superannuation allowance may be returned to his representatives.

The latest published report of the Local Government Board on the administration of the Poor-Law demonstrates that the charge upon the rates in respect of superannuation for Poor-Law officers—that is, the difference between the contributions of officers and the amount paid by the Poor-Law authorities under the Act of 1896 was equivalent to a rate of only one-tenth of a penny in the £.

THE PRESENT POSITION OF THE BILL.

Having got thus far, the question may not unnaturally be asked, why does not the National Association take the necessary steps to submit its Bill to Parliament. The answer can readily be given. In order to facilitate the passing of the Bill, the National Association has, for a long time past, been conducting negotiations with the Association of Municipal Corporations, the County Councils Association, the Urban District Councils Association, and the Rural District Councils Association, with the object not only of removing any contemplated opposition on the part of those influential bodies, but with a view to enlisting their sympathy and support. As a result of these negotiations, the associations in question have approved the principle of a national superannuation scheme in preference to the continuance of piecemeal legislation, and it is satisfactory to relate that the executive council of the County Councils Association has carefully considered a report of its Parliamentary Committee, and is prepared, subject to certain alterations in the draft Bill being adopted, to recommend it to the favourable consideration of the county councils and public authorities throughout the country, as well as to endeavour to secure the co-operation of the Association of Municipal Corporations.

The most important development of the past year has been the reference by the Chancellor of the Exchequer, when introducing the State Insurance Bill, to the existing Superannuation Acts of certain municipal authorities, and the announcement he then made that he hoped, during the ensuing Parliamentary session, to deal with the provision of adequate superannuation for teachers. The "Nalgo," therefore, embraced the opportunity of bringing the aspirations of local government officers in this direction before both the Chancellor of the Exchequer and the President of the Local Government Board, and by request has furnished the latter with a full statement of its case. It may consequently reasonably be hoped that the "Nalgo's" Bill may be advanced another stage at an early date, despite the congested state of affairs in Parliament.

As a result of the conferences which have taken place between the "Nalgo" and the associations before referred to, the former has been enabled to determine upon a definite line of action to be pursued in the future; and having regard to the encouraging remarks of the Chancellor of the Exchequer, and to the trend of [illegible] in matters akin to superannuation, steps are now being taken by the "Nalgo" to bring about the presentation of the Bill in Parliament at the earliest possible moment.

Fair public opinion, as voiced by the Press, is beginning to realise the justice of the claim of local government officers for superannuation, as evidenced by the fact that one of the most influential papers circulating in the West Country recently stated: "Of course, there is no denying as a principle the need for a recognised pension scheme for all public officers. They would then contribute their share and, at a fixed age, step aside in favour of younger men, and take superannuation as a legal right."

It is pleasing also to relate that, as the result of an appeal for support made by the "Nalgo" to the candidates at the last Parliamentary General Election, favourable replies were received from no less than 327 members of the present House of Commons.

APATHY AND A SUGGESTED REMEDY.

One of the greatest [illegible] the National Association has had to contend with in the past has been the fact that a certain proportion of municipal officers throughout the country have so far failed to identify themselves with the association, and thus given rise to the erroneous impression that local government officers are not unanimous in the desire for superannuation and [illegible] It is recorded that a President of the Local Government Board once enquired of a deputation of municipal officers, who had waited upon him with the object of enlisting his sympathetic support for superannuation, how many of their brother officers they directly represented, and having been informed that the number was comparatively small, told the delegates when they could speak on behalf of the majority of municipal servants to come again and he would give their proposals his careful consideration.

The energetic propaganda work so successfully carried on by the National Association has done much towards removing the objection raised by the eminent gentleman referred to, but when it is considered that in England and Wales alone there are

36 cities, 286 boroughs, 63 county councils, 72 county boroughs, 815 urban district councils, and 666 rural district councils, making a total of 1,938, of what may be termed the most important local government authorities, each of which employs a staff of officials ranging numerically from a few to several hundreds, and that to this total must be added the numerous smaller bodies, such as parish councils, overseers, joint sewerage, water, tramway, gas and electricity boards, port sanitary authorities, &c., it will be found that there are almost as many local authorities as there are members of the "Nalgo" at the present day.

It cannot therefore be denied that there yet remains a considerable number of municipal officers whose bounden duty it should be to step in and take an active part in furthering the work of the National Association in its endeavour to secure for *all* (not only for its members) the benefits of superannuation and security of tenure. Further, having regard to the far-reaching effects of any measure which the "Nalgo" might promote, it should be to the interest of every local government officer to be in a position (*i.e.*, by membership of the "Nalgo") to express any views he might have in regard to any such measures. In this connection it may be possible for the Institution of Municipal Engineers to play a more important part. If every member not already directly affiliated to the "Nalgo" would apply for direct membership, or, better still, undertake the task of forming a local association in his own district, the cause would be advanced by leaps and bounds. A greater interest would thereby be stimulated where at present it lies dormant, and places would be reached which the "Nalgo" could not hope to invade for years to come. If no other advantage accrued from membership, it surely must be worth something to an individual to have at his back an association numbering 30,000 ready and willing to aid and support any righteous cause. It should readily be realised what a power in the land the "Nalgo" would become if every local government officer were a member of it.

### THE COST OF AFFILIATION TO THE "NALGO."

It may not be out of place to draw attention to the fact that, as one of the affiliated professional societies, the maximum amount the institution is permitted to contribute towards the attainment of superannuation and security of tenure is 5 guineas per annum, which, based upon its present membership, works out at approximately 1¼d. per member per annum. This sum is totally inadequate for so important a purpose, hence the need for greater support, on the lines already advocated, from this and kindred institutions. It is absolutely essential that the National Association should create an adequate reserve fund, to be drawn upon in times of emergency, and this can only be effected by increasing the annual subscription to be paid by members of the affiliated guilds and the professional societies. It is to be hoped that the "Nalgo" will in the near future realise the urgent need of taking this important step, the beneficial effect of which must be obvious to all.

### ARGUMENTS AGAINST SUPERANNUATION.

So far this paper has been confined to an exposition of the views of local government officers in regard to the question of superannuation; there is, of course, the other side, to which reference should be made.

In an article which appeared some months ago in the *Local Government Review*, a writer put the arguments of the opponents of superannuation as follow: "Local authorities should be as efficient in their methods and as careful of the public purse as if they were directors of a limited company in which they were the sole shareholders. A municipal officer who is not sufficiently sensible and careful to make an adequate provision for old age out of his salary is not entitled to sympathy when he has run his day and spent his salary in full. The savings bank habit, as it is called in the United States, is absolutely essential to the manly independence of every respectable human being, and the knowledge that there is a pension waiting for a man at the end of his course entirely takes away from him that strength of character and self-reliance which is the chief virtue produced by thrift. The expectation of a pension reduces a man's efficiency. He feels that so long as he does his work in the ordinary way he will pull through all right. Industry is checked and initiative discouraged, for the latter means the risk and blame of making serious errors in work which has not been done before. Men *entitled* to pensions and with safe situations lack ginger in their daily work. It is contended that the local authorities are not merely entitled to energetic and able men who will make sacrifices for their work, but that they should take no steps that will encourage such men to relax their efforts on behalf of the community of which they form a part."

In addition to the arguments already adduced in favour of superannuation for local government officers, it may safely be contended that (1) inasmuch as superannuation is proposed to be granted on the basis of part contribution by the officer, it must be admitted that such contribution is equivalent to making provision for old age, and would be nothing more or less than deferred pay; (2) the faithful and efficient service rendered by local government officers bears eloquent testimony to the fact that they neither need ginger nor lack initiative, strength of character or self-reliance; (3) the municipal officer is a "specialist," and, as such, his remuneration, generally speaking, compares unfavourably with that of the average professional man, and of others occupying positions of equal responsibility in the commercial world; and (4) the highest standard of efficiency, morals and integrity is demanded both by municipal authorities and by the ratepayers.

### LEGAL DEFENCE AND FAIR COMPETITION FOR APPOINTMENTS.

Having dealt with the question of superannuation, a few words may be devoted to two matters of vital importance to every municipal officer which could better be handled by a large and representative body such as the "Nalgo" than by a number of separate organisations; they are, legal defence and fair competition for appointments. The value of the former is so obvious, especially to municipal engineers, as to need no comment, save to record the fact that the "Nalgo" has in the past rendered invaluable assistance to certain of its members requiring legal aid, and will continue so to do in the future. In possession of an adequate reserve fund, to which allusion has been made, the National Association could more effectively deal with this important subject, as well as with that of unfair competition. In regard to the latter, if the greatest publicity were given to discreditable cases, much good would result. In this connection it may suffice to quote one of the latest glaring instances affecting the appointment of a municipal engineer, which reflected the greatest discredit upon the authority concerned.

In November last the council of an urban district in the county of Durham advertised for a surveyor, and received 199 applications for the post. A candidate who wrote for a list of the duties of the vacant office was, without request, furnished by the clerk with the names and addresses of the members of the council. The intending candidate, not unnaturally, construed this action to be a broad hint to forward a copy of his application and testimonials to each of the members, which he did, and thereby incurred some expense. It was subsequently announced in the Press that the council in question had appointed a local builder as surveyor, in succession to his father, at a salary of £250 per annum. The scandal was, however, further increased by the fact that the individual appointed was a member of the council, and, as such, received copies of the applications and testimonials of those candidates who sent them to the members.

This is by no means an isolated case of irregularity in regard to the making of appointments.

### EXAMINATION SCHEME AND BENEVOLENT AND ORPHANS' FUND.

A passing reference has already been made to the examination scheme and the Benevolent and Orphans' Fund of the National Association.

With regard to the examination scheme, it has previously been stated that such scheme is only intended for those local government officers for whom the many existing professional societies do not cater. There can be no doubt that this is a most progressive and important step, and the primary object is to make the holding of a diploma a recognised testimony of knowledge of the several branches of local government work. It may be of interest to detail the subjects included in that portion of the syllabus which relates to the examination of clerks in surveyors' and engineers' departments, which are as follow:—

*Intermediate Examination.*—Correspondence, filing and indexing, *précis* writing; requisitions, orders, checking accounts, examining same with vouchers and orders, discounts; stationery; transit of goods; time-keeping

and preparation of wages sheets; storekeeping and recording; stocktaking, abstracting from accounts and wages sheets; prime cost accounts; statistics; preparation of minutes, reports and returns; general office routine.

*Final Examination.* — Departmental book-keeping; police court and legal proceedings, preparation of evidence; advertisements for tenders, forms of tender, schedules and specifications for supplies under contract, or for works; quotations, estimates, bills of quantities; methods of pricing tenders and quotations; scheduling of properties and principles of apportionments; applications for loans; preparation of reports, fair minutes, returns and statistics; Municipal and Companies' Acts applying to the department; insurances; registration, employment and regulation of workmen; general principles of law, (*a*) in London, (*b*) in provinces, as to sewering, draining, paving, public health, workmen's compensation, employers' liability, contracts, municipal corporations and councils.

There is a Benevolent and Orphans' Fund connected with the National Association, and, although it is still in its infancy, there is every hope that it will become a large and valuable institution. Given the help which such an admirable object deserves, there is no reason why the "Nalgo" should not eventually possess its own homes and institutions similar to those of other parochial and commercial societies.

Membership of the fund costs 2s. 6d. per annum, and for 2 guineas contributed in any one year an officer may become a life member, while any federated association donating £5 and upwards is privileged to nominate one life member for each contribution of £5.

The trustees of the fund have decided to permit all branches of the association to deal direct with urgent cases, and to render assistance involving not more than half of the branch's total subscriptions during the previous year.

It will doubtless be remembered that a short time since the institution issued an appeal to its members on behalf of one who had encountered misfortune; it met with a ready and generous response, but, owing to the interval which of necessity elapsed, resulted in failure as regards the primary object—that of affording immediate relief. It is quite conceivable that one or more similar cases of adversity may arise in the future, and, in the absence of a benevolent scheme connected with the institution, it may be considered advisable to issue an appeal in support of the "Nalgo's" fund. A very simple and efficacious method of raising money without unduly taxing the pocket of any individual would be the formation in each district, county or local office of an organisation where, by the payment by each member of the sum of 1s. or upwards a month, the contributions could be pooled and a periodical ballot taken for a life membership. As a concrete example, suppose any forty-two members agreed to take up life memberships on the 1s. monthly instalment plan, sufficient funds for one life membership per month would be forthcoming. Each individual would in turn become a life member, and the cost thereof would be spread over a period of three and a-half years, during which time no less than 84 guineas would have been contributed; by this simple and economical method huge sums could be accumulated. If, instead of confining such a scheme as that described to any separate district or organisation, the institution inaugurated a central fund, it would always have at its disposal a sum sufficient for the immediate relief of any necessitous member, and, in addition, would, if required, be enabled to secure a further grant from the "Nalgo."

### "PROGRESSION" *v.* "AGGRESSION."

In conclusion, I desire to invite attention to the necessity of making a still greater impression upon that almost impregnable obstacle "apathy," and to impress upon the minds of the members of the institution the fact that organisation is the secret of strength.

The organisation of men with common interests, and of professional societies, has been very much in evidence in recent years, and has given rise to the erroneous idea that it is fraught with the danger of resentment. It may, however, incidentally be remarked that there are "progressive" as well as "aggressive" organisations, and the institution and the "Nalgo" must be numbered among the former. The very employers of local government officers have combined for the defence of their own interests, and the strength of the County Councils Association, the Association of Municipal Corporations, the Urban and Rural District Councils Associations, and others is constantly used to the benefit of the ratepayers. These bodies realised many years ago that united action was their safeguard.

So much for concerted action; much, however, can be accomplished by individual effort in bringing to the notice of municipal corporations, local councils, members of Parliament, and others the claims of local government officers to superannuation, security of tenure, &c. It is not sufficient for any man to sit down and bemoan his fate, but, on the contrary, it will redound to his credit to be up and doing.

I venture to express the hope that the institution's delegates to the "Nalgo" may be prevailed upon to send for publication in the *Journal* particulars of the business transacted at the meetings they attend, and from time to time contribute articles on matters of mutual interest to the institution and to the "Nalgo."

As a last word, I would state that I do not pretend to have more than penetrated the surface of my subject, and would remind my hearers that I prefaced my paper by acknowledging my inability to do justice to the important questions under review. As a parting shot, I would hazard the suggestion that if the members of the Institution of Municipal Engineers desire to see in substance what is now the shadow, then, in the words of Josh Billings, "they must not keep their wishbones where their backbones ought to be."

### DISCUSSION OF MR. GRAY'S PAPER.

Mr. E. Whitwell (Abersychan) said he had very much pleasure in proposing a vote of thanks to the reader of the paper. Every member of the institution would be gratified to find such great interest had been taken in the objects of the National Association. If there was any department of life in which there was a lack of protection and an extraordinary amount of prejudice and opposition, it was that of the municipal engineer, for it seemed that ratepayers and councillors joined in trying to escape the blame that fell upon him. The question of superannuation must be dear to them, because in a sense it was their life's blood. They had no wish to be called upon to apply for the 5s. a week pension which they would have to some day unless they were placed in, for them, such an extraordinary position as to be able to save £200 or £300 a year. It was pleasant to know that as regarded this subject the attitude of Parliament was becoming more favourable to the proposal, and that there was reason to feel that in the near future their hopes as to superannuation might be realised. It was to be recalled that the President of the Local Government Board had, in reply to a deputation, stated that there would have to be within the ranks of the municipal engineers a large number eliminated before he could see his way clear to support a measure of superannuation and security of tenure. He (Mr. Whitwell) could hardly agree with the writer quoted by Mr. Winter Gray, who stated that superannuation reduced a man's efficiency. A similar argument could be used against members of any Government in power, and he did not suppose they would agree to that. With reference to the dismissal of an officer under a superannuation scheme, it might be that an officer would be dismissed for some trivial thing, or through local prejudice. Of course, he might have an appeal to the Local Government Board, but he was afraid that body would be inclined to support the local authority, and the officer might lose all the benefits which he had been paying for for years. As to the various associations which had been approached with regard to the proposed Bill, some of these had suggested alterations, and it would, he thought, be interesting to know whether these were material, or whether they would affect the principle of the measure. As regarded their own institution, he confessed he should have liked to see it referred to with a capital I in the paper. He quite agreed with the spirit of the quotation from Josh Billings at the close of the paper, for he believed it would be a good thing if they always had more backbone behind them.

Mr. W. Louis Carr (Ruislip-Northwood) seconded the vote of thanks, and remarked that though he might not be prepared to say very much upon the paper, he was quite prepared to take it home and study it. He should like to see every member of the Institution of Municipal Engineers become a member of the N.A.L.G.O. The association was doing an enormous amount of work, while they as municipal engineers appeared to be rather dormant.

Mr. L. Hill (secretary of the N.A.L.G.O.) said he thought the paper had ably covered the whole ground,

and he would echo the hope that the members of this institution would become members of the National Association, because that would undoubtedly be of great assistance to the association. They could, however, do something more—*viz.*, to form in their own districts branch organisations of the National Association embracing the whole of the local government officers in a borough, or county, or an amalgamation of smaller districts. Instances could be quoted where the action of a local branch had proved more rapid and effective than possibly could be the case from headquarters. He had cases in his mind where steps were suggested by local councils that would have had a detrimental effect upon the officers' position. Instead of sending to headquarters they had considered the matter among themselves, and respectfully submitted their views to the councils, with the result in a number of cases that the councils had agreed to meet the officials and discuss things. In the end the objectionable proposals were either withdrawn or were amended in a manner satisfactory to the officers. That showed what could be done on the spot without any semblance of trades unionism, which frequently brought about a dogged resistance on the part of some people. Mr. Whitwell had asked a question as to the suggestions received from the local associations with which the N.A.L.G.O. had been in communication on the question of superannuation. Briefly, he might say that the suggestions received were to the advantage of the officers. They had had a great amount of practical experience on the subject. In the past local authorities had promoted superannuation Bills, and in one or two cases had got them through, with advantage to the local officers. But after twenty or thirty years' working they had found themselves in a pretty severe mess, and the councils were asking "What is it going to cost us now?" In some cases they said 7 and in others 15 per cent. The financial unsoundness of one or two schemes induced Mr. Carson Roberts to make the suggestion that there should be not only a quinquennial revaluation, but that there should be a sufficient length of time allowed for the scheme to mature. That meant that they got to know the extent of their liability for all time, and the scheme was placed on a sound basis. With the experience of other associations and local authorities, the N.A.L.G.O. had drafted their Bill on such lines and data as ensured a sound scheme, and they were able to place on the table of the House of Commons a scheme that would never become unsound. That had been brought about by working upon the experience of other people, and with advice from eminent men. When they approached the organisations which they considered were the representatives of employees, and which would be approached by Parliament—and he said candidly it was only right that the ratepayers should know the extent of their liabilities to the officials—they went, among others, to the Association of Municipal Corporations and placed their case before them. They were given to understand that a scheme which would not bring about any call upon the rates for a certain number of years—three quinquennial periods would stand a good chance of being supported. But the result was going to be felt in a number of years to come. It was only delaying the evil day, and it was going to be more disastrous by delaying it so long than by meeting it boldly. One of the suggestions of the association was that the contributions from the local authorities should commence at once, which was only fair. That would avoid a severe call upon ratepayers at a future time. Other suggestions had been made to safeguard the financial soundness of the scheme such as a clause providing for admission on medical certificate. They could not object to anything of that kind. These were points which had been made by the organisation, but there were two or three others which were equally advantageous to the officer, and did not materially affect the scheme as drafted. They could take it from him that those suggestions had been wholly met, and that they did not effect any serious alteration of the scheme, and that the alterations that had been made were in favour of the officials. He wanted particularly to explain these matters, which had been raised by speakers, and he asked them to support Mr. Gray's suggestion to endeavour to bring about greater enthusiasm in their own districts with regard to the work and objects of the association. Municipal officers had too long failed to realise their position, and, as most of them knew, there had been a decided change in the official attitude towards officers. This was not for the best, and it was coming to be felt that a strong organisation was the only safeguard for the employees. The National Union of Teachers, for example, was an organisation which had such a war-chest that public authorities thought twice before they did anything affecting the teachers. It would be well if they had an equally strong organisation on the part of municipal officers. It was not necessary there should be any unpleasantness; as Mr. Gray said, they wanted to be progressive, not aggressive.

Mr. A. R. Bleazard (Clitheroe) was sorry to say he had hitherto been one of those who had been very apathetic, but he had made up his mind to be converted, and intended to give all the assistance in his power in the future.

Mr. F. Ennals (Billericay) remarked that he did not suppose there were any municipal engineers who had any doubt as to the need of both superannuation and security of tenure, but he would like briefly to relate a case of what officials had to contend with. At the January meeting of a certain council a surveyor was complimented by an influential member on the condition of his roads, the speaker going so far as to name four or five adjoining councils whose roads were in an infinitely worse state. At the February meeting the advisability was discussed of purchasing a steam roller, but meanwhile the surveyor had cause to write a complaint to a friend of the gentleman who had complimented him, and when the subject of the roller came up the councillor, while admitting that it was time the council had a roller, questioned the ability of the surveyor to manage a roller, though he had been in the council's service between twenty and thirty years, and had frequently managed four hired rollers. It was further suggested that the surveyor was getting too old for the work, and subsequently the matter was discussed at a secret committee meeting. Nothing serious came of it, but all this was, of course, very unpleasant for the surveyor, and illustrated what some officers had to put up with. There might be something in the accusation of apathy on the part of surveyors, but there were many cases where, while the men had been enthusiastic on the subject of security of tenure and superannuation, they had gradually got on in years without finding that anything had been done, and their interest began to weaken. It was a case of "hope deferred making the heart sick." He presumed that a man who was nearing the age limit would not come under the Bill without being called upon for a larger amount. It was surprising, by the way, the amount of ignorance there was among members of public bodies with respect to the work of officials. A councillor, if told about the poor pay of an officer, would remark: "It's not the salary you get so much, but what you make besides." (Laughter.) He thought it was time this idea was tackled and refuted, because he believed that the average surveyor was far above that sort of thing, and could claim more than other men to work for the love of the work. This sort of thing was told of men some of whom received 22s. a week, and had, in addition, to collect the rates. Nobody could contend that men so treated could work but for love of it. Then, again, councillors were also under the impression that all local government officers had a pension at the end of their period of service. He had been told more than once: "You may not get much now, but when I am still working on my farm you will be enjoying your pension." It should be made clear to councillors that such was not the case. If they did, they would get more support than they received, and perhaps better salaries.

Mr. Chambers-Smith (Westminster) said that though he was not a member of the institution he was glad to have the opportunity of saying a few words on the paper. He did not know whether in discussing the subject raised security of tenure should not come first, because, after all, the question of superannuation was one for which they had to obtain the consent of Parliament, and he was afraid it would be some years before they did. Security of tenure, on the other hand, could be obtained from the Local Government Board. At the same time, how security was to be obtained was not quite definitely assured. There were two ways—by putting all local government officers under the wing of the county councils, and by putting them under the Local Government Board. It was utterly unfair that local government officers should be subject to the whims, prejudices and vindictiveness of the members of local authorities, especially as there was a tendency for local authorities to degenerate. On the whole, he thought it was desirable that security of tenure and superannuation should run together. When he was a municipal officer he did not think these things were material to him, because he should have left the service before he was entitled to superannuation; but he could see the foolishness of such a point of view

now, and he considered that the sooner every member of the Institution of Municipal Engineers joined the N.A.L.G.O., and became strong, like the teachers, the better it would be for the whole body of surveyors and engineers. Under the Poor-Law the officers were not subject to the absolute jurisdiction of the boards of guardians, and they were entitled to superannuation. Why should municipal engineers be in a different position? Municipal engineers were brought infinitely more into conflict with builders, house owners, and others who might show more personal animus than was ever shown to Poor-Law officers. Why should the latter be protected, and the former not be protected? He took it the reason was because municipal engineers had not banded themselves together—they had been lifeless and apathetic.

Mr. W. Dimmock (Fulham) observed that, whether they liked it or not, trades unions had come to stay—if anything they were almost in their infancy—and the age was past when a few could bring about improved conditions of service themselves. This could only be obtained by means of such organisations as the N.A.L.G.O. The Bill promoted by the association was entirely a non-party measure, and its success depended upon the universality of the demand for it made through local associations affiliated to the central body.

Mr. A. J. Meeson (Brentwood) inquired why it was proposed in the scheme not to give the same terms as were given to Poor-Law officers, who paid a less percentage according to the years served. Was it because they were financially sound? In reckoning superannuation there was power to add a certain number of years' service, not exceeding ten. Would the N.A.L.G.O. take up a case if approached, although the officer was not a member of the association? He would also like to ask if there was any chance of the Bill coming before Parliament this Session?

The Chairman remarked that they had listened to the paper with all the more pleasure because they knew it had come from a thoroughly good source. They sometimes heard a paper read in which the author might be dubious about his subject, but in this instance Mr. Winter Gray had his subject at his fingers' end, and it was obvious he had been burning the midnight oil in trying to get facts and figures to place before them.

Mr. A Winter Gray, in reply to the discussion, said that at some of the meetings of the council he had heard the question put, either orally or through the medium of correspondence, "What is the National Association doing for superannuation and security of tenure?" He had always been sorry for the man who asked the question, because for a payment of half-a-crown a year or less, by belonging to a local association, he could know what was going on as well as he himself (Mr. Winter Gray) knew. It appeared to him that instead of replying to questions as to what was being done, a more kindly way would be to get some of the facts together. This he had endeavoured to do to the best of his ability, although he was conscious that there were many shortcomings in the paper. However, if he could by any chance excite the interest of even a few members of the institution in the subject he should have been amply rewarded. Mr. Whitwell had asked a question as to the possible dismissal of an officer for some trivial thing, but he (Mr. Winter Gray) could not give that gentleman a definition of demeanour. The Bill, with regard to security of tenure, provided for an appeal to the Local Government Board. Whether that body would give full consideration to an appeal made to them he could not say, but he thought that the establishing of a Court of Appeal would at any rate be distinctly advantageous over the practice that obtained at the present moment. To talk as Mr. Ennals did about hope deferred appeared to him to be a very ingenious way of getting out of doing one's duty to the advancement of the cause. They would generally find that a man who did nothing for the association or his own interest suggested hope deferred. He (Mr. Winter Gray) would suggest he should do something and his hopes would rise rapidly. Then Mr. Meeson asked if the National Association would take up the case of a man who was a non-member. He (Mr. Winter Gray) should say certainly not, why should they? He did not suppose the Institution of Municipal Engineers would take up the defence of a man outside their membership. Another case referred to was that of the elderly man nearing the old-age limit. In such a case the man would not derive any benefit unless he had contributed for not less than five years. Mr. Chambers-Smith had put a question, and had immediately provided the answer. It was a lack of organisation that had led municipal officers to their present position—he might almost say insignificant position. Everybody wanted superannuation, security of tenure, and legal advice, but these things had to be paid for, and they would only be obtained by organisation. They could not expect an individual to fight a council, but they might look to a large organisation to do so. Reference had been made to the National Union of Teachers. He had the greatest possible respect for that body. They did what he should like every organisation to do—take their constitution and objects seriously; they did not play with them. If they looked at the report of that union they would see a diagram showing the fluctuations of membership as the subscriptions increased or decreased. It was common sense to say that all the advantages they expected could only be obtained by paying for them, and the sooner local government officers emulated the teachers the better it would be for them. But the thing could not be done with a small membership. It was membership he hammered at and always harped on, because numbers were sometimes a greater advantage than even a reserve fund. Public opinion could be influenced by a large organisation, but a few could do nothing. A question had been put as to the difference between the Poor-Law officer and the local government officer. That was a question of stability, of the provision of a scheme that would be financially sound. He wished to close his remarks by saying that if any gentleman in the room would apply to Mr. Hill for a copy of the Bill, or for information with respect to the formation of a local association, that gentleman would supply what was required at once, and he trusted they would leave that meeting with a desire to form a branch association, and so not only enhance their own status and increase their own possibilities, but also extend similar benefits to their brother officers.

The Chairman proposed a hearty vote of thanks to Mr. Hill for his attendance. Mr. Hill had come there to assist the members of the institution, and also to assist Mr. Winter Gray in giving any information that might perchance have been omitted from the paper.

Mr. Hill, in reply, stated that there was no chance of getting their measure through Parliament as easily as the Poor-Law scheme. It was an absolute fluke that this latter scheme went through when nobody was watching it. He wished that could be done now, but there was no chance of it. There was no deficiency with the Poor-Law scheme, because any deficiency was made up, but the scheme of the local government officers was on a different footing, for all the local authorities wanted to know the extent of their liabilities under it.

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**Municipal Gasworkers' Strike.**—At Stockport the gasworkers, numbering 500, struck work on Saturday, with the result that some 20,000 people in the town were thrown out of employment. The strikers were joined by the lamplighters, street sweepers, and other corporation employees, the work of the cleansing department being as a consequence suspended for some days. Finally a settlement of the dispute was reached, the men's demands being granted.

**Tennis Courts in Public Parks.**—One of the most difficult problems confronting park officials is the laying out and maintenance of tennis courts. In the Washington Park common at Chicago about forty courts are maintained on an area approximately three times the requisite size. Once each week the position of all courts is shifted, with the result that there is not sufficient play at any one point to ruin the grass. The courts are marked with whitewash each week, and 4×4 posts are used for the nets, being moved as the courts are moved. No attempt is made to take in the nets at night or when it rains. Grass courts are out of the question in the smaller parks. The ordinary clay court is unsightly and dusty, often causing injury to adjacent vegetation. In the south parks at Chicago experiments have been made with concrete, asphalt, asphaltic concrete and asphalt with an admixture of ground cork. The latter combination is said to be satisfactory, being dustless, resilient and easy to the feet of the players, while it is very fast and true. In the first court so built the error was made of draining to the ends. It is preferable to drain to the net. An actual gutter beneath the net is no impediment to the play, and the slight downward slope to the centre is favoured by the players, while the slope in the opposite direction meets with their strong disapprobation. *Engineering and Contracting.*

# Tar Binding or Water Binding?

By G. BELSON CHILVERS, assoc.m.inst.mun.e., Engineer and Surveyor to the Oundle Urban District Council.

Having received a few inquiries as to the treatment of roads with "Tarvia" binding and "tar" binding, and as to the cost over the ordinary water-bound system, I thought it would perhaps be useful to embody the particulars in a short paper for the information of other surveyors in various parts of the country. In doing this I take into consideration that at this period of the year the estimates are being prepared for road work to be carried out during the forthcoming season, and the question to consider is the advisability of adopting more up-to-date methods in the repairing and remetalling of road surfaces, and whether surveyors are to advise their councils to use a tar binder or still adhere to the old water-bound system. There are various materials on the market from which to choose, such as ordinary gasworks tar, distilled tar, Tarvia, and other patent tar preparations. In these short notes I shall only treat upon two—that is, ordinary gasworks tar with an addition of pitch, and Tarvia. I append the approximate cost for the treatment of roads with these two materials, and also by the water-bound system as carried out by me during the past season. Of course, the cost of the various materials and work will vary in different districts according to distance from quarries, station or wharf to the road to be remetalled, and the cost of manual labour, &c. The amount paid by me for men averages about 3s. 2d. per day of nine hours. Another point to be taken into consideration in estimating the cost is the thickness of metal applied, whether 1 ton of metal is to cover 10 or 20 sq. yds., and also the size of metal used, whether 1¾ in. or upwards to 2½ in. gauge.

The method adopted by me in the treatment of the roads is as follows: The dry metal is evenly spread over the surface of the road to the required contour, and then lightly rolled with a 12-ton roller to press the stones into their position; the Tarvia or other binder is then applied evenly over the surface by means of a 2-gallon water-can or spreader, so as to cover every stone. After this has been done, ½-in. chippings are spread over the surface to fill up the interstices (allowing about 15 tons to 100 tons of metal); 10 tons are applied after application of binder. The whole is then thoroughly well rolled and brought to a good surface, after which the remaining 5 tons of chippings are spread to fill up any small holes which may still be showing, and left for the traffic to grind in. It is needless to remark that fine, warm weather is essential to carry out the work successfully and at a minimum cost. I find it necessary to have three 40-gallon tar boilers to keep properly going, otherwise the roller is standing idle, and the men have no binder to go on with, or are waiting for it to boil. Tarvia needs heating to a temperature of about 180 deg. Fahr., and it is essential that it should reach about this temperature, otherwise it will not cover the area estimated (which should be at least 1 sq. yd. to 1 gallon of material), and the work will take longer. When using Tarvia, which is very viscid, and difficult to get out of the barrel through the bunghole, especially if the weather is cold, it will be found necessary to take out the head of the barrel. The way to do this, causing least damage to the cask, is to knock off the chine and second hoops, tap the staves outwards with a hammer, remove the head, replace the second hoop and tighten up by driving it on, then empty the contents. The barrel will, of course, have been placed on the platform (mentioned later) before removing the head. The tools required are a cooper's drift and two cooper's gimlets. A platform should be erected at a convenient point by placing two or more barrels on end, and laying strong planks on them, and the barrels may be unloaded on to the platform or on to the ground, and rolled up as required on two strong planks.

### TEMPORARY PLATFORM.

Two pieces of iron should be placed on top of each tar boiler and the barrels up-ended on them. The platforms should be placed in a position so that in removing once each day the material will only have to be carried a convenient distance.

The section of roadway treated with Tarvia has been a complete success so far this winter, it being practically free from mud and dirt, except a little brought on by wheels of carts from adjoining fields. The cost, as shown, works out at about 1s. 6¾d. per yard; but I consider it can be done for 1s. 4d., given favourable weather. In carrying out my work I was handicapped by wet weather, and by only having two tar-boilers for half the time the work was in progress; but I hope next season to show that Tarvia binding can be carried out at the price mentioned.

In considering the cost, the question of scavenging and cleansing requires to be taken into account, as the amount spent this winter on the section treated has been practically nil, which would not have been the case with a water-bound road.

I experimented on a small area of about 366 sq. yds. with ordinary gasworks tar with an addition of pitch. This has been fairly satisfactory, and would, I believe, have been a complete success, but I found the men were not using enough pitch, and were not allowing the mixture to boil. It is very evident enough pitch must be used, and the mixture brought to boiling point. As an experiment I consider it satisfactory, and believe it possible to produce good results if the above precautions are taken. The costs of the various systems will be noted from the appended particulars. I hope in making these remarks something may be done to assist in bringing about a better form of road surface.

### Particulars of Tarvia Binding.

| | £ | s. | d. |
|---|---|---|---|
| Quantity of metal used, 402 tons 6 cwt. | | | |
| 322 tons 11 cwt. of 2½-in. granite ... | 148 | 15 | 7 |
| 79 tons 17 cwt. of 3-in. rejections (making up sides) ... ... ... | 27 | 5 | 8 |
| 53 tons 8 cwt. ½-in. granite chips ... | 20 | 13 | 10 |
| Steam roller hire, 15 days ... .. | 14 | 13 | 0 |
| Manual labour, 8 men 15 days ... | 19 | 8 | 8 |
| Carting all materials (approx.) ... | 35 | 18 | 8 |
| 3,813 gallons Tarvia "B" at 4½d. ... | 67 | 10 | 6 |
| Use of 95 barrels at 6d. ... ... | 2 | 7 | 6 |
| Return carriage on barrels ... ... | 3 | 6 | 11 |
| Fuel for tar boiler ... ... ... | 1 | 12 | 6 |
| Fuel for roller ... ... ... ... | 4 | 1 | 3 |
| Allow for tools and use of boilers ... | 1 | 5 | 0 |
| | £346 | 19 | 1 |

Length treated, 825 lin. yds.
Area treated, 4,400 sq. yds.
Square yards per ton of metal, 10·90.
Approximate cost per square yard, 1s. 6½d.

### Approximate Cost of Tar Binding.

| | £ | s. | d. |
|---|---|---|---|
| 23 tons (approx.) 2½-in. broken granite | 11 | 8 | 1 |
| 3 tons ½-in. chippings ... | 1 | 3 | 3 |
| 1¼ days steam roller ... ... ... | 1 | 2 | 6 |
| Manual labour ... ... ... ... | 1 | 10 | 0 |
| 280 gallons tar ... ... ... ... | 2 | 6 | 8 |
| 3½ cwts. pitch ... ... ... ... | | 14 | 0 |
| Fuel ... ... ... ... ... | | 10 | 0 |
| Tools, &c. ... ... ... ... | | 2 | 0 |
| Team labour ... ... ... ... | 2 | 10 | 2 |
| | £21 | 6 | 8 |

Area treated, 366 yds. (approx.).
Cost per yard, 1s. 2d. nearly.
Square yards per ton of metal, 16 yds.

The above figures are the maximum, as actual figures and particulars were not noted at the time, and I believe the actual cost to be less than this.

### Water-Bound Roads (Actual Figures).

| | £ | s. | d. |
|---|---|---|---|
| 80 tons 7 cwt. 2½-in. broken granite ... | 39 | 16 | 10 |
| 21 tons 12 cwt. 3-in. rejections ... | 9 | 12 | 7 |
| 6 tons ½-in. chippings ... ... ... | 2 | 6 | 6 |
| Binding ... ... ... ... ... | | 16 | 0 |
| Manual labour, 4 days ... ... ... | 4 | 6 | 11 |
| Team labour and horse for water cart 4 days steam roller ... ... ... | 8 | 4 | 7½ |
| | 3 | 12 | 0 |
| | £68 | 15 | 5½ |

Area treated, 1,372 yds.
Cost per sq. yard, 1s.
Square yards per ton of metal, 13·5.

## THE ROAD BOARD PERSONNEL.

### 2.—MR. W. REES JEFFREYS.

Although before the days of motors keenly interested as a cyclist in the question of roads, Mr. Rees Jeffreys' connection with highway matters may be said to date from the year 1903, when, relinquishing a post under the Board of Trade which he had held for a period of twelve years, he took up the duties of administrative secretary to the Royal Automobile Club and secretary to the Motor Union. He organised and prepared the motorists' case for the Royal Commission on Motor Cars on behalf of those bodies, on the separation of which, however, he ceased to be an official of the club. Mr. Rees Jeffreys up to the end of 1909 represented motorists at the various inquiries held by the Local Government Board in England and Wales in connection with applications for reduced speed limits, and he was responsible for the initiation of the model sign-posting of the London-Dover and Folkestone road. The Motor Union Insurance Company, Limited, was founded by him. On the reconstruction of the Institution of Automobile Engineers and its removal to London in 1906 he accepted the post of secretary to that body. His

*From photo by Stearn.* *Cox, Bedford St., W.*

MR. W. REES JEFFREYS.
Secretary to the Road Board.

subsequent resignation of this office was received with considerable regret by the council, who conveyed to him in a special resolution their sense of the great services which he had rendered in connection with the formation of the institution and the high organising ability which had characterised his work.

Mr. Rees Jeffreys founded and acted as secretary to the Commercial Motor Users' Association, and organised the annual parades, and he was closely identified with the development of international touring facilities for motorists. He was appointed a representative of the Cyclists' Touring Club upon the council of the Roads Improvement Association, and in 1901 became hon. secretary to that body. He prepared the case for reform and gave evidence before the Departmental Committee on Highways appointed by the Local Government Board as the result of his efforts and secured many recommendations in favour of the desired changes. In the report of the Departmental Committee it is stated: "We commenced our inquiry by examining Mr. Rees Jeffreys . . . a gentleman whose intimate knowledge connected with road maintenance, both at home and abroad, has been of great assistance to us."

Mr. Rees Jeffreys organised the experiments at Farnham in 1902, when petroleum was first tested as a dust layer, the successful tar-spreading trials and experiments in Middlesex and Berkshire in 1907, and other tests of road materials, and was associated with the editor of this journal in the arrangements for the Conference of Road Makers and Road Users held in June, 1907. He gave evidence before the Royal Commission on London Traffic and placed before it a scheme for the construction of new arterial thoroughfares through the suburbs of Greater London. He was hon. secretary for Great Britain at the Paris International Road Congress in 1908, and a technical secretary at the London Road Congress in May and June of the following year.

Mr. Rees Jeffreys is the author of numerous papers and pamphlets on highway administration and its effect upon the motor movement, on housing, as well as on the cost and efficiency of road maintenance. His paper "The Motor Problem: a Road Problem," read before the Royal Automobile Club in 1903, outlined a scheme similar in many respects to that embodied in the Development and Road Improvement Funds Act, 1909. At the Paris Congress he read a paper entitled "Systems of Highway Administration Compared." On his appointment in July, 1910, as secretary of the Road Board, he resigned the secretaryships of the Motor Union, the Commercial Motor Users' Association, the Institution of Automobile Engineers, and the Roads Improvement Association.

Mr. Rees Jeffreys is in his forty-first year, having been born in London in 1871.

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With reference to the particulars of Sir George Gibb's career, published in our last issue, it has been pointed out to us that Sir George is not now either a director of the North-Eastern Railway Company or chairman of the Metropolitan District Railways Company, having resigned those positions on taking up his duties as chairman of the Road Board. Sir George was born in 1850.

## FORTHCOMING "SURVEYOR" ARTICLES.

The following matters will be dealt with in early issues of THE SURVEYOR:—

"Petrol Air Gas." By F. T. Baines Hewitt, F.S.I.

"Main Levelling of Copenhagen." By C. F. V. Boock, surveyor-in-charge and municipal engineer-in-charge of Division B, Copenhagen.

"Breeding Grounds of Mosquitos." By Dr. Elwin H. T. Nash, medical officer of health, Wimbledon.

"Mirrors at Street Corners."

"Chemistry of Modern Highway Engineering." By Prévost Hubbard.

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**Rivers Board and Bradford.**—At a meeting of the Bradford Sewage Committee recently a notice was read from the West Riding Rivers Board announcing their decision to prosecute the corporation unless the extensions at Esholt are pushed forward before the end of March. It was decided to expedite matters as far as possible.

**Corporation and Contractors.**—In the Court of Appeal judgment has been given on a summons taken out by the corporation of Bristol, asking that matters in difference between them and Sir John Aird & Co., the well-known firm of contractors, concerning a contract to construct large docks at Avonmouth, costing near £2,000,000, should be referred to the arbitration of the docks engineer, Mr. W. W. Squire, M.INST.C.E., The amount in dispute is £171,215. The contractors resisted the application. The Court agreed with the master and the judge below that it was not desirable that the engineer should act as arbitrator, and dismissed the corporation's appeal.

**Birmingham, Tame and Rea Drainage Board.**—The report of the Works Committee presented at the meeting held on Wednesday included a report from the engineer, Mr. J. D. Watson, showing the necessity for enlarging the area of the bacteria beds at Minworth Greaves in order to cope with the increased volume of sewage arriving at the works. The committee recommended the board to authorise an application to the Local Government Board for sanction to a loan of £56,000 for the construction of 7 acres of bacteria beds. The committee recommended the board to accept the tender of the Clay Cross Company, Chesterfield, in the sum of £2,351, for the supply and delivery of cast-iron pipes for the sludge disposal scheme at Saltley and Minworth. The report was adopted.

# Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

## THE MONTHLY PREMIUM.

The premium for February is awarded to

Mr. S. S. Harpur,
Engineer and Surveyor's Office,
Commercial-street,
Maesteg,
Glamorganshire,

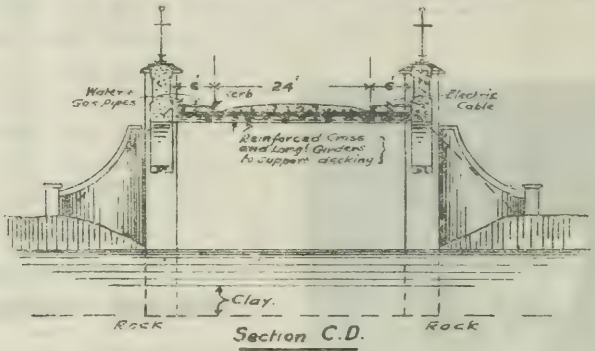
whose contribution has, in the opinion of the adjudicators, been the best received during the month.

## QUESTIONS.

This week answers are invited to the following questions:—

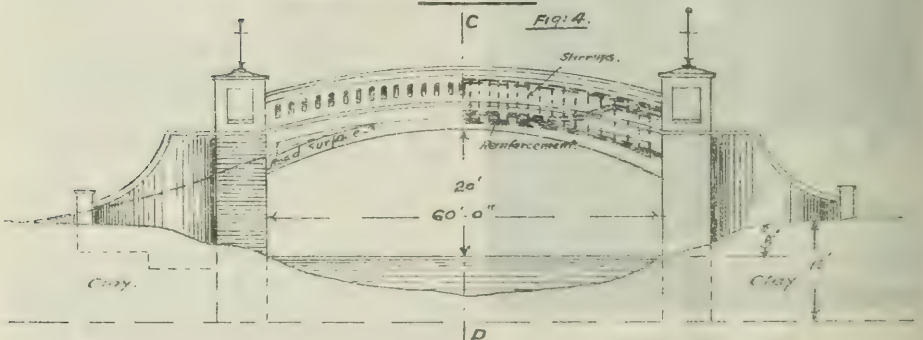
**227. Refuse Disposal.**—Describe, with illustrations, the most efficient and economical form of refuse destructor for a village of 500 inhabitants. (M.Inst.Mun. and C.E., *Seccondee.*)

**229. Swimming Bath.**—Give sketches showing plan and cross-section of a covered swimming bath, say 70 ft. by 30 ft., with a detail of the roof. What method would you adopt for heating the bath? (M. and C.E.)




Section C.D.

Fig: 4.




Elevation.

Fig: 3.

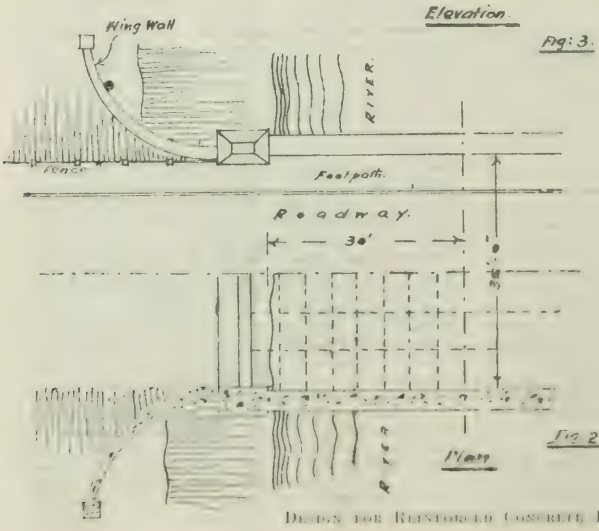



Fig. 2

Plan

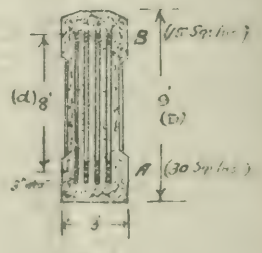



Fig. 1.

(Section on C.D.)

Design for Reinforced Concrete Bridge.

# The Surveyor

And Municipal and County Engineer.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**230. Refuse Disposal.**—Describe, with sketches, a device for the mechanical sorting of house refuse.

**231. Discharge of Sewage.**—What is a suitable formula for calculating the discharge of sewage having a variable velocity over a 90° V-notch? (H. E. R., *Barnard Castle.*)

**232. Books for Examination.** What are the *best* and *cheapest* books to get for studying for the A.M.I.C.E. examination in the following subjects: Geography, history, literature, mechanics, strength and elasticity of materials, theory of structures, hydraulics, geology and mineralogy? (C. Institute.)

### REPLIES TO QUESTIONS.

**223. Reinforced Concrete Bridge.**—Design a reinforced concrete bridge to carry a 36-ft. main road over a river (at right angles), single span 60 ft. between abutments, 36 ft. wide, 20 ft. from mean surface of water to the crown of arch. Banks 5 ft. above mean water level; foundations 15 ft. clay, then hard red sandstone. Allow for usual main road traffic, and show calculations. (A. P., *Liverpool.*)

Reinforcement at A (see Fig. 1.)

$$\frac{WL}{8} \quad S A d \qquad 8 \qquad 60{,}000 \text{ lbs. or } 27 \text{ tons approx.}$$

$$15$$

$$3 \quad 9 \qquad 30$$

$$WL. \quad \frac{60 \times 36 \times 3}{8 \times 2 \cdot 20} \quad \frac{60 \times 12}{2}$$

$$S$$

$$81 \cdot 180$$

Multiply by 5 for safety

$$\cdot SAd \quad 81 \cdot 180 \cdot 5$$

$$3 \quad 15$$

$$A \quad \frac{81 \cdot 180 \cdot 5}{27 \cdot 8 \cdot 12}$$

$$= \frac{225}{8} = 28. \quad \text{(say 30 sq. inches of metal at "A.")}$$

Reinforcement at B $= \frac{A}{2} = 15''$

The steel used to be capable of bearing not less than 60,000 lb. per square inch in tension, with not less than 20 per cent. elongation in a length of 8 in.

The concrete to be composed of 1 part Portland cement, 2 parts washed sand, 4 parts stone (1-in. to 1¼-in. gauge).

The following tests should be applied to the completed bridge, and deflection should not exceed 1/1,500th to 1/2,000th the span:—

*Dead Weight.*—Load the bridge over total length, then on each half, and finally in the middle. For this test moist sand may be used at the rate of 165 lb. per square foot on roadway, and 123 lb. per square foot on side walks.

*Moving Load.*—One 16-ton steam roller, two two-axled carts (16 tons), six single-axled carts (8 tons), making a total of 40 tons, plus the weight of teams passing over simultaneously.

The chief advantages to be claimed in this construction are protection against rot, fire and rust; the strength of ferro-concrete, too, increases with age. In case of fracture the concrete fails first, leaving the steelwork entire. Figs. 2, 3 and 4 show half plan, elevation and section of the completed bridge. (A. G. A., *Colchester.*)

## CORRESPONDENCE.

"*All truth is precious, if not all divine.*"—COWPER.

### THE QUEST OF THE IDEAL ROAD.

*To the Editor of* THE SURVEYOR.

SIR,—I should like to protest, in the interest of your readers, against the habit of writers on the road question giving road maintenance costs, ideal or otherwise, without giving at same time the traffic on the road and the cost of the road material locally available.

As an instance, I have recently read some remarks in one of your contemporaries under the above heading, in which the writer mentions that what is required is the discovery of a road that can be laid for 1s. a superficial yard. He then goes on to remark that nothing has been heard of Colonel Crompton's wonderful 2s. road.

Of course, all your readers know that under certain conditions, where road metal is extremely cheap and an ample supply of binder is available at a low price, and the traffic on the road is of a light character, a road can now be satisfactorily resurfaced in a modern manner to give good results, both as to dustlessness and cost of upkeep, at a cost of 1s. per super. yard, and that Colonel Crompton's 2s. road has already been beaten in a large number of cases by the unaided efforts of the surveyors themselves, but, of course, under favourable conditions of cost of material and traffic.

What is now required is a classification of roads pronouncement from the Road Board or one of the technical institutions, or possibly from yourself, on the subject of traffic. For instance, a writer ought to be able to say that in his county, where stone can be procured at the roadside at a cost of, say, —s. a ton, and suitable binder, such as pitch, can also be procured at £— a ton, a surface to carry successfully an average traffic of, say, 100 tons a day, can be produced at —d. per yard super., and that the life of this surface is likely to be — years.—Yours, &c.,

CONTRIBUTOR.

February 22, 1912.

[While in sympathy with the underlying principle in our correspondent's letter, we feel that it will for a long time be necessary to give costs without traffic statistics, which vary much with seasons, and even from year to year. As regards the last paragraph, we fully agree that the pertinent particulars should always be given if possible. We hope to deal with the points raised in an early issue. But there is no *royal* road to ideal road. ED. SURVEYOR.]

### ABSTRACTION OF MOISTURE FROM SLUDGE.

*To the Editor of* THE SURVEYOR.

SIR,—Might I be allowed to add as a postscript to my letter in your issue of the 16th ult., *re* Schaefer-terMeer sludge machine, that as your correspondent "N." required particulars only of the machine, I purposely refrained from criticising its efficacy, or from speculating on its possibilities in connection with English sludge?—Yours, &c.,

STANLEY WILKINSON, Assoc.M.Inst.C.E.,
Resident Engineer.

Surbiton Sewage Works.
February 27, 1912.

## LLANELLY WATER SUPPLY.

### NEW FILTER-BEDS AND SERVICE RESERVOIR.

The inauguration took place last week of new filter-beds and a service reservoir in connection with the water supply of Llanelly.

The works are situated at Felinfoel (about 1½ miles from Llanelly and about 1 mile from the Upper Lliedi reservoir) at an elevation of 237·5 ft. above ordnance datum. They consist of five filter-beds, each with a filtration area of 1,120 sq. yds. With four beds working at a time, they are capable of filtering about 1,900,000 gallons of water in twenty-four hours. The capacity of the service reservoir is 850,000 gallons.

The reservoir and filter-beds are constructed with concrete walls, faced blue brick, and lined in Callendrite bitumen sheeting. The depth of sand on the beds is 2 ft. 6 in., resting upon three layers of graded stone, each layer being 4 in. thick. The flow from each bed is separately recorded by Venturi meters, and a 24-in. Venturi meter is fixed on the main leading from the service reservoir for the purpose of registering the aggregate flow of filtered water passing to the town.

*From photo by* LLANELLY'S NEW WATERWORKS. *[Vaughan Evans.*

These works form a part of a scheme sanctioned by Parliament in 1909, by which the water used for domestic purposes is to be supplied from the Upper Lliedi reservoir and filtered.

Duplicate mains have been laid so as to deal separately with the large quantity of water required for manufacturing purposes, which will be supplied unfiltered from the Cwmlliedi reservoir.

The separation of the filtered and unfiltered water necessitated the laying of 8 miles of duplicate mains, varying in diameter from 15 in. to 3 in.

Filtered water will be delivered in the district through trunk mains 18 in. and 15 in. in diameter, while the trade water will pass through the existing 24-in. main. The quantity of water required for manufacturing purposes in this district is exceptionally high, and is equal to a daily consumption of about 50 gallons per head of population. This water, which is an urgent and absolute necessity for Llanelly's flourishing tinplate industry, is supplied at a very low tariff, varying in price from a maximum of 6d. to 1½d. per 1,000 gallons.

The aggregate capacity of the town's storage reservoirs amounts to 430,000,000 gallons.

The contract for the construction of the reservoir and filter-beds has been carried out by Messrs. W. and J. R. Watson, Limited, of Edinburgh, at a cost of £15,893. Mr. George Watkeys (the engineer and surveyor to the urban district council) and Mr. J. H. Montgomery have acted as engineers and have also superintended the laying of the main. The total cost, including the acquisition of land, is £40,000.

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

### FORTHCOMING INQUIRIES.

**Accrington T.C.** (February 27th. Mr. T. C. Ekin).—£33,000 for the adoption of a system of generating power gas, as against steam, for the production of electricity.—It was stated that Accrington would be the first corporation to adopt the system, although a number of large industrial firms have done so with unquestioned success. According to careful estimates of the economies resulting from the use of gas as against steam, there was for a 60 per cent load factor on 2,000 b.h.p. a saving in favour of gas of £1,100 a year, allowing 12½ per cent for interest, sinking fund, and repairs, and taking coal at 10s. a ton, and from the recovery of by-products it is estimated that a further £1,250 a year would be forthcoming. The town clerk said that the electricity works were at present being run to their fullest capacity, and with demand for additional supply of current to Haslingden, Clayton-le-Moors, and Church considerably more plant was needed.

**Birkenhead T.C.** (February 21st. Major C. E. Norton).—£1,266 for works in connection with Bidston-avenue.—Bidston-avenue is the boulevard to be constructed from Park-road North to Boundary-road, debouching opposite the gates of Flaybrick-hill cemetery. The boulevard will be a total of 60 ft. in width, and the wide footpaths will be planted with trees. A portion of the road has already been constructed, and the remainder will be completed as houses are built on the bordering estate.

**Dewsbury T.C.** (February 15th. Mr. R. G. Hetherington and Mr. R. C. Maxwell).—This was an inquiry with reference to the application of the council for a Provisional Order authorising them to take trade effluents into the public sewers and charge the traders with the cost of the treatment. The application also embraced a request for permission to borrow £50,000 for extension of the gasworks.

**Durham R.D.C.** (February 13th. Mr. R. G. Hetherington).—£3,600 for the purpose of sewerage and sewage disposal for the village of East Hetton, in the township of Coxhoe.—The clerk, Mr. J. Chambers, stated that the Durham County Council made application to the Local Government Board to issue an order against the rural district council, and the board ultimately made an order in October, 1911, for the council to perform their duties in the matter. On November 30th the council passed a resolution for the loan of £3,600, with that inquiry as the result. Mr. George Gregson, surveyor to the council, explained the plans and general scheme.

**Jarrow T.C.** (February 16th. Mr. M. K. North).—£830 for the provision of a public convenience.—The town clerk (Mr. T. Batey) explained that the council proposed to acquire certain properties in order to convert them into a convenience. The estimates of the borough surveyor, Mr. J. Scott Weir, for adapting the houses was £365, while the cost of the houses was £465, which made a total of £830. The council would like as long a period as possible for the repayment of the loan, and suggested sixty years for the cost of the site, and thirty years for the cost of the alteration.

**Mansfield T.C.** (February 13th. Mr. H. R. Hooper).—This was an inquiry into a petition to the Local Government Board for a Provisional Order to purchase and take lands, otherwise than by agreement, for the purpose of the widening and improvement of ten streets.—It was represented that the improvements—which were estimated to cost ultimately £25,000—were absolutely necessary owing to the rapid growth of the trade of the town.

**Newcastle-on-Tyne T.C.** (February 5th. Mr. R. A. Farrar).—£600 for the erection of a mortuary and post-mortem room at the old Toll-House, Swing Bridge.—The town clerk, Mr. A. M. Oliver, furnished particulars of the scheme under which it was proposed to provide a mortuary on the quay level, a coroner's and witnesses' waiting rooms on the bridge level, and an inquest room on the first floor. The post-mortem room it was proposed to build on vacant land adjoining the old Toll-House. The inspector suggested one or two amendments to the scheme, which included the provision of a caretaker's house, the erection of a viewing screen, the opening of an entrance from the mortuary to the post-mortem room, and the elimination of an interior staircase.

**York T.C.** (February 23rd. Major J. Stewart).—£7,575 for street works.—The town clerk stated that it was proposed that the cobbled streets of the city, eighty-six in number, and chiefly side streets, should be paved with tar-macadam. There was little traffic on them. The corporation had already done some 21,290 sq. yds. out of revenue. There was no opposition, and the inspector subsequently visited some of the streets affected.

### APPLICATIONS FOR LOANS.

**Carshalton U.D.C.**—£833 for road improvement purposes.

**East Barnet U.D.C.**—£3,380 for street construction works.

**Hexham R.D.C.**—£3,000 for the Broomley sewerage scheme.

**Linton R.D.C.**—£900 for a housing scheme.

**Luton T.C.**—£1,200 for additions to two schools.

**Merthyr T.C.**—£3,800 for the purchase of the recreation ground.

**Selby U.D.C.**—£2,000 for the purpose of making advances under the Small Dwellings Acquisition Act, 1899.

**Southend-on-Sea T.C.**—£4,675 for making up certain roads.

**Thornaby T.C.**—£4,300 for the purchase of property and land for depot purposes.

**Walthamstow U.D.C.**—£22,624 for additional electricity plant.

**Wednesbury T.C.**—£5,000 for alterations to the municipal offices and baths.

### LOANS SANCTIONED.

**Branston (Lincs) R.D.C.**—£1,200 for workmen's dwellings.

**Castleford U.D.C.**—£900 for filtration plant at the baths.

**Mansfield T.C.**—£900 for the purchase of a site for a school.

**Monmouthshire C.C.**—£1,200 for a new school for Blackwood Libanus.

**Rawtenstall T.C.**—£450 for the purposes of a depot and refuse tip.

**Scarborough T.C.**—£1,865 for the provision of kiosk, convenience, &c.

**Swansea T.C.**—£1,130 for alterations to secondary school and £125 for a playshed at a public school.

**Wandsworth B.C.**—£500 for a convenience on Clapham Common.

### FORTHCOMING INQUIRIES.

| MARCH. | £ |
|---|---|
| 4.—**East Ham.** For street, sewerage, and baths purposes (Mr. F. H. Tulloch) ... ... | 4,283 |
| 4.—**Southgate.** For street and sewerage works (Mr. R. H. Bicknell) ... ... | 9,789 |
| 4.—**Wimbledon.** For the provision of a recreation ground (Mr. W. H. Colin) ... ... | 4,000 |
| 5.—**Battle.** For water supply purposes (Mr. W. O. E. Meade-King) ... ... ... | 1,250 |
| 5.—**Bedford.** For laying down tar-macadam (Mr. R. H. Bicknell) ... ... ... | 4,071 |
| 5.—**Kingston-upon-Hull.** For the erection of stables (Major J. Stewart) ... ... ... | 16,500 |
| 5.—**Otley.** For sewage disposal purposes( Mr. F. O. Stanford) ... ... ... ... | — |
| 5.—**Oundle.** For bridge widening purposes (Mr. A. A. G. Malet) ... ... ... ... | 7,475 |
| 5.—**Penybont.** For sewage disposal purposes (Mr. A. W. Brightmore) ... ... ... | 8,070 |
| 5.—**Romford.** For street widening purposes (Mr. Courtenay Clifton) ... ... ... | 1,100 |
| 5.—**St. Annes-on-the-Sea.** For sewerage and road improvement purposes (Mr. P. M. Crosthwaite) ... ... ... ... ... | 16,860 |
| 6.—**Birkenhead.** For the purposes of the gas undertaking (Mr. P. M. Crosthwaite) ... | 32,253 |
| 6.—**Birmingham.** For street and sewer purposes (Mr. R. H. Bicknell) ... ... | 3,993 |
| 6.—**Blofield.** For sewage disposal works (Mr. A. A. G. Malet) ... ... ... | 10,750 |
| 6.—**Bromley.** For road improvement purposes (Mr. Courtenay Clifton) ... ... ... | 1,086 |
| 6.—**Burnley.** For street widening purposes (Mr. Edgar Dudley) ... ... ... ... | 3,800 |
| 6.—**Dover.** For works of water supply (Mr. W. O. E. Meade-King) ... ... | 520 |
| 6.—**Hemsworth.** For laying a water main (Mr. F. O. Stanford) ... ... ... | 977 |
| 6.—**Nantwich.** For sewage disposal purposes (Major C. E. Norton)... ... ... ... | 1,075 |
| 6.—**Nuneaton.** For electricity purposes (Mr. R. H. Bicknell) ... ... ... | 7,500 |
| 6.—**Weymouth.** For the provision of a disinfecting apparatus, &c. (Mr. J. Spencer Low) ... ... ... ... ... | 450 |
| 7.—**Congleton.** For sewage disposal works (Major C. E. Norton) ... ... ... | 2,100 |
| 7.—**Felixstowe.** For sewage and road improvement purposes (Mr. A. A. G. Malet) ... | 1,970 |
| 7.—**Southend-on-Sea.** For the erection of a lodge (Mr. M. K. North) ... | 1,000 |
| 8.—**Cainsborough.** For the enlargement of the public baths (Major J. Stewart) ... | 1,200 |
| 8.—**Ilkeston.** For the purposes of sewerage (Mr. F. O. Stanford) ... ... ... ... | 30,000 |
| 8.—**Newcastle-under-Lyme.** For an improvement scheme (Mr. Edgar Dudley) | 2,200 |

"**Pudlo.**" Copies of a booklet issued by Messrs. Kerner-Greenwood & Co., of King's Lynn, should be secured by all engineers and surveyors having any anxiety as to the waterproofness of brick, stone or concrete work which they may have to carry out. The use of the substance known as "Pudlo" is claimed by the firm mentioned to be a certain and safe method by which cement can be rendered permanently waterproof without impairing the nature of the cement, and its employment is recommended not only in such works as bridges, reservoirs and swimming baths—where absolute watertightness is *a sine qua non*—but in walls and floors of buildings as a means of preventing dampness. It is a fine white powder, and in use is mixed with neat cement in varying proportions, according to the purpose for which it is required. The combination with the structural material is said to be so strong that it is impossible for any moisture to creep in, a point of equal importance being that the material also accomplishes the useful operation of filling voids in cement and cement mortar, and so tending to increase the strength of the latter. "Pudlo" would thus seem to provide a most satisfactory means of making an absolutely waterproof structure.

# Municipal Work in Progress and Projected.

*The Editor invites the co-operation of* Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Bridgend, Haddington, Hendon £6,000, Shepton Mallet; roads and materials—Felixstowe, Kerry £12,000, Norwich £2,500; sewerage and sewage disposal—Coventry £12,000, Easington, Felixstowe, Hexham £3,000, Hornsey £2,600, Southport; water gas and electricity — Thakenham, Walthamstow £22,624; miscellaneous — Greenock. — Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

## ADMINISTRATION.

**Edinburgh T.C.**—The Streets and Buildings Committee have agreed to recommend an increase in the wages of the labourers in the employment of the roads department, raising the minimum from 24s. to 25s. per week.

## BUILDINGS.

**Birmingham T.C.**—Arrangements have been made for some of the municipal departments to take possession of their new quarters in the council house extension now rapidly approaching completion. The site is practically square. On the east (or Margaret-street) front is the education department, consisting of four floors of offices; on the south (or Edmund-street) front and in the interior of the site is the gas department; and on the west (or Congreve-street) front, including three floors, are the offices of the health and tramways departments, both of which have already outgrown their new quarters since the extension of the city. On the first floor over the gas department are the new picture galleries, and on the second floor of Congreve-street the natural history museums, both approached from the present round room over the new bridge across Edmund-street. The completion of the extension on the north side is now in hand, and will give further accommodation for the tramways, health and gas departments, including, in addition, further picture galleries and museums for casts on the upper floors, with a special entrance devoted, as it were, to the Feeney galleries. Each of these departments is self-contained, each has its own main entrance and staircase, and at the same time there is easy access between the departments. The architects are Messrs. H. Y. Ashley & Winton Newman, of London.

**Bridgend (Glamorgan) U.D.C.**—The surveyor, Mr. W. F. Tudor, has been instructed to prepare plans for new council offices.

**Gravesend T.C.**—The tender of Mr. A. E. Tong, at £237, has been accepted for the erection of a concert stand and kiosk on the Promenade.

**Haddington C.C.**—A sub-committee have been appointed to meet a committee of the Berwickshire County Council to consider a joint scheme for the erection of bridges to span the Whitadder at Harehead and the Bothwell at Stagines. A second scheme in which the Haddingtonshire Committee alone participate provides for a bridge at Millknowe over the Whitadder. The bridge at Harehead will necessitate a span of 72 ft. clear, and in the other two cases of 33 ft. each. The bridges will do away with four fords, and if the scheme is carried out the road from the Middle District of Berwickshire to Edinburgh will be much shortened. Reinforced concrete is favoured by the Haddingtonshire Committee.

**Hendon U.D.C.** It has been decided to erect a fire station on a site adjoining the municipal offices, at a cost of about £6,000, from a design by Mr. H. A. Welch, A.R.I.B.A., of Golders Green.

**Scarborough T.C.**—Plans for the erection of conveniences and a kiosk at the north-east corner of the Spa undercliff, at a cost of £760, for the erection of the shelter at the foot of the Spa undercliff at a cost of £700, and for the widening of the footpath connecting the Spa with the Spa undercliff, at a cost of £215, have been approved.

**Shepton Mallet U.D.C.**—A site has been selected for the proposed swimming bath, and tenders have been invited for the work.

**Torquay T.C.**—The borough surveyor, Mr. H. A. Garrett, has been instructed to construct a concrete platform on Torre Abbey sands, beneath the sea-wall, for bathing purposes. The work is estimated to cost £550.

**Wandsworth B.C.**—A site adjoining the Larch-road depot is to be purchased for £800 for the purpose of a swimming bath.

## HOUSING AND TOWN PLANNING.

**Camborne U.D.C.**—Steps are to be taken for carrying out the Housing and Town Planning Act.

**Droitwich T.C.**—Twelve cottages are to be erected under the Housing of the Working Classes Act, at an estimated cost of £140 per house.

**Greenock T.C.**—A deputation has been appointed to visit certain Scottish cities for the purpose of inspecting the special houses erected by the town councils for workmen's dwellings.

**Hornsey B.C.**—The tender of Messrs. Rowley Bros., of Boundary Works, Crowley-road, Wood Green, at £29,267, has been accepted for the erection of workmen's dwellings at Highgate.

**Liverpool T.C.**—Consideration has been given by the Housing Committee to seven or eight insanitary sites in various parts of the city, and it has been decided that new schemes shall go forward in respect of them. The surveyor, Mr. J. A. Brodie, and medical officer of health have been instructed to prepare plans and report as to the total cost. The committee have also authorised the surveyor and medical officer of health to furnish a report of the work of the committee since 1902, showing what has been done and what remains to be done with regard to insanitary property in the city.

**Portadown (Co. Armagh) T.C.**—It has been decided not to proceed with the scheme for building ninety-two houses, at a cost of £13,406.

## PARKS AND OPEN SPACES.

**Blandford T.C.**—The tender of Messrs. H. Stickland & Son for extending the water supply to the pavilion in the recreation ground has been accepted.

**Gourock T.C.**—The council have accepted the gift of ground for a public park from Major Darroch, together with the conditions attached thereto—*viz.*, fencing and laying out the ground, formation of King-street and the extension of Broombery Drive, and the building of a new entrance and lodge for Gourock House.

**Crimsby T.C.**—The borough surveyor, Mr. H. Gilbert Whyatt, has received instructions to carry out the work of extending the bowling greens by direct labour.

**Rushden U.D.C.**—It has been agreed to purchase about 8 acres of land, at £100 per acre, for the purpose of a recreation ground.

**Smethwick T.C.** — The West Smethwick Park, together with the valuable endowments given by the late Sir James Timmins, has been handed over to the council by Mr. G. F. Chance, on behalf of the trustees.

## ROADS AND MATERIALS.

**Blackrock (Co. Dublin) U.D.C.** The town clerk has reported that the county council admits the claim of the urban councils to a share of the road development grant. Meanwhile, the council have applied to the county council for the sum of £500 for rounding off the corner of the road leading to Stradbrook at the top of Temple Hill; £1,000 for widening and straightening the road from Ardmore House to the junction of Newtown-avenue with Temple-road; £700 for widening the roadway from Avoca-avenue to George's-avenue; and £1,000 for tar-macadamising certain roads.

**Blandford T.C.** The notices in connection with the private street works of Alexandra-street having expired, the borough surveyor, Mr. P. C. Woodhall, has been instructed to proceed with the works forthwith.

**East Suffolk C.C.**—At the meeting of the council last week the question was raised of subsidised roads in towns, and as to the legality of the resolution of the council adopted in November, 1889, that no street in a town should be accepted as a main road. The clerk Mr. A. T. Cobbold, said he had carefully considered the matter, and although he did not like to

find fault with the county council, there was no doubt that they knew now more about legal procedure than they did then. After carefully reading the section of the Act which dealt with the matter, he thought the resolution of 1889 was *ultra vires*. In further explanation the clerk said that at the passing of the Act there was a very small portion of main roads in Lowestoft and in other urban districts. If they had claimed the right to maintain they would have got it, but Lowestoft did not make that particular application at that time. Therefore the maintenance for these roads fell on the county council, but they had power to contract with the urban authority for the maintenance of these roads, and that seemed reasonable, if there were other main roads, that the urban authority having control of the main roads should have the supervision of other main roads, whether made by Act of Parliament of an earlier date or subsequently made main. If any road in an urban district was made a main road, the urban authority would have the right to maintain if exercised within twelve months, and the county council could not divest them of that right. The county council paid, and there had been many arbitrations on this question. The Local Government Board had power to settle what the amount should be for the cost of the maintenance and improvement of the road.

**Felixstowe U.D.C.**—The council have approved the plans of the engineer, Mr. H. Clegg, for doubling the width of about ¾-mile length of the existing concrete-paved promenade, and for laying out the common lands on the sea-front.

**Kerry C.C.**—The secretary of the Road Board, Mr. Rees Jeffreys, has written stating that the board have had under their consideration the question of dealing with the improvements required in the Glengariff-Kenmare-Killarney road, and they have decided that, having regard to the special circumstances of the case and the urgent need of the improvements in the general public interest, they would contribute practically the whole of the cost of such works of improvement as the board might, when complete plans and estimates were submitted to them, finally approve. The board were prepared to say that if 10 per cent of the cost were provided either out of the rates or by means of private subscriptions, they would, subject to Treasury approval, provide the remaining 90 per cent by grants out of the road improvement fund. The county surveyor said the road was 30 miles in length, and it would take about £12,000 to make it good. The council have decided to adjourn the matter until they found out the actual amount of the contributions towards which the 10 per cent was asked for.

**Keynsham R.D.C.**—At a recent meeting the surveyor, Mr. H. A. Endsor, stated that since April last a sum of £480 had been saved on the main road as a result of tar-spraying.

**Liskeard R.D.C.**—The clerk at the council meeting last Saturday read a communication from the county surveyor, Mr. E. A. Brookes, asking that certain particulars should be specially supplied to him by the district surveyors. Mr. J. R. Sobey, surveyor of the southern district, said it was a serious matter. It would involve more clerical work, which meant the neglect of the roads, since the best part of his time would be spent on the main roads and in clerical work. If it was to be left to the roadmen, all the poor old cripples and blind men, he said, would have a bad time of it. The council would need to have road foremen of intelligence and a certain amount of education, otherwise there would be a risk of not having their roads passed, and they would be mulcted in expenditure. Mr. Creber observed that it looked as if the county surveyor wanted the district council to give up the work. Mr. Sobey added that it would mean eleven different books in his district. He did not blame Mr. Brookes, who was an ambitious gentleman, and intended to bring the roads up to a better standard. Mr. W. G. Groves, the northern district surveyor, said Mr. Brookes got his idea from West Cornwall, where a surveyor had only 80 or 90 miles of road to look after, and had a clerk to help him. After further discussion, Mr. Honeycombe gave notice to move that the council refuse to enter into a contract with the county council under the proposed new conditions.

**Louth T.C.**—It has been decided to purchase, for £750, property in Mercer-row and some adjoining property for £1,250. The object of the purchase is to effect a street improvement in Upgate, one of the principal streets in which traffic is at present very congested.

**Norwich T.C.**—Sir Charles Harvey and the trustees of the late Mr. I. B. Coaks have given enough land to enable Telegraph-lane to be converted into a good carriage road, so as to shorten the vehicular communication between Thorpe and Mousehold Heath. At present carriage traffic from anywhere in the neighbourhood of the Britannia Barracks to Thorpe has to go round by Rosary Corner. The estimated cost of the work is, roughly, £2,500, of which about £2,000 will go for labour. The first part of the scheme, which alone it is proposed to attempt this year, will probably cost £1,500, £1,000 of which, it is hoped, may be obtainable from the Local Government Board, to provide work for the unemployed.

**Sandown (Isle of Wight) U.D.C.**—The raising of Morton Common-road, the first piece of work in the Isle of Wight to be carried out with the aid of the Road Board, will be commenced early next month, weather permitting. The board are contributing half the cost.

**Wolverhampton T.C.**—The borough surveyor, Mr. G. Green, has prepared a plan for the improvement of North-street by widening it for about 120 yds. from the present average of 24 ft. to an average width of 45 ft.

## SEWERAGE AND SEWAGE DISPOSAL.

**Clones (Co. Monaghan) U.D.C.**—A proposal has been before the council for a supplementary sewerage scheme to complete the drainage of the town, and particularly that portion of it which has grown up so rapidly in recent years in the vicinity of the railway station, and which is unprovided with proper drainage owing to a defect in the original scheme carried out about ten years ago. The scheme of Mr. Weaver, Leicester, has been approved of.

**Coventry T.C.**—A scheme has been adopted for the surface-water drainage of the Earlsdon and Chapelfields districts, at an estimated cost of £12,000.

**Easington R.D.C.**—At the meeting held recently a letter was read from the Local Government Board on the Wingate sewerage scheme, suggesting that the council should either entrust the scheme to an outside surveyor, or provide their own surveyor with assistance, so that there would be no further delay in getting the work done. If at the end of two months the board had not received a definite proposal from the council, they would consider the advisability of directing an inquiry into the complaint made in the report of the county council. In reply to a member, the chairman said that, in addition to Wingate, the scheme would deal with Station Town, Hutton Henry, Castle Eden Colliery, High Hesleden, and Blackhalls. The surveyor (Mr. G. Waterhouse), in reply to questions, said the only people complaining were the Local Government Board. As a matter of fact, this was about the least important sewerage scheme he had on hand. Mr. G. A. Carey said he thought that if the Local Government Board held an inquiry they would find that things were not so bad as they were made out to be.

**Felixstowe U.D.C.**—The sewage-ejector station is to be extended according to plans prepared by the engineer, Mr. H. Clegg.

**Hexham R.D.C.**—A scheme of sewerage for Broomley is to be carried out at an estimated cost of £3,000.

**Hornsey B.C.**—The council have approved a scheme submitted by the borough engineer, Mr. E. J. Lovegrove, for lifting the sewage from the Burghley-road pumping works directly into the outfall sewer without deposition of sludge. The area, the drainage of which flows into this pumping station, is the north-eastern portion of the North Harringay district. It is drained mainly on the combined system, hence a considerable quantity of storm water has to be dealt with. In connection with the work it will be necessary to lay a new intercepting pipe sewer along the whole length of Lyttleton-road, with six manholes and flushing chambers, to receive the flow from seven subsidiary sewers, and convey it direct to the ejectors. The estimated cost of the scheme is £2,500.

**Market Drayton R.D.C.**—In connection with the proposed sewage disposal scheme, it has been decided to purchase a local farm for a sum of £2,600.

**Southport T.C.**—Mr. Midgley Taylor has been engaged to prepare the detailed drawings for the Local Government Board of the Ainsdale and Birkdale portions of the sewage disposal scheme.

**Uckfield R.D.C.**—The sanitary surveyor, Mr. J. Taylor, has prepared plans, sections, and estimates

for the diversion of sewers and new disposal works in connection with the Crowborough Warren estate, in the parish of Buxted. The cost of these works he estimates at £1,350.

## WATER, GAS, AND ELECTRICITY.

**Alfreton U.D.C.**—The Waterworks Committee have had under consideration the question of arranging for an auxiliary water supply, which should prevent the recurrence of a water famine such as was experienced last summer. They have considered alternate schemes, one of which provides for a reservoir extension, and the other for the acquirement of a supply from the Wingfield Manor Colliery Company, who have undertaken to give a supply for a minimum payment of £156 per annum, including the pumping of the water into the council's mains. The committee have, after mature consideration, accepted the colliery company's offer.

**Dunoon T.C.**—The Board of Trade have agreed to an extension of the electric lighting order (1906) for another year.

**Liverpool T.C.**—In the report of the superintendent of street lighting (Mr. A. G. Smith) on the work of his department for the year 1911, it is stated, *inter alia*, that the automatic lighting has made satisfactory progress during the year, 2,020 controllers having been fixed, as against 1,420 in the previous year. This brings the total number installed in the district up to 4,374, so that approximately one-fifth of the total installation is now completed. It was estimated in last year's report that this would reduce the wages bill to £17,976, but the actual amount was £18,135. This increase, however, was entirely due to extra payments, which could not be anticipated in making out the estimate. The only electric alteration that has been carried out during the year is the substitution of sixteen flame arc lamps for those of the open type in Prince's-road, which has effected a great improvement in the lighting of that important thoroughfare. The total length of roads lighted at the end of the year, irrespective of courts and passages, amounted to 471 miles, 6¾ being by electricity, 455¼ by incandescent gas, and the remaining 9 miles, principally back streets, by the ordinary flat-flame system. The total charges in connection with the public lighting of the city and the supervision of the gas supply for the year amounted to £55,545, and a revenue of £2,821 has been derived from work charged to the other departments and bodies, making a nett expenditure of £52,724.

**Thakenham R.D.C.**—The council on Tuesday last adopted the scheme of Major Tulloch for providing Torrington with water from the chalk.

**Walthamstow U.D.C.**—A scheme has been approved for providing additional plant at the generating station, at a cost of £22,624.

## MISCELLANEOUS.

**Coventry T.C.**—The arbitrator has assessed the value of the tramway undertaking which the council seek to acquire at £202,000.

**Greenock T.C.**—Quotations are to be obtained for a motor fire engine.

**Tynemouth T.C.**—The tender of Mr. R. Fisher, at £6,300, has been accepted for the reclamation of a portion of the foreshore from the river in order to provide additional stands for fish packers and others. The consent of the Board of Trade, however, is necessary before the work can be commenced. A start has been made with the extension of the fish quay westward, in order to provide additional berthage for fishing boats. The contracts for this work, amounting to £6,500, were placed some weeks ago.

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**Public Health Law.**—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangement well suited for easy reference.—*The Law Times.*

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By Sydney G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

## PERSONAL.

Mr. F. J. Thackeray has been appointed surveyor to the Hoyland Nether Urban District Council.

Mr. P. G. Lloyd, manager of the sewage works of the Corporation of Kingston (Surrey), has had his salary increased from £200 to £250 per annum.

Prince Arthur of Connaught has consented to become patron of the Twenty-seventh Congress of the Royal Sanitary Institute, to be held at York in July next.

Mr. H. Percy Boulnois, M.INST.C.E., has been appointed consulting engineer for the Gravesend drainage scheme, at a fee of 250 guineas, plus travelling expenses.

Mr. Harold Parker, M.AM.SOC.C.E., on February 9th, delivered a lecture on "Contracts and Specifications" before the graduate students in highway engineering at Columbia University.

Mr. A. C. Crew, assistant surveyor of main roads to the Wilts County Council, has had his salary increased to £200 a year, with the prospect of a further increase to £220 in two years.

Mr. J. Ainsworth Settle, of Heywood, the new borough engineer of Bury, has been presented with a silver rose bowl by the members of the Heywood Municipal Officers' Association.

Mr. Cyril W. Kendrick, of Ripley, Derbyshire, has been appointed sanitary surveyor and inspector of nuisances to the Bingham (Notts) Rural District Council, at a salary of £100 per annum.

Mr. Basil Champneys will, at a meeting of the Royal Institute of British Architects to be held on Monday evening next, be proposed as the next recipient of the Royal Gold Medal for his executed works as an architect.

Mr. Wallace C. Wildman, in the service of the Bedfordshire County Council, has been appointed surveyor for the Derby main road district by the Derbyshire County Council, at a salary of £200, rising to £250 a year.

Mr. Charles Jones, borough surveyor, of Ealing, gave his annual treat recently to the children of the corporation employees, at the baths in Longfield-avenue, some 220 little folks thoroughly enjoying a tea and entertainment.

Mr. C. J. Reed has resigned the position of building inspector of Plymouth owing to ill-health, but the corporation have decided to retain his services until further order at a remuneration of £50. It has also been decided to advertise the vacancy, at a salary of £100 per annum.

Mr. A. Murray, secretary to the Local Government Board for Scotland, died last week at the age of fifty-nine. Mr. Murray was appointed staff clerk in charge of the Local Government branch of the Department in 1894, chief clerk in 1897, and secretary in 1909. Mr. Murray was joint editor, along with Mr. Patten Macdougall, of Skelton's "Hand-book of Public Health" and editor of the "Councillor's Manual."

Mr. T. F. Harvey has decided to resign his office as borough engineer of Merthyr Tydfil on March 31st, on his appointment as joint engineer with Sir Alexander Binnie of the new waterworks to be constructed at Pontsticill, and Mr. A. J. Marshall, chief assistant surveyor, has been appointed borough engineer by the Merthyr Corporation at a salary of £250. Mr. F. Thackeray, deputy surveyor, will in future act as borough architect.

Mr. Arthur Gladwell, surveyor to the Eton Rural District Council, has received many messages of sincere sympathy upon the loss he has sustained by the death of his second son, John, at the early age of 28. This present bereavement is all the more distressing as it is the third son Mr. Gladwell has lost in three years. The deceased had been away for some time, but recently returned to Slough on account of his illness. The funeral took place at Gerrard's Cross on Saturday afternoon.

FOR OTHER ADVERTISEMENTS
See End of Paper.

DRAUGHTSMAN. — Wanted at once, for a temporary engagement, an experienced Draughtsman, with a knowledge of drainage and reclamation works. Apply, stating age, qualifications and wages expected, to Box 1,140, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

## COUNTY BOROUGH OF HUDDERSFIELD

APPOINTMENT OF ENGINEERING AND SURVEYING ASSISTANT.

The Corporation invite applications for the appointment in the Borough Engineer's Department of an experienced Engineering and Surveying Assistant, at a salary of £140 per annum.

The person appointed must be thoroughly qualified to fulfil the duties of the office, particulars of which may be obtained on application to the Borough Engineer.

Application, in candidate's own handwriting, giving full particulars as to experience, age, present and previous appointments, accompanied by not more than four recent testimonials, to be addressed to me the undersigned not later than 10 a.m. on Wednesday, March 13th, 1912.

Canvassing will disqualify.

(By order)

K. F. CAMPBELL, M.INST.C.E., M.I.E.E.,
Borough Engineer and Surveyor.

Huddersfield.
February 28, 1912.

## CITY OF YORK.

SEWAGE DISPOSAL

WORKS EXTENSIONS—CONTRACT No. 1.

The York Corporation invite Tenders for the Construction of Works of Sewage Disposal at Naburn, near York, comprising Detritus Tanks, Septic Tanks, Percolating Filters, Humus Tanks, &c.

Plans may be inspected, and copies of Specification, Bill of Quantities, &c., obtained, on application at the office of the undersigned on and after the 1st March. Applications must be accompanied by a deposit of £3, which will be returned on receipt of a *bonâ-fide* Tender.

Tenders, sealed and endorsed "Sewage Disposal—Contract No. 1," to be delivered to the undersigned not later than Thursday, March 21st, 1912.

The lowest or any Tender not necessarily accepted.

F. W. SPURR,
City Engineer.

Guildhall, York.
February 26, 1912.

## TWICKENHAM URBAN DISTRICT COUNCIL.

PRIVATE STREET IMPROVEMENT WORKS.

The above Council hereby invite Tenders for the Works in connection with Forming, Levelling, Paving, Kerbing, Channelling, Metalling and making good the following Streets within the district of Twickenham:—

1. Spencer-road (Section 1).
2. Walpole-road.
3. Walpole-gardens.

Plans and Specifications may be seen, and Bills of Quantities and Forms of Tender obtained, on application at the Office of Mr. Fred. W. Pearce, F.S.I., Surveyor to the Council, Town Hall, Twickenham, and the payment at my Office of a deposit of One Guinea, which deposit will be returned on receipt by the Council of a *bonâ-fide* Tender.

Sealed Tenders, endorsed with the name of the street, and marked "Tender for Street Improvement Works," to be delivered to the undersigned not later than noon on Wednesday, the 13th day of March, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

H. JASON SAUNDERS,
Clerk to the Council.

Town Hall, Twickenham.
February 28, 1912.

## WILLESDEN DISTRICT COUNCIL.

APPOINTMENT OF JUNIOR CLERK IN ENGINEER AND SURVEYOR'S DEPARTMENT.

The Willesden District Council are prepared to receive applications for the appointment of Junior Clerk in the Engineer and Surveyor's Department, the commencing salary being 10s. per week, rising by annual increments of 2s. 6d. per week to a maximum of 20s. per week.

Candidates must be not less than 14 nor over 18 years of age.

Candidates must have received a good general education, and will be required to submit themselves for examination in certain subjects.

Further particulars may be obtained upon application to the undersigned on and after Monday, March 4th, 1912.

Applications, in Candidate's own handwriting, and accompanied by copies only of three testimonials, to be delivered to the Engineer to the Council not later than 4 p.m. on Tuesday, the 12th March, 1912.

(By order)

O. CLAUDE ROBSON,
Engineer to the Council.

Public Offices, Dyne-road,
Kilburn, N.W.
February 29, 1912.

## MILTON RURAL DISTRICT COUNCIL.

CONTRACTS FOR MATERIALS, Etc.

The Council invite Tenders for Supplying the following Materials, &c.:—

Surface-picked Flints.
Pit Flints.
Fine Gravel.
Cherbourg Quartzite.
Cornish or Welsh Granite.
Kentish Rag.
Horse Labour.
Steam Rolling and Scarifying.

Particulars and Forms of Tender may be obtained on application to Mr. E. C. Pearcy, District Surveyor, 45 High-street, Sittingbourne.

Sealed Tenders to be delivered at my Office not later than four o'clock p.m. on Tuesday, 12th March, 1912.

The Council do not bind themselves to accept the lowest or any Tender, and reserve the right to accept any part of a Tender.

(By order)

E. CECIL HARRIS,
Clerk.

Sittingbourne.
February 28, 1912.

## BOROUGH OF KINGSTON-UPON-THAMES.

WOOD PAVING.

The Corporation of Kingston-upon-Thames invite Tenders for the Wood Paving with Best Swedish Yellow Deal Blocks, creosoted under pressure, of about 30,000 square yards in the following roads—*viz.*:—

Main Roads.—London-road, Richmond-road, Eden-street, High-street and Surbiton-road.
Non-Main Roads.—Market-place, Church-street and Thames-street.

The Drawings can be inspected at the office of the Borough Surveyor, Mr. R. Hampton Clucas, from whom copies of the Specification and Forms of Tender can be obtained.

Sealed Tenders, endorsed "Wood Paving," to be sent to me not later than Wednesday, the 13th March, 1912.

The lowest or any Tender will not necessarily be accepted.

(By order)

HAROLD A. WINSER,
Town Clerk.

Municipal Offices,
Kingston-upon-Thames.
February 28, 1912.

## DALTON-IN-FURNESS URBAN DISTRICT COUNCIL.

STEAM ROAD-ROLLER.

The Council invite Tenders for the Supply and Delivery at Dalton-in-Furness of a New 10-ton Steam Road Roller on terms (1) cash on delivery and (2) payment by three annual instalments.

Sealed Tenders, accompanied by Specifications and particulars, endorsed "Road Roller," to be forwarded to "the Clerk to the Council" not later than 13th March proximo.

Further information may be obtained on application to the Council's Surveyor.

The Council do not bind themselves to accept the lowest or any Tender.

J. TYSON,
Clerk.

Town Hall,
Dalton-in-Furness.
February 27, 1912.

## BILSTON URBAN DISTRICT COUNCIL.
### TO BROKEN STONE CONTRACTORS.

Notice is hereby given that the Urban District Council of Bilston, in the County of Stafford, are prepared to receive Tenders for the Supply of Broken Rowley Rag or Granite for the year ending 31st March, 1913.

Specification and Form of Tender may be obtained on application to Vincent Turner, ASSOC.M.INST.C.E., Surveyor's Office, Town Hall, Bilston.

Sealed Tenders, endorsed "Tender for Broken Stone," are to be delivered, by registered post, in the enclosed envelope, to the Office of the undersigned, not later than 9.30 a.m. on Tuesday, the 19th day of March, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(Signed) JOHN D. WASSELL,
Clerk to the Council.

Clerk's Office,
Town Hall,
Bilston.

## COUNTY COUNCIL OF ABERDEEN.

*DEESIDE DISTRICT COMMITTEE.*

### TO ROAD CONTRACTORS.

The Deeside District Committee invite Tenders for the Reconstruction of about 8 miles of the Braemar-road.

Specification, Schedule of Quantities, and Form of Tender can be obtained on application to Mr. A. H. Clayton, Road Surveyor, Aboyne, on payment of Two Guineas, which sum will only be refunded on receipt of a *bonâ-fide* Tender.

Tenders, enclosed in sealed envelopes and endorsed "Braemar-road Improvement," must be received by the undersigned not later than 5 p.m. on Tuesday, the 12th March.

The Committee do not bind themselves to accept the lowest or any Tender.

JOHN MURRAY,
Clerk to the District Committee.

22 Bridge-street,
Aberdeen.

## BRUMBY AND FRODINGHAM URBAN DISTRICT COUNCIL.

The above Council invite Tenders for Supplying about 800 tons of Whinstone, more or less, up to March 31st, 1913, to be supplied at such times and in such quantities as ordered by the Surveyor, and delivered at Frodingham and Gunness Stations (G.C.R.).

The Council do not bind themselves to take the above quantity, but more or less as required.

The lowest or any Tender not necessarily accepted.

Specifications and Form of Tender may be had from the undersigned, to whom Tenders, sealed and endorsed "Tender for Whinstone," must be sent not later than Saturday, 9th March, 1912.

JOE GREEN,
Surveyor.

Council Offices,
New Frodingham,
Lincolnshire.
February 28, 1912.

## KENT COUNTY COUNCIL.

The Bridges and Roads Committee invite Tender for the Supply of:

Shovels,
Forks,
Scavenging Brooms,
Scoops,
Scrapers,
Cart Grease,
Tallow,
Oil,
and other Tools and Materials.

Particulars and Forms of Tender may be obtained on application to the County Surveyor, St. Peter-street, Maidstone.

Sealed Tenders, endorsed "Tenders for Tools," are to be sent to me at or before 12 o'clock noon on Saturday, the 23rd of March, 1912.

The lowest or any Tender not necessarily accepted.

W. B. PROSSER,
Clerk to the County Council.

Session House, Maidstone,
March 2, 1912.

## RURAL DISTRICT OF CLAYPOLE.
### TENDERS FOR ROAD MATERIALS.

The above Council invite Tenders for the Supply of about 2,800 tons of Granite and 2,200 tons of Slag, to be delivered in such quantities and at such times and places in their District as the Council or their District Surveyor shall require and direct.

Sealed Tenders, marked "Tender for Road Material," to be delivered to me the undersigned not later than Monday, the 25th March. Samples must be delivered, free of expense, at the Board Room, The Ossington, Newark, on Monday, the 25th day of March next.

The Council do not bind themselves to accept the lowest or any Tender, and they reserve to themselves the right to accept such part of any Tender as they may deem proper.

The Contractor will be required to enter into a bond for the due fulfilment of his Contract.

Further particulars may be obtained upon application to the District Surveyor, Mr. F. C. Meyrick, Beckingham, Newark, upon receipt of a stamped and addressed foolscap envelope.

(By order of the Council)

A. J. FRANKS,
Clerk.

Union Offices,
24 Lombard-street, Newark.
February 27, 1912.

## HOYLAND NETHER URBAN DISTRICT COUNCIL.

*TO STONE MERCHANTS, CONTRACTORS, &c.*

### CONTRACTS FOR SUPPLIES.

The above Council invite Tenders for the Supply and Delivery of the following Road Materials for the year ending 31st March, 1913:

Broken Slag.
Granite.
Tar-Macadam.

Full particulars and Form of Tender may be obtained on application at my office.

Sealed Tenders (accompanied by samples), endorsed "Tender for Materials," addressed to the undersigned, must be delivered not later than Wednesday, March 13th, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

FRED. J. THACKRAY,
Engineer and Surveyor.

Town Hall, Hoyland, near Barnsley.
February 26, 1912.

## COUNTY BOROUGH OF STOKE-ON-TRENT.

The Council invite Tenders for the Supply of Materials and Goods for the year ending March 31st, 1913, as under —

1. Portland Cement.
2. Blue Paving Bricks and Common Bricks.
3. Sanitary Pipes and Gullies.
4. Kerbs and Setts.
5. Macadam and Chippings.
6. Pitch and Oil.
7. Cast-Iron Work.
8. Picks, Shovels and General Ironware.
9. Paints and Oils.
10. Soap, Soda, &c.
11. Brooms and Brushes.
12. Bath Towels, Dusters, &c.
13. Ironmongery and General Stores.
14. Disinfectants.

Specifications, Conditions and Forms of Tender, and all requisite information will be supplied to firms applying for same in writing to my Office, Town Hall, Stoke-on-Trent, not later than March 9th.

All samples must also be forwarded to me.

The Council do not bind themselves to accept the lowest or any Tender.

A. BURTON, ASSOC.M.INST.C.E.,
Borough Surveyor.

Town Hall,
Stoke-on-Trent.
February, 1912.

## SOME RECENT PUBLICATIONS.*

Our Homeland Churches and how to Study them. By Sidney Heath. Price 2s. 6d. London: The Homeland Association, Limited.

Though really the second edition of a forerunner published in 1907, the book before us is practically new, having been very largely rewritten in the light of the experiences elicited from the first edition. As it stands it will be a delightful and instructive companion, not only to the architect, but to all who can appreciate the historical interest of our homeland churches. It will be an invaluable aid to the right understanding of these "sermons in stones," and its numerous illustrations—there are nearly seventy of them, from architectural drawings by J. R. Leathart, and from photographs—help materially to elucidate the lucidly-written text. To all who can read and have pockets we cordially commend this dainty little companion.

Chemistry for Engineers and Manufacturers. By B. Blount and A. G. Bloxam. Second edition. Price 14s. London: Charles Griffin & Co., Limited.

This book has been written primarily to meet the requirements of those engineers, works managers, and students whose business renders it necessary that they should have some knowledge of chemical technology. The work is the first of two volumes by the same authors, the second of which deals with the chemistry of manufacturing processes. Commencing with an excellent chapter on the chemistry of the chief materials of construction, the authors next proceed to treat of the chemistry of the sources of energy, of steam raising, and of lubricants and lubrication. Part II. of the book deals with metallurgy. The information given is essentially practical in character, and the authors have aimed at affording the student of manufacturing chemistry a sound groundwork, without incorporating an unnecessary mass of facts. In this aim they have well succeeded, and a useful and practical book is the result.

London Statistics, 1910-11. Price 5s. Published for the London County Council by Messrs. P. S. King & Son.

This is the 21st volume (the sixth of the new series) which the London County Council have issued containing statistics of the public services carried on within the administrative County of London. It is a mammoth compilation, containing over 600 pages of tabulated information gathered together under the direction of the council's statistical officer. It is impossible within the space of a short notice like the present adequately to give even a short summary of the contents. Suffice it to say that if particulars are required of any branch of the work of any public authority in the Metropolis, they will be found in this volume. For example, we chose at random and find Census statistics; labour disputes (London and United Kingdom compared); pauperism; local sanitary administration; housing of the working classes; habitual drunkenness; theatre regulation; educational services; highways; water supply; and a thousand other matters are fully dealt with. Those who are in any way practically interested in London local government will find this compilation absolutely indispensable.

### "The Surveyor" New Year's Issue: An Appreciation.

We have received with much gratification the following encouraging expressions from Mr. W. W. Crosby, chief engineer to the State of Maryland States Road Commission: "May I offer you my congratulations on your issue of January 26, 1912, copy of which has just reached me? Although I have been for years an eager reader of engineering literature, I must say I do not remember ever having seen as complete and as readable a *résumé* of a year's work as that which you have printed in the opening pages (93 to 129) of your issue referred to. I am particularly impressed with the way in which you have driven home the important points made during the year. Your writers have so sharpened these points by their admirable style and phraseology that they penetrate painlessly and readily the sutures of even the hardest of skulls and pleasingly tickle into keener consciousness the appreciation centres of the reader's mind."

*Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

## THE STORAGE OF COAL.

At a joint meeting of American Technical Societies, held recently, one of the papers read dealt with the storage of coal, a subject which is occasionally of interest to municipal engineers, and is likely, perhaps, to be of somewhat more importance during the next few years. The authors of this paper, Mr. H. C. Porter and Mr. F. K. Ovitz, concluded with a list of ten definite recommendations, as follows:—

(1) Do not pile over 12 ft. deep, nor so that any point in the interior will be over 10 ft. from an air-cooled surface.

(2) If possible, store only lump.

(3) Keep dust out as much as possible; reduce handling to a minimum.

(4) Pile so that lump and fine are distributed as evenly as possible; do not allow lumps to roll down a pile and form air passages at the bottom.

(5) Rehandle and screen after two months.

(6) Keep away external sources of even moderate heat.

(7) Allow six weeks' "seasoning" after mining before storing.

(8) Avoid alternate wetting and drying.

(9) Avoid admission of air to interior of pile through interstices around foreign objects, such as timbers or irregular brickwork; also through porous bottoms, such as coarse cinders.

(10) Do not try to ventilate by pipes, as more harm than good is often done.

**Drainage Works and Sanitary Fittings.**—A third edition, revised and brought up to date, particularly as regards the questions of concrete sewers, sewer ventilation and flushing, and the Public Health Acts Amendment Act of 1907, still further evidences the success of this little manual,* which manifestly deserves the attention and confidence of all concerned in the important subject with which it deals.—*The Bookseller.*

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President*—Mr. Albert D. Greatorex, M.Inst.C.E., Borough Engineer and Surveyor of West Bromwich.

### FORTHCOMING MEETINGS.

The following meetings are reported as fixtures: June 7th and 8th, Scottish meeting at Stirling; Eastern District, June 15th, at East Ham; Eastern District meeting on June 22nd, at Lowestoft.

A West Midland District meeting will be held at Stourbridge, April 13th, the Paris meeting at Whitsun, and the annual meeting will probably be held July 11th, 12th and 13th.

Provincial members who propose to take part in the visit to Paris will, in cases where the journey exceeds a distance of 30 miles, be able to obtain return tickets to London at a single fare and a quarter.

Members desirous of submitting a paper at the forthcoming annual meeting are requested to give early information of their desire.

Premiums not exceeding 30 guineas are awarded by the council for the best papers read by members and associate members during the year.

Thomas Cole,
*Secretary.*
11 Victoria-street,
London, S.W.

## ROYAL SANITARY INSTITUTE.

### MEETING AT MANCHESTER.

At a meeting of the Royal Sanitary Institute, to be held at Manchester on Friday, March 8th, discussions will be opened on "The Application of the Housing and Town Planning, &c., Act, to the Development of Suburban Areas now in Process of Transition," by Mr. F. W. Platt, building surveyor, Salford, and on "The Quantity of Water Available from Upland Drainage Areas," by Prof. J. Radcliffe, M.Sc. On the following day visits will be made to places of local interest.

*"Drainage Work and Sanitary Fittings." By Wm. H. Maxwell. Price 2s. nett. London: St. Bride's Press, Limited, 2a Bride-lane, Fleet-street, E.C.

## INSTITUTION OF MUNICIPAL ENGINEERS.

*President*—Mr. E. A. Stickland, assoc.m.inst.c.e., Borough Surveyor, Windsor.

### SOUTH-EASTERN DISTRICT.

A discussion evening will be held in the council room of the institution, 39 Victoria-street S.W., on Wednesday next, at 7 p.m., when there will be an open discussion on "Methods of Inviting Public Tenders": The advantages and disadvantages of stipulating that: (1) The lowest tender will be rejected; (2) the tender next above the lowest will be accepted.

Another discussion evening has been arranged for Tuesday, March 19th, the subject for consideration being "The Size and Design of Street Gullies, Grates and Weirs."

Bernard Partridge,
Town Hall, *Hon. District Secretary.*
Walthamstow.

### VISITS.

A visit will be paid to the International Building Trades Exhibition at Rusholme, Manchester, on Saturday, March 16, at 2 o'clock.

Programme.

2 p.m.—Meet at the Exhibition entrance, Old Hall-lane.
2.15 p.m.—Informal meeting within the Exhibition.
3 p.m.—Proceed to inspect the various exhibits.
5 p.m.—Tea, at the kind invitation of Mr. H. Greville Montgomery, director of the Exhibition.

A visit will be paid to the showrooms and works of Messrs. Doulton & Co., Limited, Albert Embankment, London, on Wednesday, March 27, at 2.30 p.m.

Members will assemble in the showrooms at 2.30, and the processes to be seen during the round of visits will include the manufacture of drain pipes and other sanitary stoneware, fireclay stoves, architectural terra-cotta, and Doulton and other art ware.

B. Wyand,
39 Victoria-street, S.W. *Secretary.*
February 27, 1912.

## SOCIETY OF ENGINEERS.

### PAPER ON RAILLESS TRACTION.

On Monday next, at a meeting of the Society of Engineers at the Institution of Electrical Engineers, Victoria Embankment, W.C., Mr. Henry C. Adams, assoc.m.inst.c.e., m.i.mech.e., a.m.i.e.e., will read a paper entitled "The Trolley Vehicle System of Railless Traction," the following being a synopsis:—

Introduction—The system abroad—Historical *résumé* of progress in this country—Bills in Parliament—The Brighton Bills—Anticipated legislation—Conditions under which the system is suitable—Subsidiary sources of revenue—Description of "Max Schiemann" system — Description of "Mercedes-Stoll" system — Description of "Lloyd-Köhler" system — Description of "Filovia" system — Description of "R.E.T." system at Leeds and Bradford—Capital cost of construction—Cost of overhead equipment—Cost of vehicles—repayment of loans—Cost of running—Passengers carried—Fares—Double-deck vehicles—Trailers—Wear of Tyres—Wear of roads—Conclusion.

The chair will be taken at 7.30 p.m.

## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned* (*No.* 1359 *Holborn*), *subject to later confirmation by letter.*

Surveyor.—March 4th.—Tyldesley Urban District Council. £200 per annum.—Mr. W. J. Matthews, clerk.

Draughtsman and Clerk.—March 4th.—Cumberland County Surveyor's Office. £150—£250 (for draughtsman); £60—£100 (for clerk).—Mr. C. W. Allan Hodgson, clerk, The Courts, Carlisle.

Junior Assistant.—March 5th.—Stretford Urban District Council. £75 per annum.—Mr. A. Burton, borough surveyor.

Surveyor's Temporary Assistant.—March 6th.—Urban District Council of Heston and Isleworth. £3 3s. per week.—Mr. H. J. Baker, clerk.

Road Foreman.—March 6th.—Hollingbourn Rural District Council. £1 per week.—Mr. H. J. Bracher, clerk, 33 Earl-street, Maidstone.

Inspector and Assistant Highway Surveyor.—March 6th.—Steyning East Rural District Council. £80 per annum.—Mr. Arthur Flowers, clerk.

Clerk of Works.—March 7th.—Corporation of Merthyr. £2 2s. 6d. per week.—Mr. T. A. Rees, town clerk.

Assistant in Surveyor's Office.—March 7th.—Skegness Urban District Council. £52 per annum.—Messrs. Tweed, Stephen & Co., clerks.

Surveyor and Inspector.—March 9th.—Llanidloes Town Council. £75 per annum.—Mr. A. Davies, town clerk.

Road Surveyor.—March 13th.—Denby and Cumberworth (Yorks) Urban District Council.—Mr. Wilfred Barnes, clerk.

Inspector of Nuisances.—March 14th.—Redruth Rural District Council. £120 per annum.—Mr. T. Peter, clerk.

Chief Engineer.—April 15th.—Board of Trustees for the Improvement of Calcutta. 2,000 rupees per mensem, rising to 2,500 rupees.—Mr. C. H. Bompas, chairman, 5 Clive-street, Calcutta.

Land Valuer.—April 15th.—Board of Trustees for the Improvement of Calcutta. 1,250 rupees per mensem, rising to 1,500 rupees.—Mr. C. H. Bompas, chairman, 5 Clive-street, Calcutta.

Assistant Engineers.—May 1st.—Indian Public Works and State Railway Departments.—Secretary, Judicial and Public Department, India Office, London, S.W.

Working Foreman.—East Suffolk County Council.—Chief Surveyor of Main Roads, County Hall, Ipswich.

Foreman of Works.—Lagos Government Waterworks in Southern Nigeria. £300—£345.—Crown Agents for the Colonies, Whitehall-gardens, S.W. Quote M. 5,186 on left-hand top corner of application.

## MUNICIPAL COMPETITIONS OPEN.

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Windsor.—March 5th.—Designs for an iron footbridge, for the corporation.—Mr. E. A. Stickland, borough surveyor.

Warrington.—March 9th.—Schemes for installation of power-stoking machinery, mechanically dealing with coke, and for coke or breeze washer, for the Gas Committee.—Mr. W. S. Haddock, gas engineer.

St. Helens.—March 13th.—Designs for a park conservatory, for the corporation.—Chairman, Parks and Public Buildings Committee.

Harrow-on-the-Hill.—March 16th.—Enlargement of public offices, for the urban district council. Cost not to exceed £4,500. Premiums of 30, 20 and 15 guineas are offered.—Mr. J. P. Bennetts, engineer and surveyor.

Portland.—April 4th.—Designs and plans for council offices, for the urban district council. Premiums of £50 and £10 are offered.—Mr. R. A. Colenutt, clerk.

Wombwell.—May 1st.—Designs for public swimming bath, for the urban district council. Prizes of £30, £20 and £20 are offered.—Mr. W. Quest, surveyor.

Hale.—June 25th.—Designs for a town planning scheme for the urban district council. Premiums of £50 and £25 are offered.—The Clerk.

Dusseldorf.—July 1st.—Plan for the extension of the city. Premiums of £1,000 and £375 are offered.—The Chief Burgomaster.

Padiham.—Plans and designs for laying-out a site, for the urban district council. Premiums of £40 and £20 are offered.—Mr. John Gregson, surveyor.

## MUNICIPAL CONTRACTS OPEN.

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### Buildings.

NELSON.—March 2nd. — For the erection of public baths at Bradley, for the corporation.—Mr. J. H. Boldwick, town clerk.

GLASGOW.—March 2nd- 27th.—For the construction of swing bridges over the Forth and Clyde Canal, for the corporation.—Mr. John Bowers, town clerk.

LLANDUDNO.—March 2nd.—For the erection of a governor-house and alterations to meter-house, for the urban district council.—Mr. T. W. Scott, clerk.

ESSEX.—March 2nd.—For the erection of certain buildings, for the Education Committee.—Mr. F. H. Bright, 53 High-street, Maldon.

OXFORD.—March 2nd.—For the erection of a school, for the Education Committee. — County Surveyor, 9 New-road, Oxford.

DEVIZES.—March 4th.—For the construction of a convenience, for the urban district council.—Mr. F. G. Billingham, borough surveyor.

STEPNEY.—March 4th.—For structural alterations at a public library, for the borough council.—Mr. G. W. Clarke, town clerk.

READING.—March 4th.—For additions to swimming bath, for the corporation.—Mr. J. Bowen, borough engineer and surveyor.

BRADFORD.—March 4th.—For the erection of a shed, motor house, &c., for the corporation.—Town Clerk.

SALFORD. — March 4th. For the erection of a secondary school, for the Education Committee.—Mr. Henry Lord, 42 Deansgate, Manchester.

BIRMINGHAM.—March 4th.—For the erection of an electric sub-station, for the Electric Supply Committee.—Mr. R. A. Chattock, electrical engineer.

BRIGHTON.—March 5th.—For alterations to buildings on the racecourse, for the corporation.—Mr. H. Talbot, town clerk.

ESSEX.—March 5th.—For addition to county asylum at Brentwood.—The Clerk.

BLACKPOOL.—March 5th.—For the erection of a meter testing shop and other buildings, for the Fylde Water Board.—Mr. C. Arthur, secretary, Seftonstreet.

GREAT YARMOUTH.—March 6th.—For the erection of stabling for twenty-six horses, for the corporation.—Town Clerk.

WEST SUFFOLK.—March 6th.—For the construction of a ferro-concrete bridge, for the county council.—Mr. A. Ainsworth Hunt, county architect.

HAYES.—March 6th.—For laying out site and building fifty-one houses, for the urban district council.—Mr. D. C. Fidler, engineer and surveyor.

NORTH RIDING.—March 6th.—For rebuilding a bridge near Guisborough, for the county council.—Mr. W. G. Bryning, county surveyor, County Hall, Northallerton.

HOVE.—March 6th.—For building boundary walling, shedding stores, and other work, for the corporation.—Mr. H. Endacott, town clerk.

WEST RIDING.—March 9th.—For the erection of a school, by the Education Committee. — The Clerk, County Hall, Wakefield.

CORNWALL.—March 9th.—For the erection of two schools, for the Education Committee.—Mr. F. R. Pascoe, secretary, Education Office, Truro.

SOUTH WESTMORLAND.—March 9th.—For the erection of a public convenience, for the rural district council.—Mr. A. Milne, clerk, 12 Lowther-street, Kendal.

HALIFAX.—March 11th.—For the erection of two shelters, for the corporation.—Mr. H. Ostler, secretary, Education Offices.

DERBYSHIRE.—March 11th.—For the erection of a school at Ilkeston, for the county council.—Mr. George H. Widdows, architect, St. Mary's-gate, Derby.

WEST HAM.—March 12th.—For the erection of a building to contain twelve slipper baths, &c., for the corporation.—Mr. Fred. E. Hilleary, town clerk.

LITTLEHAMPTON.—March 14th.—For the erection of stables and cartsheds, for the urban district council.—Mr. Arthur Shelley, clerk.

BIRMINGHAM.—March 14th—April 1st.—For the erection of a boiler-house, &c., for the corporation.—Secretary Electric Supply Department, 14 Dale-end.

BANGKOK.—March 15th.—For the erection of an electric power station, for the municipality.—Mr. F. B. Shaw, engineer-in-charge, Municipal Electric Power Station, Local Sanitary Department, Bangkok.

LEEDS.—March 20th.—For the extension of a school building, for the Education Committee. — Mr. J. Graham, secretary.

FINCHLEY.—March 23rd.—For the erection of an elementary school, for the urban district council.—Mr. E. H. Lister, clerk.

WEST SUSSEX.—March 26th.—For the erection of a school, for the Joint Education Committee.—Mr. L. Thompson, secretary, Thurloe House, High-street, Worthing.

### Iron and Steel.

NOTTINGHAM.—March 2nd.—For the supply of steel rails, for the Tramways Committee.—Mr. J. H. Green, town clerk.

YEOVIL.—March 2nd.—For the supply of second-hand water-main piping, for the rural district council.—Mr. L. Caplen, district surveyor, Montacute, Somerset.

LLANELLY.—March 4th.—For the supply of iron fencing, for the urban district council.—Mr. H. W. Spowart, clerk.

BRADFORD.—March 6th.—For the supply of cast-iron pipes and specials, for the corporation.—Mr. F. Stevens, town clerk.

IPSWICH.—March 7th.—For the supply of cast-iron pipes, for the corporation.—The Chairman, Waterworks Committee.

GOOLE.—March 13th.—For the supply of pipes and specials, for the urban district council.—Mr. R. Tyson, clerk.

AUCKLAND (New Zealand).—March 13th.—For the supply of wrought-iron gates and fencing, for the Harbour Board.—Messrs. W. & A. McArthur, Limited, 18-19 Silk-street, Cripplegate.

BIRMINGHAM.—For the purchase of the machinery and plant at the Bournbrook generating station from the corporation.—Mr. Alfred Baker, general manager, Tramway Department.

### Roads.

RICCALL.—March 2nd.—For the supply of road materials, for the rural district council.—Mr. E. Townend, clerk.

CHESTERTON.—March 2nd.—For the supply of team labour and granite, for the rural district council.—Mr. John F. Symonds, clerk.

DRIFFIELD.—March 2nd.—For the supply of whinstone, broken slag, sea cobbles, sea gravel and tarred chippings, for the rural district council.—Mr. T. Cosser Beaumont, surveyor.

WETHERBY.—March 2nd.—For the supply of road materials, for the rural district council.—Mr. R. A. Watson, surveyor.

ESSEX.—March 2nd.—For reconstructing Askingford Bridge, for the county council.—Mr. Percy J. Sheldon, county surveyor.

ASHINGTON.—March 2nd.—For work of road-rolling, for the urban district council.—Mr. G. Beaty, surveyor.

ESSEX.—March 2nd.—For widening Town Bridge, Halstead, for the county council.—Mr. Percy J. Sheldon, county surveyor.

GUISBOROUGH.—March 2nd.—For the supply of whinstone, tarred whinstone, slag and tarred slag, for the urban district council.—Mr. W. Richardson, clerk.

EAST RIDING.—March 2nd.—For the supply of stone, for the county council.—Clerk, County Council Offices, Beverley.

BOLSOVER.—March 2nd.—For the supply of road materials, for the urban district council.—Mr. H. J. Watson, clerk.

BELPER.—March 2nd.—For the supply of road materials, for the rural district council.—Mr. R. C. Cordon, surveyor, Duffield, near Derby.

EARSDON.—March 4th.—For the supply of road materials, for the urban district council.—Mr. F.

Kirby, clerk, Council House, Shiremoor, Northumberland.

Stockton.—March 4th.—For the supply of whinstone and slag, for the rural district council.—Mr. T. H. Faber, clerk, Stockton-on-Tees.

Colchester.—March 4th—15th.—For the construction of roads and surface-water drainage, for the Visiting Committee of the County Lunatic Asylum.—Mr. H. H. Gepp, clerk, 57 New-street, Chelmsford.

Sawbridgeworth.—March 4th.—For work of street watering, for the urban district council.—The Clerk.

East Retford.—March 4th.—For the supply of slag and broken granite, for the rural district council.—Mr. C. B. Smith, clerk.

Lichfield.—March 4th.—For the supply of granite and slag, for the rural district council.—Mr. John Derry, clerk.

Blyth and Cuckney.—March 4th.—For the supply of broken slag, for the rural district council.—Mr. J. S. Whall, clerk, 66 Bridge-street, Worksop.

Chepping Wycombe.—March 4th.—For the supply of flints, for the corporation.—Mr. T. J. Rushbrooke, borough surveyor.

High Wycombe.—March 4th.—For the supply of flints, for the corporation.—Mr. T. J. Rushbrooke, borough surveyor.

Glasgow.—March 4th.—For paving certain streets with rock asphalte, for the corporation.—Town Clerk.

East Grinstead.—March 4th.—For the supply of road materials, for the rural district council.—Mr. F. S. White, clerk.

Ashington.—March 4th.—For the supply of road metal and freestone, for the urban district council.—Mr. G. Beaty, surveyor.

Hunts.—March 4th.—For the supply of granite and slag, for the county council.—Mr. Herbert Leete, county surveyor.

Fort William.—March 4th.—For work of road repair, for the county council.—Mr. T. Allison, district clerk, Fort William.

Castle Ward.—March 4th.—For the supply of materials and road-making work, for the rural district council.—Mr. G. Wilkinson, clerk, 1 Mosley-street, Newcastle-upon-Tyne.

Warrington.—March 4th.—For the supply of granite or whinstone cubes, for the corporation.—Borough Surveyor.

Cheetsey.—March 4th.—For the supply of highway materials, for the rural district council.—Mr. H. Beeney, surveyor, High-street, Chobham.

Rochford.—March 4th.—For the supply of road materials, for the rural district council.—Mr. H. T. Sidwell, Rayleigh, Essex.

Cudworth.—March 4th.—For the supply of granite and slag, for the urban district council.—Mr. W. T. Lynam, surveyor.

Sleaford.—March 4th.—For the supply of granite and slag, for the urban district council.—The Clerk.

Portland.—March 5th.—For the supply of granite or basalt, for the urban district council.—Mr. R. S. Henshaw, engineer and surveyor.

Ealing.—March 5th.—For making up a road, for the corporation.—Mr. Geo. E. Brydges, town clerk.

Elham.—March 5th.—For the supply of granite, for the rural district council.—The Clerk, 54 High-street, Hythe, Kent.

Barton-upon-Irwell.—March 5th.—For the supply of road materials, for the rural district council.—Mr. A. H. Mountain, surveyor, Union Offices, Patricroft, Lancs.

Brentford.—March 5th.—For work of repair and paving, for the urban district council.—Mr. J. W. Croxford, surveyor.

Lewisham.—March 5th.—For works of road making, for the borough council.—Borough Surveyor.

Potterspury.—March 5th.—For the supply of granite and slag, for the rural district council.—Mr. W. R. Parrott, clerk, High-street, Stony Stratford.

Tottenham.—March 5th.—For making up certain roads, for the urban district council.—Mr. E. Crowne, clerk.

Dumbarton.—March 6th.—For the supply of whinstone metal, for the Eastern District.—Mr. J. F. Robertson, clerk, 179 West George-street, Glasgow.

Hollingbourn.—March 6th.—For the supply of road materials, for the rural district council.—Mr. J. Bracher, clerk, 33 Earl-street, Maidstone.

Desborough.—March 6th.—For the supply of granite, for the urban district council.—Mr. G. E. Marlow, surveyor.

Arundel.—March 6th.—For the supply of Guernsey granite, granite chippings and flints, for the corporation.—Borough Surveyor.

Hove.—March 6th.—For carrying out paving and other works, for the corporation.—Mr. H. Endacott, town clerk.

Barnsley.—March 6th.—For work of making up, for the corporation.—Mr. J. H. Taylor, borough surveyor.

Bingham.—March 6th.—For the supply of team labour, for the rural district council.—Mr. R. H. Beaumont, clerk.

Sevenoaks.—March 6th.—For the supply of a steam roller and scarifier, for the rural district council.—Mr. F. H. Vibert, clerk.

Wanstead.—March 6th.—For the widening of High-street and making up part of Belgrave-road, for the urban district council.—Mr. Bruce Blewitt, clerk.

Erpingham.—March 7th.—For the supply of materials and labour, for the rural district council.—Mr. T. Ling, clerk, Northrepps, Norwich.

Kiveton Park.—March 7th.—For the supply of broken slag and granite, for the rural district council.—Mr. J. S. Whall, clerk.

Eastbourne.—March 7th.—For the supply of road materials, for the rural district council.—Mr. T. E. V. Kirtlan, clerk.

Bridlington.—March 7th.—For the supply of road materials, for the rural district council.—Mr. G. Hankinson, clerk.

Loughborough.—March 7th.—For the supply of broken granite, for the corporation.—Town Clerk.

Saddleworth.—March 7th.—For the supply of granite, limestone chippings, granite chippings, tar, &c., for the urban district council.—Mr. E. Rowbotham, clerk.

Hastings.—March 9th.—For the supply of unbroken bluestone, for the rural district council.—Mr. D. Paine, district surveyor, Stonelynk Farm, Fairlight, Hastings.

Armagh.—March 9th.—For the supply of one 8-ton compound road-roller, sleeping van and a water cart, for the county council.—Mr. Joseph Atkinson, secretary.

Crompton.—March 9th.—For paving 2,300 tons of granite setts, including concrete foundations, for the urban district council.—Mr. F. F. Gartside, clerk and surveyor.

Burnley.—March 9th.—For the supply of granite macadam, limestone, shovels, brooms, sewer pipes, kerbs, &c., for the rural district council.—Mr. J. S. Horn, clerk.

Selby.—March 9th.—For the supply of road materials, for the rural district council.—Mr. E. Townend, clerk.

Willingdon.—March 9th.—For constructing asphalte footpath, for the urban district council.—Mr. J. G. Wilson, clerk, 5 North Bailey, Durham.

Leyland.—March 9th.—For the supply of road materials, for the urban district council.—Mr. M. H. Wilkinson, surveyor.

Clown.—March 9th.—For the supply of granite and slag, for the rural district council.—Mr. J. S. Whall, clerk, 66 Bridge-street, Worksop.

Staffs.—March 9th.—For the supply of materials, tools and implements, for the county council.—Clerk, County Buildings, Stafford.

Knutsford.—March 11th.—For the supply of road materials, for the rural district council.—Mr. G. Leigh, clerk.

Horsham.—March 11th.—For the supply of granite, team labour, hire of two steam rollers, and two tar boilers, for the rural district council.—Mr. A. C. Coole, clerk.

Wandsworth.—March 11th.—For the making up of a road, for the borough council.—Mr. Henry George Hills, town clerk.

Billericay.—March 11th.—For the supply of granites, flint, and gravel, for the rural district council.—Mr. C. E. Lewis, clerk, New-road, Brentwood.

Rye.—March 11th.—For the supply of road materials.—Mr. H. J. Elliott, district surveyor, Winchelsea.

Dartford.—March 11th.—For the supply of road materials, maintenance, and steam rolling, for the rural district council.—Mr. Eustace J. Hobbs, clerk.

Bourne.—March 11th.—For the supply of granite, for the urban district council.—Mr. S. R. Andrews, clerk.

Goole.—March 11th.—For paving work, for the urban district council.—Mr. R. Tyson, clerk.

Haslingden.—March 11th.—For the supply of road materials, for the corporation.—Mr. W. Musgrove, town clerk.

Kent.—March 11th.—For laying tar-paving, for the county council.—Mr. F. W. Crook, secretary, Caxton House, Westminster.

Wandsworth.—March 11th.—For making up part of Upper Richmond-road, for the borough council.—Mr. Henry George Hills, town clerk.

Newark.—March 11th.—For the supply of granite, slag and tar-macadam, for the rural district council.—Mr. A. J. Franks, clerk.

Fleetwood.—March 11th.—For the supply of kerbs, channels, flags, limestone macadam, &c., for the urban district council.—Mr. A. Cottam, clerk.

Wing.—March 11th.—For the supply of granite, slag, sand and gravel, for the rural district council.—Mr. W. W. B. Calcott, clerk.

Milton.—March 12th.—For the supply of flints, gravel, Cherbourg quartzite, granite, Kentish rag, horse labour and steam rolling, for the rural district council.—Mr. E. Cecil Harris, clerk.

Sculcoates.—March 12th.—For the supply of stone, gravel, asphalte, coal and team labour, for the rural district council.—Mr. Jas. Fras. Robinson, clerk.

Docking.—March 12th.—For the supply of road materials and labour, for the rural district council.—Mr. J. A. Stoughton, clerk.

Maidstone.—March 12th.—For the supply of road materials, for the corporation.—Mr. S. Lance Monckton, town clerk.

Maldens and Coombe.—March 12th.—For works of road construction, for the urban district council.—J. W. Johnson, clerk.

Mountain Ash.—March 12th.—For the supply of broken mountain limestone, gravel and haulage, for the urban district council.—Mr. H. P. Linton, clerk.

Hartismere.—March 13th.—For the supply of granite and pit stones, for the rural district council.—Mr. Harold Warnes, solicitor and clerk.

Strood.—March 13th.—For the supply of road materials, for the rural district council.—Mr. J. E. Povey, clerk.

Chatham.—March 14th.—For the supply of road materials, for the corporation.—Mr. C. Day, borough surveyor.

Caister.—March 15th.—For the supply of granite and slag, for the rural district council.—Mr. A. A. Padley, clerk.

Sevenoaks.—March 15th.—For the supply of materials, steam rolling, team labour, &c., for the rural district council.—Mr. F. H. Vibert, clerk.

Dartford.—March 16th.—For the supply of road materials, for the rural district council.—Mr. E. J. Hobbs, clerk, Sessions House, Dartford.

Nelson.—March 16th.—For the supply of granite macadam, limestone macadam, limestone paving chippings, Barns flags, Yorkshire flags, grit setts, kerb, Portland cement, and oil for the corporation.—Mr. J. H. Boldwick, town clerk.

Pontefract.—March 16th.—For the supply of road materials, for the rural district council.—Mr. J. D. Smith, clerk.

Altrincham.—March 18th.—For the supply of road materials, for the urban district council.—Mr. H. E. Brown, surveyor.

King's Lynn.—March 18th.—For the supply of road materials, for the corporation.—Mr. Alfred J. Smith, borough surveyor.

Croydon.—March 26th.—For work of street repair, for the corporation.—Mr. F. C. Lloyd, town clerk.

Barnet.—March 27th.—For making up a private street, for the urban district council.—Mr. Hy. W. Poole, clerk.

Mothram.—April 11th.—For the supply of rock setts, for the urban district council.—Mr. F. Thompson, clerk, 123 Stamford-street, Stalybridge.

## Sanitary.

Rotherham.—March 2nd.—For the removal of nightsoil, for the rural district council.—Messrs. Oxley & Coward, clerks, 6 Westgate.

Driffield.—March 2nd.—For scavenging work, for the rural district council.—Mr. H. Botterill, clerk.

Ardsley.—March 2nd.—For scavenging work, for the urban district council.—Mr. J. Morley, surveyor, Stairfoot, near Barnsley.

Hendon.—March 4th.—For works of sewerage, surface-water drainage, kerbing, &c., for the urban district council.—Chairman of the Council.

Auckland.—March 4th.—For the construction of sewage disposal works, &c., for the rural district council.—Mr. Sam Adams, clerk.

Tangier.—March 4th.—For the construction of a drain, for the Special Committee of Public Works.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

Wolstanton.—March 4th.—For the removal of house refuse, for the urban district council.—Mr. E. Hollinshead, clerk.

Sunderland.—March 4th.—For the removal of nightsoil, refuse, &c., for the rural district council.—Mr. J. C. Wilson, clerk.

Coulsdon.—March 4th.—For work of scavenging, for the rural district council.—Mr. E. J. Gowen, clerk.

Rochford.—March 4th.—For the supply of disinfectants, and scavenging work, for the rural district council.—Mr. F. Gregson, clerk, Southend.

Croydon.—March 5th.—For the collection and removal of refuse, for the rural district council.—Mr. E. J. Gowen, clerk.

Thornton-le-Fylde.—March 6th.—For the construction of sewers, for the urban district council.—Mr. H. Fenton, surveyor.

Westhampnett.—March 6th.—For the collection and removal of refuse, for the rural district council.—Mr. W. D. Rasell, acting clerk.

Newport (Isle of Wight).—March 6th.—For removal of house refuse, &c., for the rural district council.—Mr. H. E. Stratton, clerk.

Wallington.—March 7th.—For scavenging work, for the rural district council.—Mr. E. J. Gowen, clerk.

Bakewell.—March 9th.—For the construction of sewers, manholes, &c., for the rural district council.—Mr. A. Hawes, clerk.

Neath.—March 9th.—For the construction of sewage disposal works, for the rural district council.—Messrs. Cuthbertson and Powell, clerks.

Bellington.—March 11th.—For work of scavenging, for the urban district council.—Mr. C. D. Forster, joint clerk, 24 Grainger-street West, Newcastle-on-Tyne.

Worksop.—Marth 11th.—For work of scavenging, for the urban district council.—Mr. J. H. White, clerk, Bank Chambers, Mansfield.

Alnwick.—March 11th.—For cleaning out ashpits, for the rural district council.—Mr. H. W. Walton, clerk.

Birmingham.—March 12th.—For the supply of iron, steel, tools, ironmongery, oils, paints, drysaltery, timber, brushes, cement, lime, &c., for District Drainage Board.—Mr. John D. Watson, Tyburn, Birmingham.

Coventry.—March 12th.—For the supply of engine coal to the pumping station, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

Brightlingsea.—March 13th.—For the removal of sludge and house refuse, for the urban district council.—Mr. W. I. Osborn, clerk.

Carshalton.—March 13th.—For work of scavenging, for the urban district council.—Mr. C. P. Lovelock, clerk.

Littlehampton.—March 14th.—For the construction of earthenware pipe sewers, manholes, outfall sewer, &c., for the urban district council.—Mr. Arthur Shelley, clerk.

Manchester.—March 14th.—For the construction of main drainage work, for the Rivers Committee.—Mr. Thomas Hudson, town clerk.

Raunds.—March 18th.—For the construction of sewage disposal works, for the urban district council.—Mr. W. F. Corby, clerk.

Mitcham.—March 19th.—For scavenging work, for the rural district council.—Mr. E. John Gowen, clerk.

Wenlock.—March 21st.—For the construction of sewers and sewage disposal works, for the corporation.—Mr. F. H. Potts, town clerk.

Hindley.—March 23rd.—For the construction of cast-iron main sewer, for the urban district council.—Mr. Thomas Robey, clerk.

## Stores.

Middleton.—March 2nd.—For the supply of setts, flags, sanitary tubes, granite, macadam, manholes, covers, street grids, waste-water closets, lime, brooms, &c., for the corporation.—Mr. Frederick Entwistle, town clerk.

South Shields.—March 2nd.—For the supply of road materials, cement, cast-iron work, brooms, disinfectants, sanitary pipes, tar, oils, &c., for the corporation.—Mr. Leslie Roseveare, borough engineer.

Chepping Wycombe.—March 4th.—For the supply of cast-iron pipes, surface boxes, manhole covers, stop and bib cocks, tubes, and fittings, for the corporation. —Mr. T. J. Rushbrooke, water engineer.

Ealing.—March 4th.—For the supply of limes, pipes, cement, ironmongery, iron castings, paints, oils, granite, gravel, sand, tarred macadam, tar, wood-paving repairs, &c., for the corporation.—Mr. Geo. E. Brydges, town clerk.

Reading.—March 4th.—For the supply of granite, setts, gravel, cement, stoneware pipes, gullies, coal, brooms, ironmongery, &c., for the corporation.—Mr. John Bowen, borough engineer and surveyor.

Cambridge.—March 4th.—For the supply of timber, stoneware pipes, cement, gravel, brooms, horses, carts, &c., for the corporation.—Mr. J. E. L. Whitehead, town clerk.

Guildford.—March 6th.—For the supply of broken granite, chippings, Durax cubes, cast-iron pipes, brooms, flints, disinfectants, horse hire, carriage, iron castings, oils, pitch, tar, Portland cement, &c., for the corporation.—Mr. A. D. Jenkins, town clerk.

Colne.—March 9th.—For the supply of cement, granite macadam, limestone macadam, lime, ironwork, repair of highways, team labour, pitch, creosote oil, pipes and gullies, brushes, &c., for the corporation. —Mr. A. Varley, town clerk.

Eastbourne.—March 11th.—For the supply of Portland cement, cast-iron goods, wrought-iron goods, tools, ironmongery, oils, timber, broken granite, granite kerb and setts, bricks, pipes, brooms, &c., for the corporation.—Mr. A. Ernest Prescott, borough surveyor.

Twickenham.—March 13th.—For the supply of ballast, shingle, granite cubes, cement, coal, street gullies, drain pipes, broken granite, &c., for the urban district council.—Mr. H. Jason Saunders, clerk.

Gainsborough.—March 15th.—For the supply of granite, whinstone macadam, whinstone setts, slag, kerbs, flags, earthenware and cast-iron pipes, tar-macadam, &c., for the urban district council.—Mr. Sam W. Parker, engineer and surveyor.

Lanark.—March 15th.—For the supply of tools and implements, fencing materials and drain pipes, for the District Committee of Middle Ward.—Mr. W. E. Whyte, district clerk, Hamilton.

East Ham.—March 16th.—For the supply of glazed stonework pipes, gulley fittings, Portland cement, greystone, chalk, lime, bricks, Thames ballast, engineer's sundries, ironmongery, granite setts, kerbs, gulleys, hire of horses and carts, uniforms, paving flags, &c., for the corporation.—Mr. C. Eustace Wilson, town clerk.

Coventry.—March 16th.—For the supply of broken roadstone, granite kerbs, granite setts, stoneware pipes, castings, and workmen's tools, for the corporation. Mr. J. E. Swindlehurst, city engineer and surveyor.

Sutton Coldfield.—March 19th.—For the supply of granite macadam and kerb, Limestone macadam and red gravel, Yorkshire or Pennant kerb, Rowley setts, earthenware pipes, cement, lime, castings, iron, steel, &c., for the corporation. Mr. W. A. H. Clarry, borough surveyor.

## Miscellaneous.

Wandsworth.—March 2nd.—For the purchase of disused slop vans, slop carts, water carts, and other carts from the borough council.—Mr. P. Dodd, borough engineer.

St. Pancras.—March 4th.—For the supply of horse forage, for the borough council.—Mr. C. H. F. Barrett, town clerk.

Alsager.—March 7th.—For an experimental boring for water supply purposes, for the urban district council.—Mr. John J. Nelson, clerk.

Coventry.—March 9th.—For the supply of waterworks stone, cast-iron pipes, lead pipes, solder, &c., for the corporation. Mr. J. E. Swindlehurst, water engineer.

Westminster.—March 15th.—For the supply of tip vans, for the borough council.—Mr. John Hunt, town clerk.

Penarth.—March 30th.—For the supply of a steam or petrol motor wagon, trailer, and water van, for the urban district council.—Mr. George Wainwright, clerk.

Malvern.—Offers wanted for fire appliances, including two-horse tender, with 50-ft. escape, small manual engine and fire-escape.—Mr. W. Osborne Thorpe, surveyor and chief officer.

## TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

ALDERSHOT.—For the supply of flints, for the urban district council:

| | |
|---|---|
| W. Foot & Sons, Farnham | £275 |
| T. Lamport & Sons, Farnham | 246 |
| W. Norris, Farnham | 233 |
| Farnham Flint Company, Farnham | 301 |
| M. Wells & Co., Aldershot | 220 |

EASTBOURNE.—For private improvement works, for the corporation. —Mr. A. E. Prescott, borough engineer:—

| | |
|---|---|
| A. J. Bessant, Eastbourne | £29 |
| J. M. Vine, Eastbourne* | 27 |

GLOUCESTERSHIRE.—For additional classrooms at Bream Council School. Mr. R. S. Phillips, architect:—

| | |
|---|---|
| W. G. Nelmes, Coleford | £2,117 |
| A. S. Cooke, Stroud | 1,477 |
| E. Walters & Son, Bristol | 1,467 |
| P. C. Cousins, Gloucester | 1,435 |
| Collins & Godfrey, Tewkesbury | 1,419 |
| A. G. Heard, Bristol | 1,399 |
| E. J. Flewelling, Lydbrook | 1,370 |
| Orchard & Peer, Stroud* | 1,310 |

HARROGATE.—For the execution of private street works, for the corporation.—Mr. C. E. Rivers, borough engineer and surveyor:—

| | |
|---|---|
| A. Hymas, Harrogate | £737 |
| W. H. Pettinger, Harrogate | 728 |
| C. H. Dickinson, Harrogate | 727 |
| T. Godfrey, Harrogate | 726 |
| C. A. Nettleton, Harrogate | 723 |
| E. Long, Starbeck* | |

HEADINGTON.—For the supply of granite and chippings, for the rural district council.—Mr. A. Walker, district surveyor:—

Jee's Hartshill Granite Company, Hartshill, 1,250 tons.
Croft Granite Company, Croft, 1,110 tons.

LEWISHAM.—The Works and Highways Committee recommend that the following tenders be accepted:—

Artificial Stone.—W. Pearce, at 2s. 9d. per yard super.

Stoneware Goods. Doulton & Co., Limited, at 57½ per cent below the priced schedule for 4, 6 and 9 inch pipes; 52½ per cent below for 12-inch pipes; 50 per cent below for 15 and 18 inch pipes, and 47½ per cent below for 24-inch pipes, with a further discount of 2½ per cent for monthly payments.

Asphalte.—Seyssel and Metallic Lava Asphalte Company, for Portland cement concrete 3-in. thick, at 11 per cent below the priced schedule; for asphalte 1-in. thick, at 10 per cent below the priced schedule and for asphalte ¾-in. thick, at 12½ per cent below the priced schedule.

Portland Cement.—C. Pearce, at 24 per cent above the priced schedule.

Lime.—W. Whiteway & Co., at 33⅓ per cent above the priced schedule.

Sewerage jobbing works.—J. T. Gloag, at 2½ per cent below the priced schedule.

Granite Kerb and Setts.—Fry Brothers, for Guernsey granite kerb and setts, at 1½ per cent below the priced schedule; W. Griffiths & Co., Limited, for Norway granite kerb and setts at the priced schedule.

Road Material.—Fry Brothers, for broken Guernsey granite, at 12s 6d. per ton in Division 1; 13s. per ton in Division 2; 12s. per ton in Division 3; and 12s. 2d. per ton in Division 4; and for dug flints in Division 4 at 6s. 8d. per ton. W. Pearce, for dug flints, at 6s. 10d. per ton in Division 1, and 6s. 11d. per ton in Division 2. J. & B. Martin, for dug flints, at 6s. 4d. per ton in Division 3. Chittenden & Simmons, Limited, for broken Kentish ragstone, at 9s. 8d. in Division 2; 10s. in Division 3; and 9s. 10d. in Division 4.

Thames Ballast.—J. Weston & Sons, at 6 per cent above the priced schedule in Divisions Nos. 1, 2, 3 and 4.

Pit Ballast.—W. G. Penfold, at 2½ per cent below the priced schedule in Divisions Nos. 1, 2, 3 and 4.

Thames Sand.—W. R. Cunis, Limited, at the priced schedule in Division 1, and 1½ per cent above the priced schedule in Division 2. W. G. Penfold, at the priced schedule in Division 3. J. Weston & Sons, at 3 per cent above the priced schedule in Division 4.

Crushed Thames Ballast.—W. R. Cunis, Limited, at 2½ per cent below the priced schedule in Divisions 1 and 2; and 5 per cent below in Division 3. S. West, Limited, at the priced schedule in Division 4.

Screened Clean ¾-in. Shingle.—S. West, Limited, at the priced schedule in Divisions 1 and 4. W. R. Cunis, Limited, at 3 per cent below the priced schedule in Division 3. W. Pearce, at 2½ per cent below the priced schedule in Division 2.

Croydon Gravel.—J. Weston & Sons, for fine, at 6 per cent above the priced schedule in Divisions Nos. 1, 2, 3 and 4.

Tar-paving.—Constable, Hart & Co., Limited, for coarse tar-paving, fine tar-paving and Kent rag chippings, delivered at Lee, Lewisham, Catford, Lower Sydenham or Penge, S.E. & C.R. stations, at 12 per cent above the priced schedule.

Repairing Roads.—W. Pearce, for executing the necessary works in providing, spreading and rolling broken Kent ragstone, at 13s. per ton in Divisions 1 and 4, and at 13s. 3d. per ton in Division 2, and at 13s. 1d. per ton in Division 3; J. T. Gloag, for executing the necessary works in providing, spreading and rolling dug flints at 8s. 11d. per ton in Division 1; 9s. 1d. per ton in Division 2; 8s. 8d. per ton in Division 3; and 9s. 1d. per ton in Division 4.

Disinfectants.—Middleton Brothers, for permanganate of potash, at 38s. 6d. per cwt.; smoke rockets, at 4s 3d. per dozen; chloros, at 1s. 9½d. per gallon; formalin (Schering's), at 1s. 4d. per lb.; and glycerine, at 11d. per lb. Sanitas Company, Limited, for drain testers, at 45s. per gross; carb-ite acid (No. 5), at 1s. 7d. per gallon; carbolic powder (15%), at 3s. 3d. per cwt., and flowers of sulphur, at 6s. 8d. per cwt. Adcocks, for carbolic powder (10%), at 2s. 7½d. per cwt. Savannah Chemical Company, Limited, for soluble sani-

tary fluid (15%) at 7½d. per gallon. Burt, Boulton & Haywood, Limited, for soluble sanitary fluid (25%) at 8½d. per gallon. Jeyes' Sanitary Compounds Company, Limited, for cyllin, at 3s. 6d. per gallon.

Ironwork to Sewers and Drainage.—Globe Foundry (Stratford), Limited, at 31½ per cent below the priced schedule.

Brooms and Brushes.—F. Smith & Co., at 28½ per cent below the priced schedule.

Dust Baskets.—A. E. Dellow, junr., at 12½ per cent below the priced schedule.

Removal of House and Trade Refuse (for Three Years).—B. Cloke, at 3s. 6d. per load from Forest Hill Station (L.B. & S.C.R.), and 2s. 9d. per load from Lee, Blackheath, Catford and Lower Sydenham Stations (S.E & C.R.).

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LLANDUDNO.—For the supply of retorts and fire-clay goods, for the urban district council:—

Mobberley & Perry, Stourbridge, £52.

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MERTHYR.—For the erection of two schools, for the education committee:—

Troedyrhiw School.—A. J. Colborne, Swindon, £6,748.
Gellifaelog School.—E. Williams & Sons, Dowlais, £18,979.

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NORTHAMPTONSHIRE.—For the supply of broken granite, for the county council.—Mr. C. S. Norris, county surveyor:—

| | Tons. |
|---|---|
| B. J. Forder & Son, Limited, London | 4,505 |
| Ellis & Everard, Leicester | 4,320 |
| Enderby and Stoney Stanton Granite Company, Leicester | 3,935 |
| W. L. Ireland, Atherstone | 3,260 |
| Whitwick Granite Company, Leicester | 3,000 |
| Charnwood Granite Company, Loughborough | 2,515 |
| Groby Granite Company, Leicester | 1,385 |
| Forest Rock Granite Company, Leicester | 1,230 |
| Clee Hill Granite Company, Ludlow, Salop | 700 |
| Mountsorrel Granite Company, Loughborough | 635 |
| Abdon Clee Granite Company, Bridgnorth, Salop | 580 |
| Midland Quarry Company, Nuneaton | 565 |
| Judkins, Limited, Nuneaton | 250 |
| W. Boon & Son, Nuneaton | 190 |
| C. Abell & Company, Atherstone | 190 |
| Jee's Hartshill Granite Company, Atherstone | 190 |

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PONTYPRIDD.—For the construction of a concrete wall, for the urban district council:—

| | |
|---|---|
| W. & J. R. Watson, Limited, Bridgend | £2,210 |
| Mackay & Davies, Cardiff | 1,973 |
| T. J. Davies & Co., Penarth | 1,961 |
| Barnes, Chaplin & Co., Cardiff | 1,884 |
| W. J. Davies, Pontypridd | 1,836 |
| G. L. Morgan, Pontypridd | 1,790 |
| J. Sutherland, Abercynon | 1,722 |
| A. G. Collins & Co., Barry | 1,720 |
| H. Murray, Pontypridd | 1,719 |
| H. Smith, Newport | 1,680 |
| A. Hyslop, Manchester | 1,643 |
| A. J. Seaton, Pontypridd* | 1,458 |

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SANDOWN.—Accepted for raising a road, for the urban district council.—L. G. Dashper, surveyor:—

J. Jones, Sandown.

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SOUTH SHIELDS.—For the erection of nine sewer ventilating shafts, for the rural district council:—

| | |
|---|---|
| J. Barras, South Shields | £76 |
| G. Wells, Sunderland | 66 |
| J. Davidson, East Boldon | 57 |
| T. J. Purdy, Monkwearmouth | 57 |
| J. Elliott, Cleadon | 52 |
| J. Hornsby, Junr., East Boldon* | 18 |

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SWINTON.—For the supply of cast-iron water mains, for the urban district council:—

| | Per ton. £ s. |
|---|---|
| McLaren & Co., Glasgow | 5 17 |
| Staveley Coal & Iron Company, Chesterfield* | 5 8 |
| J. Oakes & Co., Alfreton | 5 8 |
| Stanton Ironworks Company, Nottingham | 5 8 |
| Clay Cross Company, Chesterfield | 5 8 |
| Sheepbridge Coal and Iron Company, Sheepbridge | 5 8 |
| Holwell Iron Company, Melton Mowbray | 5 8 |
| Cochrane & Co., Middlesbrough | 5 8 |
| Allan & Sons, Thornaby-on-Tees | 4 18 |

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WEST SUSSEX.—For alterations to the Funtington School, for the Joint Education Committee:—

| | |
|---|---|
| E. Hill, Littlehampton | £522 |
| J. Tanner, Havant | 517 |
| W. R. Smith, Westbourne | 470 |
| H. W. Wiggins, Emsworth* | 460 |

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WORTLEY.—Accepted for the laying of stoneware pipe sewers, &c., for the rural district council:—

Worrall Outfall Sewer.—J. E. Wadin, Sheffield, £640.
Pilley Sewer.—J. E. Wadin, Sheffield, £214.

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## MEETINGS

*Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.*

MARCH.

1.—Institution of Civil Engineers (Students' Meeting): Mr. H. J. F. Gourley on "The Design and Construction of Masonry Dams." 8 p.m.

4.—Royal Institute of British Architects: Election of Royal Gold Medallist. 8 p.m.

4.—Society of Engineers: Mr. Henry C. Adams on "The Trolley Vehicle System of Railless Traction," Institution of Electrical Engineers, 7.30 p.m.

6.—Institution of Civil Engineers: Students' visit to the Associated Portland Cement Manufacturers' Works, Swanscombe, Kent.

6.—Institution of Municipal Engineers: Discussion on "Methods of Inviting Public Tenders." Institution Offices, 7 p.m.

7.—Society of Architects: Mr. A. Alban H. Scott, M.S.A.S.E., on "The Testing of Materials." 8 p.m.

9.—Opening of Building Trades Exhibition, Rusholme, Manchester.

11.—Institute of Sanitary Engineers: Mr. Percival M. Fraser, A.M.I.M.A. on "The Modern Home." Caxton Hall, Westminster, S.W.1.

19.—Institution of Municipal Engineers: Discussion on "The Size and Design of Street Gullies, Grates and Weirs."

## APPOINTMENTS OPEN.

DENBY AND CUMBERWORTH URBAN DISTRICT COUNCIL.

Wanted, by the above Council, an experienced Working Road Surveyor, able also to superintend the Waterworks and Sewerage Undertakings of the Council. Applications, in candidate's own handwriting, endorsed "Surveyor," enclosing copies only of two testimonials of recent date, and stating salary required, will be received by me, the undersigned, up to 7 o'clock p.m. on Wednesday, March 13th, 1912.

The person appointed will be required to keep in proper order and date all the accounts prescribed by the Orders of the Local Government Board relating to his departments, and must if required be able to produce evidence of his ability to do so.

Canvassing the members of the Council for this appointment, either personally or by deputy, will be deemed a disqualification.

(By order)

WILFRID BARNES,
Clerk to Council.

Denby Dale,
February 22, 1912.

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URBAN DISTRICT COUNCIL OF HESTON AND ISLEWORTH.

TEMPORARY ASSISTANT SURVEYOR'S DEPARTMENT.

A Temporary Assistant is required in the Surveyor's Department of the above Council for a period of not less than six months.

Candidates must be fully qualified by experience to Survey and to revise Ordnance Shee'ts. The person appointed will be required to assist in the preparation of a Town Planning Scheme.

The salary will be at the rate of £3 3s. per week.

Applications, endorsed "Temporary Assistant," and accompanied by copies of not more than three recent testimonials, must reach the undersigned not later than noon on Wednesday, the 6th March, 1912.

H. J. BAKER,
Clerk to the Council.

Council House,
Hounslow.
February, 1912.

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TEMPORARY ASSISTANT wanted in a Borough Engineer's Office in London, salary £2 2s. per week, must be good draughtsman and accurate leveller.—Applications, with copies of three testimonials, stating age, experience, &c., to be sent to Box 1,136, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

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ROAD OVERSEER.—Wanted, after 31st March, to take charge of about 30 miles of roads in Belfast Rural District (cyclist); wages 30s. per week. Applicants should state age and experience, and give references to present or former employers, or furnish copies of testimonials. County Surveyor, County Courthouse, Belfast.

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COUNTY BOROUGH OF STOKE ON TRENT.

BOROUGH SURVEYOR'S DEPARTMENT.

The Corporation invite applications for the appointment of a Junior Assistant in the Borough Surveyor's Office, at a salary of £75 per annum.

Applicants must be neat and expert tracers, Draughtsmen, and accurate Surveyors and Levellers.

Applications, stating age and experience, accompanied by not more than three recent testimonials, and endorsed "Junior Assistant," must be sent to me on or before Tuesday, 5th March, 1912.

Preference will be given to candidates who have had experience in a Borough Surveyor's Office.

Canvassing, directly or indirectly, will be a disqualification.

A. BURTON, A.M.I.C.E., F.S.I.,
Borough Surveyor.

Town Hall,
Stoke-on-Trent.
February 27, 1912.

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WANTED at once in Surveyor's Office of Urban District Council in Berks, a Pupil for three years, with premium. This is a good opportunity for a smart boy direct from school.—Apply Box 1,139, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

EAST SUFFOLK COUNTY COUNCIL.
Wanted, several competent men as Working Foremen of gang employed on Pitch-grouting Macadam Work.

Apply by letter, not later than 6th March, stating experience in the maintenance of roads, laying of macadam, surface tarring, kerbing, &c., and giving age, wages required, and references, to Chief Surveyor of Main Road, County Hall, Ipswich.

AGENTS required in unrepresented districts for the Imperial Accident Insurance Co., Ltd. Est. 1878. Horses Insured against Death from Accident or Disease, Mares for Foaling and Loss of Foals; Farmers' Liability for Accidents to Labourers, Servants, and Workmen's Compensation. Claims paid, £500,000. Address Agency Manager, 17 Pall Mall East, London, S.W.

## TENDERS WANTED.

NEATH RURAL DISTRICT COUNCIL.

*SEWERAGE AND SEWAGE DISPOSAL WORKS.*

TO CONTRACTORS AND OTHERS.

The Council are prepared to receive Tenders from Persons desirous of Contracting with them for the Construction of Detritus Tanks, Settling Tanks for Continuous-flow Treatment, Storm-Water Tanks, Effluent Tanks, Bacteriological Filter-Beds, Automatic Mechanical Distributors of the Sewage over the Beds, the Laying of about 224 yards of 12-in. Sewer, 1,052 yards of 9-in. Sewers, and 3,317 yards of 7-in. Sewers, together with the necessary Manholes, Flushing Chambers, Vent Shafts, and other appurtenances.

Plans and Specifications, Bills of Quantities, Schedule of Prices, Form of Tender, and Conditions of Contract may be obtained of the Engineer, Mr. W. E. Clason Thomas, A.M.I.C.E., Engineer and Surveyor to the Council, District Council Offices, Orchard Street, Neath, on deposit of a Five Pound Bank of England Note, which will be returned to the tenderer on receipt of a *bonâ-fide* Tender, and return of all documents and the prices completely entered in the Bills of Quantities, &c.

The Contractor must agree to pay all employees in carrying out these works the recognised rate of wages of the respective trades, and, further, he shall insure at his own expense such employees against accidents under the Workmen's Compensation Acts in a substantial Insurance Office.

The Contractor to state what works of a similar character he has carried out.

Sealed Tenders, on the forms supplied, endorsed "Tender for Resolven Sewerage Works," are to be delivered at our office at 58 Water-street, Neath, not later than 12 o'clock noon on Saturday, 9th March.

The Council do not bind themselves to accept the lowest or any Tender.

CUTHBERTSON & POWELL,
Clerks.

58 Water-street, Neath.
February, 1912.

COUNTY BOROUGH OF WEST HAM.
TO BUILDING CONTRACTORS.

The Council hereby invite Tenders for the Erection of a Building to contain 12 Slipper Baths, with Waiting Room, &c., in Fen-street, Tidal Basin.

Specification, Form of Tender, and further particulars may be obtained at the office of Mr. John G. Morley, Borough Engineer, Town Hall, West Ham, E., upon payment of One Pound, which will be returned upon receipt of a *bonâ-fide* Tender.

Note.—No Tender will be considered unless the same is delivered at the office of the Town Clerk, Town Hall, West Ham, E., in the envelope supplied, by registered post, not later than 4 o'clock p.m. on Tuesday, 12th March, 1912.

The Council do not bind themselves to accept the lowest or any Tender. The Contractor will be required to enter into a bond, with one surety, for the due performance of the contract, and no work will be ordered under the contract until such bond has been duly executed.

The Contractor whose Tender is accepted, and with whom a contract is entered into, will be required to pay the whole of his workmen such rate of wages, and observe such hours of labour, as are recognised by the Workmen's Trade Unions, and shall not assign, nor under-let, or make a sub-contract with any person or persons for the execution of any part of such work. In the event of any breach of such agreement the Council will enforce the penalty clause in its entirety.

(By order of the Council)
FRED. E. HILLEARY,
Town Clerk.

Town Hall,
West Ham, E.
February 23, 1912.

BOROUGH OF COLNE.
The Highways and Streets Committee of the Borough of Colne are prepared to receive Tenders for the Supply and Delivery of the following Materials for the twelve months ending 31st March, 1913:—

| | |
|---|---|
| Cement. | Team Labour. |
| Granite Macadam. | Pitch. |
| Limestone Macadam. | Creosote Oil. |
| Lime. | Earthenware Pipes and Gulleys. |
| Ironwork (Street Crates, Manhole and Lamphole Covers). | Brushes. |
| Repair of Highways. | Leading Limestone. |

Specification and Forms of Tender and other information may be obtained on application at the Office of the Borough Surveyor, Mr. T. H. Hartley, and Tenders addressed to the Chairman of the Highways and Streets Committee, properly endorsed, must be delivered at his Office not later than 10 a.m. on March 9th, 1912.

The Committee do not bind themselves to accept the lowest or any Tender, and persons tendering must do so at their own cost.

(By order)
ALF. VARLEY,
Town Clerk.

Town Hall,
Colne, Lancs.
February 22, 1912.

CITY OF COVENTRY.
WATERWORKS STORES (CAST-IRON PIPES, LEAD PIPES, SOLDER, Etc.).

The Waterworks and Fire Brigade Committee of the Corporation of the City of Coventry invite Tenders for the Supply and Delivery of Cast-iron Pipes, Lead Pipes, Solder, Hydrant and Valve Boxes, &c., for the year ending 31st March, 1913.

Form of Tender and full particulars may be obtained, and Samples inspected, on application to the undersigned.

Tenders are to be delivered at the Water Engineer's Office, St. Mary's Hall, Coventry, on or before 10 a.m. on Saturday, the 9th day of March, 1912, sealed and endorsed "Tender for Waterworks Stores."

The lowest or any Tender will not necessarily be accepted, and no Tender will be considered which is not made out on the form supplied.

J. E. SWINDLEHURST, M.Inst.C.E.,
Water Engineer.

Saint Mary's Hall,
February 22, 1912.

CITY OF COVENTRY.
CONTRACT FOR MATERIALS.

The General Works Committee of the Corporation of the City of Coventry invite Tenders for the Supply and Delivery of the following Materials during the year ending 31st March, 1913:—

Broken Road Stone.
Granite Kerbs.
Granite Setts.
Stoneware Pipes.
Castings.
Workmen's Tools.

Form of Tender and full particulars may be obtained, and samples inspected, on application to the undersigned.

Tenders to be delivered to the City Engineer's Office on or before 10 a.m. on Saturday, the 16th day of March, 1912, sealed and endorsed "Tender for Materials."

The lowest or any Tender will not necessarily be accepted, and no Tender will be considered that is not made out on the form supplied.

J. E. SWINDLEHURST, M.Inst.C.E.,
City Engineer and Surveyor.

Saint Mary's Hall,
February 22, 1912.

## RURAL DISTRICT COUNCIL OF DARTFORD.

### ROAD MATERIALS, MAINTENANCE, AND STEAM ROLLING.

The Rural District Council of Dartford invite Tenders for the Supply of the under-mentioned Materials, and for the Maintenance and Repair and the Steam Rolling of the District Roads under their jurisdiction for One Year, from the 1st April, 1912, to the 31st March, 1913, as follows:—

(1) MATERIALS.

(*a*) The Supply and Delivery to Wharves and Railway Stations, as required, of about 4,220 tons of Broken Hard Stone of one of the following kinds: Rhenish Basalt, Guernsey Granite, Clee Hill Basalt, Leicestershire Granites, Cornish Granites, Penmaenmawr, or other North Wales Granite, Quartzite, Quenast, or other durable material.

The Hard Stone to be supplied must be of the best description, and samples of the same must be deposited with the Tenders. Each sample to be marked with the name of the Contractor and the description of the material.

(*b*) The Supply and Delivery to roadsides of about 7,000 cubic yards of Unbroken Flints, about 1,000 cubic yards of Broken Kentish Ragstone or Sevenoaks Rock, and about 500 yards of Gravel. The Ragstone or Rock and Gravel to be squared ready for measurement.

(2) MAINTENANCE AND REPAIR.

(*a*) All Labour in connection with the proper Scavenging and Removal of Mud, &c., Water Tabling with Removal of Silt Sidings, &c., Breaking and Yarding of Flints, and Spreading of all the Material, and all other Labour in connection with the proper Maintenance of the Roads and the Footpaths adjoining them.

(*b*) The Haulage of Broken Hard Stone from the Wharves and Stations, and other Materials from the Depots to the required places in the District.

(*c*) The Tar-painting of Roads, Paths, and Channels where required at per superficial yard.

(3) STEAM ROLLING.

The Steam Rolling and Setting of the above-mentioned quantities of materials (more or less). Tenders to include the providing of Rollers, Water, Coal-, Engine Driver, and Attendant.

Contractors must provide an approved surety for the due performance of the contract.

Forms of Tender, with Specification (which will show the Sub-Division of the District), can be obtained upon application to the Surveyor, Mr. John Hookins, "Gartly," Dartford.

Sealed Tenders, endorsed "Tender for Highways," must be sent to the undersigned upon the prescribed form), not later than 12 o'clock noon, on Saturday, the 16th day of March, 1912.

The Council do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to accept the whole or any portion of a Tender.

(By order)

EUSTACE J. HOBBS
Clerk to the Council.

Sessions House, Dartford.
February 20, 1912.

## BARNET URBAN DISTRICT COUNCIL.

*TO CONTRACTORS.*

PRIVATE STREET WORKS ACT, 1892.

The Council invite Tenders for the Making Up, under the above Act, of the Private Street within their District known as Bedford-avenue (2nd portion).

Plan and Specification can be seen, and all information obtained, on application to Mr. W. F. Wilkins, Surveyor to the Council at his Office, No. 40 High-street, Barnet, any day during office hours.

Tenders, sealed and endorsed "Tender for Bedford-avenue," are to be addressed to me and delivered at the Council's Offices, No. 40 High-street, Barnet, on or before Wednesday, March 27, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

HY. W. POOLE,
Clerk of the Council.

Barnet.
February 26, 1912.

## BOROUGH OF SUTTON COLDFIELD.

### ANNUAL CONTRACTS.

The Corporation are prepared to receive Tenders for the Supply of the following Materials during the year ending March 31st, 1913:—

No. 1. Granite Macadam and Kerb.
2. Limestone Macadam and Setts.
3. Gravel and Broken Pebble Stones.
4. Yorkshire or Pennant Kerb.
5. Rowley Setts.
6. Earthenware Pipes.
7. Cement and Lime.
8. Iron Castings.
9. Iron and Steel.
10. Timber.
11. Hardware.
12. Oils and Paints.
13. Bass Brooms.

Conditions of Contract and Forms of Tender may be obtained on application to the undersigned.

Sealed Tenders, on the Forms supplied, to be sent in not later than Tuesday, the 19th of March, 1912, endorsed "Tender for Materials."

The Corporation do not bind themselves to accept the lowest or any Tender.

W. A. H. CLARRY, A.M.INST.C.E.,
Borough Surveyor.

The Council House, Sutton Coldfield.
February 22, 1912.

## HARTISMERE RURAL DISTRICT COUNCIL.

### GRANITE AND PIT STONES.

The above-named Council invite Tenders for the Supply of about 2,450 tons of 1¾-in. Granite and 2,470 tons of Pit Stones, to be delivered as required at the following Stations:—

Diss, Eye, Finningham and Mellis, on the Great Eastern Railway.

Aspall, Mendlesham and Brockford, on the Mid-Suffolk Light Railway.

Samples of Materials to be sent, carriage paid, to the Master of the Workhouse, Eye.

Tenders to be sent to the undersigned not later than Wednesday, the 13th March, 1912.

No Form of Tender is issued.

The Council do not bind themselves to accept the lowest or any Tender.

HAROLD WARNES (Solicitor),
Clerk to the Council.

Eye, Suffolk.
February 27, 1912.

## TO CONTRACTORS AND OTHERS.

THE COUNCIL OF THE METROPOLITAN BOROUGH OF WANDSWORTH is prepared to receive Tenders for the Making Up and Paving of that part of Upper Richmond-road, Putney, which lies between Daylesford-avenue and Roehampton-lane.

The Specification and Drawings may be seen, and Forms of Tender obtained, of the Borough Engineer, at the office of the New Streets Department, No. 56 East-hill, Wandsworth, S.W., between the hours of 10 and 4 (Saturdays 10 and 12), upon payment of a deposit of Five Guineas.

Tenders, enclosed in sealed envelopes, and endorsed "Tender for Paving Upper Richmond-road (4)," must be delivered at the Council House, East-hill, Wandsworth, S.W., and may be placed by the person tendering in the box provided for the purpose, not later than 4 o'clock in the afternoon of Monday, the 11th March next.

Persons tendering must, in the case of all workmen employed by them in and about the execution of the contract, pay wages at not less, and observe hours of labour not greater, than the rates and hours recognised by the Associations of Employers and Employees and in practice obtained in the district where the work is to be executed.

No Tender will be received unless it be made upon one of the forms provided for the purpose. The Council does not pledge itself to accept the lowest or any Tender. If required the Contractor must provide two sureties for the due execution of the contract.

HENRY GEORGE HILLS.
Town Clerk.

Council House,
Wandsworth, S.W.
February 26, 1912.

## BOROUGH OF EASTBOURNE.

The Town Council of Eastbourne invite Tenders as follows:

For the Supply of
- Portland Cement.
- Cast-iron Goods.
- Wrought-iron Goods.
- Tools, &c.
- Ironmongery (Miscellaneous).
- Oils and Colours.
- Timber.
- Broken Granite.
- Granite Kerb and Setts.
- Bricks.
- Pipes, Junctions, &c. (Stoneware).
- Brooms, Brushes, &c.

Specifications may be seen, and Forms of Tender obtained, at the Borough Surveyor's Office, Town Hall, Eastbourne.

All Tenders must be received by the undersigned on or before Monday, the 11th day of March, 1912, at noon.

No tender will be considered unless sent in on the proper Form.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

A. ERNEST PRESCOTT,
Borough Surveyor

Dated this 20th day of February, 1912.

## BOROUGH OF EALING.

PRIVATE STREET IMPROVEMENTS.

The Town Council of this Borough hereby invites Tenders for the Making Up of the following Road:—

Midhurst-road (from southern end to No. 72).

The Drawings and Specifications may be seen, and Forms of Tender, together with Schedule of Quantities and other particulars obtained, from Mr. Charles Jones, M.INST.C.E., Borough Engineer, Town Hall, Ealing, W. any day during office hours, upon payment of a deposit of 10s. 6d., which will be returned upon receipt of a *bonâ-fide* Tender.

Sealed Tenders, in the envelopes provided, endorsed "Tender for Making Up ——," must be delivered at my Office not later than 9.30 a.m. on Tuesday, the 5th day of March, 1912.

The Council does not bind itself to accept the lowest or any Tender.

Dated this 22nd day of February, 1912.

(By order of the Council)

GEO. E. BRYDGES,
Town Clerk.

Town Clerk's Office,
Town Hall, Ealing, W.

## GAINSBOROUGH URBAN DISTRICT COUNCIL.

ANNUAL CONTRACTS, 1912-13.

The Urban District Council are prepared to receive Tenders for the Supply and Delivery of the undermentioned Materials, as may from time to time be ordered, during the year ending 31st March, 1913:—

1. Broken Granite, Syenite, or Whinstone Macadam.
2. Granite, Syenite, or Whinstone Setts.
3. Broken and Block Slag, Slag Chippings and Dust.
4. York Setts, Kerbs, Channels and Flags.
5. Concrete Flags.
6. Stoneware and Earthenware Pipes, Gullies, &c.
7. Cast-iron Pipes.
8. Tar-Macadam.
9. Pitch and Creosote Oil.
10. Portland Cement.

Specification and Forms of Tender may be obtained by written application, addressed to the undersigned.

Sealed Tenders, endorsed "Tender for ——," accompanied by Samples of the Materials to be supplied (except Nos. 4, 7, 8, 9, 10), to be delivered at the Office of Mr. Dearmin M. Robie, Clerk to the Council, 6 Lord-street, Gainsborough, not later than Friday, 15th March next.

The Council do not bind themselves to accept the lowest or any Tender.

SAM W. PARKER,
Engineer and Surveyor.

Council Offices, Gainsborough.
February 21, 1912.

## EAST HAM CORPORATION.

ANNUAL SUPPLIES.

The Corporation of East Ham invite Tenders for the aftermentioned Supplies, and for executing the following Work, for the period ending 31st March, 1913:

- Glazed Stoneware Pipes.
- Glazed Stoneware Gulley Fittings (London make).
- Portland Cement.
- Greystone, Chalk and Ground Limes.
- Lime for Sewage Precipitation.
- Stock and other Bricks.
- Thames Ballast, Sand, &c.
- Coal and Coke.
- Engineer's Sundries (Oils, Colours, Painters' Brushes, &c.), for Borough Engineer's Department.
- Engine-room Stores, Brushes, &c. (for Electric Lighting and Tramways Department).
- Ironmongery (for Electric Lighting and Tramways Department).
- Painter's Requisites (for Electric Lighting and Tramways Department).
- Broken Granite.
- Crushed Granite.
- Granite Setts.
- Guernsey Granite Chippings.
- Granite Kerb.
- Broken Flints.
- Cast-iron Work, Gulleys, &c.
- Shovels, Brooms, Picks and Handles.
- Disinfectants.
- Oilskins.
- Hire of Horses and Carts for Watering Streets.
- Hire of Horses and Carts for General Cartages.
- Uniforms for Firemen, &c.
- Uniforms for Tramway Employees.
- Sewer Ventilating Columns.
- Paving Flags.
- Boots, Sewer Smocks, &c.
- Veterinary Attendance on and Shoeing Horses.
- Provender.
- Relighting and Repair of Street Lamps.
- Jarrah Wood Blocks.
- Receiving, Sorting and Levelling Refuse at Destructor Works.
- Removal of Tinware from Destructor Works.
- Window Cleaning.
- Cleaning Eaves and Gutters.
- Newspapers and Periodicals.
- Sweeping Chimneys.

Particulars and Forms of Tender may be obtained upon application at the Office of the undersigned, or by forwarding an addressed envelope (foolscap size), duly stamped.

The person or persons whose Tender is accepted will be required to observe and fulfil the obligations upon Contractors specified in the Fair Wages resolution adopted by the House of Commons on the 10th March, 1909, which is fully set forth in the Form of Tender, and to enter into a contract with a bond for the due performance thereof.

Tenders to be sent in addressed to His Worship the Mayor, Town Hall, East Ham, E., and endorsed according to the supply or work tendered for, not later than 12 o'clock noon of Saturday, the 16th day of March, 1912.

The Corporation does not bind itself to accept the lowest or any Tender.

(By order)

C. EUSTACE WILSON,
Town Clerk.

Town Hall,
East Ham, E.
February 26, 1912.

## PENRITH URBAN DISTRICT COUNCIL.

MOTOR WAGON, ETC.

The above-named Council invite Tenders for a Steam or Petrol Motor Wagon, Trailer, and Water Van.

Makers are to supply their own details and full Specifications.

Further information and Form of Tender may be obtained from the Surveyor.

Last date for receipt of Tenders is March 30th, 1912.

GEORGE WAINWRIGHT,
Clerk.

Town Hall,
Penrith.
March 1, 1912.

## WING RURAL DISTRICT COUNCIL.
### TO GRANITE MERCHANTS AND OTHERS.

Tenders are invited for the Supply and Delivery of 1,500 tons of Granite, and 1,200 tons Slag, Sand and Gravel, at the various Stations and Wharves in the district (including unloading and wharfage charges), to be delivered as required.

Tender forms may be obtained from the Surveyor, Mr. M. G. Gurney, Linslade, Leighton Buzzard, and to be forwarded to me not later than Monday, the 11th day of March, endorsed "Tenders for Materials."

No pledge is given to accept any Tender.

Samples required to be sent at the same time, to Mr. Gurney as above.

C. W. B. CALCOTT,
Clerk to the Council.

Leighton Buzzard.
February 16, 1912.

## MANCHESTER CORPORATION.

The Rivers Committee invite Tenders for the Construction of Main Drainage Work No. 10 (Upper Moss-lane, Parsonage-street, Moss-lane East, and Wilmslow-road Intercepting Sewer).

Plans may be seen, and Specification, Bill of Quantities, and Form of Tender obtained, on application at the City Surveyor's Office, Town Hall, Manchester, on payment to the City Treasurer of the sum of £10 10s., which sum will, after the Corporation have come to a decision upon the Tenders received, but not before, be returned to the person submitting a *bonâ-fide* Tender.

All cheques or postal orders are to be made payable to the order of "The Corporation of Manchester." Tenders, enclosed in the official envelope, and addressed to the Chairman of the Rivers Committee, are to be delivered at the City Surveyor's Office not later than 10 a.m. on Friday, March 15th, 1912.

The Corporation do not bind themselves to accept the lowest or any Tender.

THOMAS HUDSON,
Town Clerk.

Town Hall, Manchester.
March 1, 1912.


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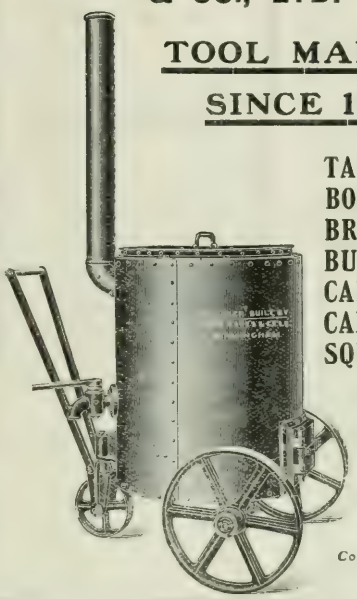

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THE **RANSOME** NUMBER **IS** ROW **A** STAND NO. **1**

*The exhibit will be of particular interest to Architects, Surveyors, Engineers and Contractors, as it will include*

**TAR-MACADAM MIXER** as supplied to the Southport Corporation,
**CONCRETE MIXER** as used on the new C.P.A building, Manchester,
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**LONDON, S.W.**

TELEPHONE: 2188 VICTORIA.
TELEGRAMS: "VERMEHRICO, LONDON."

COUNTY OF ARMAGH.

The County Council invite Tenders for:—

One 8-ton Compound Road-roller.
One Sleeping Van.
One Water Cart.

Particulars and Forms of Tender may be obtained on application to Mr. R. H. Dorman, M.INST.C.E., County Surveyor, Armagh.

Sealed Tenders, endorsed "Tenders for Road Plant," to reach undersigned not later than the 9th March, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

JOSEPH ATKINSON,
Secretary to the Council.

February 24, 1912.

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LITTLEHAMPTON URBAN DISTRICT COUNCIL.

TO BUILDERS.

Tenders are invited for the Building and Completion of a Block of Stables and Cart Sheds, also a pair of Workmen's Cottages, together with Boundary Walling and other works on the site of proposed Sewerage Pumping Station, north of the Littlehampton Gasworks.

Drawings, with Specification, can be seen, and Form of Tender obtained, on application to the Council's Surveyor, Mr. H. Howard, M.S.A., Town Offices, Littlehampton. A Bill of Quantities can also be supplied from that office at the same time on payment of One Guinea, which will be returned on the receipt of a *bonâ-fide* Tender. Approved security will be required.

Sealed Tenders, marked "Stables and Cottages," to be sent to me on or before Thursday, the 14th March next.

The lowest or any Tender will not necessarily be accepted.

ARTHUR SHELLEY,
Clerk to the Council.

Littlehampton.
February 24, 1912.

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LITTLEHAMPTON URBAN DISTRICT COUNCIL.

*SEWERAGE WORKS.*

CONTRACT No. 1.

The above Council desire to receive Tenders for the Construction of about 5,000 lineal yards of 15, 12, 10, 9, 8 and 6 inch Earthenware Pipe Sewers, with Manholes, &c.; also 40-inch Cast-Iron Outfall Sewer, Storage Tank, Piling, Roads and other works.

Drawings may be seen, and Specification and Quantities, with Form of Tender, obtained, at the office of the Engineer, Mr. H. A. Johnson, M.INST.C.E., 15 The Exchange, Bradford, or at the office of the undersigned, on payment of a deposit of Ten Guineas, which will only be returned on a *bonâ-fide* Tender being sent in, in accordance with the Specification.

Sealed Tenders, marked "Sewerage," to be sent to me on or before Thursday, the 14th day of March, 1912.

The lowest or any Tender will not necessarily be accepted.

ARTHUR SHELLEY,
Clerk to the Council.

Littlehampton.
February 24, 1912.

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## PREPARATION FOR EXAMINATIONS.

## MUNICIPAL AND COUNTY ENGINEERS' EXAMINATION.

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*Patentees and Makers:* **BELL BROS., Ravensthorpe, YORKS.**

# The Surveyor

And Municipal and County Engineer.

Vol. XLI. MARCH 8, 1912. No. 1,051.

## Minutes of Proceedings.

**Safe Velocities in Aqueducts.**

The maximum velocities which engineers allow for water flowing in straight, smooth aqueducts are often much less than those which the materials lining the aqueducts will really bear, and this sometimes results in the first cost of an aqueduct being higher than it ought to be. When water is flowing in a straight, smooth channel, the velocities, as shown by velocity curves for lines across the channel, vertically and horizontally, fall rapidly as the sides and bottom are approached, and, indeed, there is often a skin of practically still water on these surfaces. Any considerable projection from the surface of the lining, or any substantial interference with the current, will disturb this condition, and the currents, actually impinging on the lining, will then wear it rapidly if the average velocity of the stream is such that the actual velocity of such a current is above some fairly definite figure depending upon the materials employed. Since these actual velocities depend upon the average velocity of the current and upon the amount of obstruction—or the sharpness of twists and bends—it is clearly an error to assign limiting velocities for certain materials regardless of the form of the channel. The engineer will usually be safe if, for a current without excessive turmoil or very abrupt obstruction, he adopts the limiting vehicles usually allowed; but he will be by no means courting difficulties if he allows very much higher velocities for the straight parts of an aqueduct.

In irrigation works in flat countries, or main irrigation canals with limited fall, the head required to produce such a velocity may be more valuable than the saving in cost made possible by building the straight part of the aqueduct with a smaller channel—the engineer saves concrete, but he loses acres. In addition, the water may flow out of the aqueduct with a central stream of high velocity which will disturb the earth channel down stream. In many situations, however, the reduction in the size of the straight part of an aqueduct is clear gain, and there is ample head to give the desired velocity, and in these cases velocities very much higher than those usually allowed may often be safely used. As regards the velocities which may be allowed for water flowing over concrete, some interesting information is given in a recent issue of *Engineering News* by Mr. A. P. Davis, chief engineer of the United States Reclamation Service. In the case of a dam with an ogee overflow, Mr. Davis found that a velocity which must sometimes have reached 70 ft. per second at the foot of the 100-ft. slide caused no actual damage, although the water carried a good deal of sand. In another case, velocities up to about 10 ft. per second down a slope had caused no perceptible damage, and on another concrete slope, where the velocities must have exceeded 20 ft. per second, a slimy moss accumulated on the surface of the concrete under the water.

The most striking example, however, was that afforded by a conduit under the Pathfinder dam, 4 ft. by 6 ft., tapering to 4 ft. by 4 ft. at the lower end, through which water was discharging for nearly six months under a head of more than 150 ft. Measurements of discharge showed that the velocity during this period was from 75 to 90 ft. per second, yet the concrete was uninjured and still showed marks of the forms. Another outlet, however, a tunnel, was badly injured, nearly all its steel lining being torn out, and the concrete backing carried away. The essential difference between the two outlets is that the tunnel is provided with gates of about half the cross-sectional area of the tunnel itself, producing violent turmoil and severe cross-currents under the great head of water. Mr. Davis concludes that where clear water can be made to glide smoothly over concrete "without disturbing its velocity or abruptly changing its direction, there is no practical limit to the velocities that can be permitted without harm." His other conclusion, that concrete subjected to the impact of water under high velocity is rapidly eroded, is, of course, in conformity with ordinary experience; but we may add that the importance in such a case of either limiting the velocity or smoothing the passage or bend is not always fully grasped. There are conditions under which the usual limiting velocities are too high as well as those, already considered, where they are too low.

* * *

**The Chemistry of Highway Engineering.**

Mr. Prévost Hubbard, who is in charge of the roads and pavements branch of the work of the Institute of Industrial Research at Washington, has kindly sent us a copy of an address which he read lately before the American Association for the Advancement of Science. We are printing this address in another part of the present issue, and we commend it to the notice of our readers as a careful and conscientious study of the relations between chemistry and highway engineering, and of the shares which the engineer and the chemist respectively should take in the work of studying the chemical properties of materials used in making road crusts. We are fully in accord with Mr. Hubbard's view that the chemist has an important part to play in the development of highway engineering. The engineer who is closely occupied with the regular work of road maintenance may or may not carry out some of the simpler physical and chemical tests for himself; but most of them as an ordinary matter, and all of them occasionally, will seek the aid of the specialist in such matters. In some cases this specialist will be a consulting engineer, and the nature and extent of the work of physical and chemical testing which such an engineer will carry out will depend, of course, upon the qualifications which he and his staff possess, and on the extent of his resources in the matter of chemical and physical laboratories. Such a consulting engineer will, however, be fully alive to the value of the information which a professional chemist can give him in difficult cases.

specially in the matter of analysis, and under conditions as they are developing to-day the consulting chemist should have a good deal to do, analysing and testing materials sent directly to him by highway engineers, and, either as consultant or in directing the work of the consulting engineer's chemical laboratory, dealing with the chemical side of reports on materials sent to consulting highway engineers. We should like to encourage the man on the spot to make such simple tests, both physical and chemical, as are permitted by his means and qualifications, and we should be sorry to say anything which would lessen his reliance upon judgment and actual experience; but, as Mr. Hubbard shows so clearly in his valuable paper, the work of the highly-skilled chemist may greatly aid the practical work of highway engineers, who should not fail to have recourse to exact analysis or delicate physical tests when the circumstances suggest it.

In comparing an engineer's specification to a medical prescription Mr. Hubbard takes into account just those facts which formed the basis of recent remarks of our own on this subject. The use of a medical prescription for a kind of sickness different from that for which the prescription was written may be successful if the patient has faith in the remedy; but the engineer cannot transmit his faith in a specification to the materials of a road crust, which must behave strictly according to natural laws. There are several "faith cures" for the ills of highways—but they don't work. The study of papers such as this useful address provides a valuable corrective to "specifics" of this character.

* * *

**Road Improvement in Ceylon.**

In his report for the year 1910-11, the director of public works in Ceylon, the Hon. F. A. Cooper, C.M.G., M.INST.C.E., gives particulars, among other matters, of the cost of road administration in the island. There are, it appears, 3,839 miles of roads in Ceylon, classified into metalled, 2,640 miles; track-metalled, 303 miles; gravelled, 548 miles; natural, 346. The average cost of upkeep, translated into English currency, may be given thus: Metalled roads, £61 per mile; gravelled roads, £28 per mile; natural roads £8 per mile. The conditions of Ceylon as to climate, and the cost of labour and materials, differ in so many respects to our own, that these figures offer few, if any, criteria of comparison with the upkeep of roads in this country, and it is only necessary, therefore, to point out that, as with us, the cost of maintenance will increase with the demand for a higher standard of efficiency in road management. Mr. Cooper is hopeful that the more general introduction of steam rollers to replace the rollers drawn by bulls will bring about a marked improvement in the surface of some of the roads, and reduce the time taken in consolidating newly-spread road metal. There are at present fifteen 6-ton steam rollers and six 4-ton steam rollers in use by the Department of Public Works, and it is hoped that the number of 6-ton steam rollers will be increased to twenty-seven during the ensuing twelve months.

The report sheds an illuminating light upon the wear and tear caused by the heavy tractors and trailers that have come into vogue for the purposes of transport. "The results of introducing tractors and trailers with steel tyres," Mr. Cooper writes, "and axle loads reaching in some cases to 4 tons on the axle, clearly prove that the ordinary macadam surface, even though laid on a stone foundation, will not stand the wear and tear due to the continuous passage of these vehicles keeping to one track along the centre of the road. The roads being very narrow, and the subsidiary works not specially constructed to withstand vibration, much damage has been caused to retaining walls, parapet walls, and culverts." The metal surface of the roads, of course, requires widening; but meanwhile something is being done to meet existing conditions, as the Government has ordered, for experimental purposes, a motor lorry, width 5 ft. 6 in. over all, with wheels fitted with rubber tyres, the maximum axle load, fully loaded, not exceeding 3 tons, and hopes are entertained that vehicles of this type will be generally adopted. Mr. Cooper states that satisfactory results have been obtained from treating the roads in certain districts with "Gregsonite." The report, which in many directions affords evidence of a marked progressive development of public administration in Ceylon, records the completion of the Galle waterworks, which include a storage reservoir of a capacity of 700,000,000 gallons, providing for a daily supply of 350,000 gallons.

* * *

**The Proposed Western Approach Road to London.**

In our issue of February 16th we reported the holding of a conference at the offices of the Road Board, with the object of making clear the manner in which the Board may help the project. Sir George Gibb explained the financial position of the Board, and stated that, with respect to works of street improvement, their policy is to secure the execution of works of "great and general public utility" rather than to fritter away their funds to afford relief to expenditure on local works. He added that the scheme now in question seems to be that for which there is the strongest case, and mentioned £875,000 as the sum which the Board were likely to contribute towards the cost, which is at present estimated as £1,000,000 in the County of London and £750,000 in Middlesex. An important matter of principle is embodied in Sir George's statement that it seems both equitable and practically necessary that the local contribution should be relatively large where the cost of property is greatest, and he drew a distinction between the cost of acquiring property and that of executing works. In the present case the proposed contribution of one half may be partly for both purposes, and the various authorities will await with much interest the decision, which will come in due time when the project is further advanced, as to whether the Board will make an even mileage contribution or whether they will recognise a higher normal cost of property and preliminary work as justifying the payment of a higher mileage rate in the more thickly-populated parts. In full proportion of the actual cost they will not do this, as Sir George Gibb has explained, but they may perhaps recognise a higher normal cost as justifying a somewhat higher contribution. If the Board, as we hope they will in this and similar cases, make their contribution last, they will be able to take into account any unfair distribution of the burden, which may be found to exist after the other authorities have made their contributions. For the present the matter stands over until another conference is held.

* * *

**Is a Canal a "Building"?**

Questions as to the meaning of the term "building" as used in various Acts of Parliament have been a frequent cause of difference of opinion and consequent litigation. Usually, however, if not invariably, the dispute has arisen with respect to something in the nature of an erection, such as a hoarding, a wall, a conservatory, a pay-office on wheels, or a roundabout. In the recent case of *Regent's Canal and Dock Company v. London County Council* it was contended on behalf of the company that a canal was a building. The point was raised in connection with the widening of the bridge carrying the New North-road over the Regent's Canal, under the London County Council (Tramways and Improvements) Act, 1910, which incorporates the Lands Clauses Consolidation Act, 1845. The council proposed, in exercise of their

powers, to purchase compulsorily certain land belonging to the company on each side of the bridge. Now it is, of course, well known that under sec. 92 of the Lands Clauses Act no one can be required to sell or convey a part only of "any house or other building or manufactory" if he is willing and able to sell the whole thereof. The company contended that under this section they were not bound to sell the land required apart from the canal, but that the council were bound to purchase the canal in its entirety, because it constituted a single building. In deciding against this view of the matter, Mr. Justice Warrington, while admitting that in one sense the canal was a building, asked whether any ordinary person, looking at the statute, would say that it was a building within the meaning of that section, where the word is used in collocation with, and means something in the nature of, a house.

We certainly do not think that any impartial reader of the section would imagine that it applied to a canal, and there seems no reason in equity for thinking that it was ever intended to apply to such an undertaking.

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**The Salaries of Public Officials.**

The short article on "The Salaries of Public Officials" which appears in another column draws attention to an anomalous state of affairs, which, although well known to exist, has not hitherto attracted the attention which it deserves. The device of central control which the writer of the article advocates has very much to commend it, provided that it is hedged about with adequate safeguards. Local conditions vary so much that it would be extremely difficult to devise an equitable fixed scale based upon area, population, or rateable value. For instance, the work devolving upon the engineer to a comparatively small town having a progressive and up-to-date council would probably be far greater than that falling to the lot of the chief official in a much larger and more sleepy city. Again, much depends upon whether a district is fully developed or is in process of active expansion. The conditions under which the officials of local authorities work bear, in this respect, some analogy to those which have produced the miners' demand for a "minimum wage." In municipal work there are "abnormal and difficult places," demanding special treatment. Some improvement, however, on the existing absurd system would be made by giving power to the Local Government Board to lay down a scale of maximum and minimum salaries for chief officials, according to the character of their district. The duties and remuneration of subordinate officers would be very difficult to provide for in such a way, and short of complete central control, as obtains in regard to Poor Law officers, we do not think that the Local Government Board could usefully be given any power over the salaries of such officials. Of course, in the case of municipal engineers, some control over remuneration will doubtless be a corollary of Government protection, whenever that much-needed and long-delayed reform is brought to pass.

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**A Complete Vindication.**

Municipal engineers throughout the country will join in according heartiest congratulations to Mr. William Jones, Assoc.M.Inst.C.E., the surveyor and water engineer to the Colwyn Bay and Colwyn Urban District Council, on the completely successful termination of his libel action against Mr. S. T. Frost, the editor of the *Colwyn Bay Critic*. This paper was a small publication gratuitously distributed for some time in Colwyn Bay, and in no fewer than twenty-three out of its seventy-five issues it contained attacks upon Mr. Jones in his capacity of surveyor to the council, alleging that he had been guilty of favouritism and corruption in regard to various contracts. The result of the trial of the action at the Chester Assizes, before Mr. Justice Eldon Bankes and a special jury, was a complete vindication of Mr. Jones's character, he being awarded £200 damages and costs. We said a moment ago that this was a completely successful termination of the proceedings, and so it would be but for the fact that the defendant is not likely to be able to pay the damages awarded. The consequence is that Mr. Jones is £170 out of pocket in resisting an entirely unjustifiable attack after twenty-two years' service as surveyor to the council. It is a case of this kind which makes us feel that there ought to be some fund at the disposal of the Institution of Municipal and County Engineers for assisting its members to resist such wanton attacks upon their personal honour and professional reputation. We understand that the present case is to be brought before the Institution, and we hope that some way may be found by which the whole of this heavy expense may not fall upon Mr. Jones himself.

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**The Railless Trolley Car.**

It is now generally conceded that the railless trolley car has a great future, and it behoves municipal engineers to keep themselves thoroughly well informed in all the latest developments of this system. In this connection we have pleasure in directing the attention of our readers to the excellent paper on this subject which was read on Monday last before the Society of Engineers by Mr. Henry C. Adams. As the reader of the paper said, the progress which the system has already made is such as to show that it has long passed the merely experimental stage, and there can be no doubt that it will soon be extensively used where additional means of transport are required without incurring the outlay necessary for the construction of an electric tramway. In another column we publish some extracts from Mr. Adams's able paper, and we regret that considerations of space preclude us from reproducing it *in extenso*. The descriptions which are given of the four principal methods of applying the trolley-omnibus system abroad are specially useful; and the accounts which are given of existing installations will be found to be of great value to those who may be concerned in the inauguration of a new scheme. We have on a former occasion written of the comparative advantages of the electric tramway, the motor omnibus, and the railless trolley car, both as regards initial expense, cost of maintenance, and usefulness under various conditions. We will therefore conclude the note, as we began, by saying that the new system merits the close attention of municipal engineers, and that from this point of view Mr. Adams's paper is well worthy of perusal.

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**The Institution of Municipal and County Engineers.**

At the recent meeting of the council of the Institution of Municipal and County Engineers a satisfactory report was received as to the progress which is being made with the standardisation of vitrified ware pipes. That the preparation of standard specifications of the materials of construction is generally appreciated is evidenced by the fact that it was reported that the sales of the standard specification for concrete flags had been very satisfactory. The tabulation of the replies received as to the corrugation of tramway rails is in progress, and will form a very useful return when completed.

The district nomination forms for the various district officers and representatives to the council will be distributed shortly, and must be returned to the secretary not later than seven days from the date of issue. The Institution is to be congratulated on the officers and members of the council who have already been elected, and it is confidently anticipated that when the council is completed by the district elections, the Institution will be served by a strong and thoroughly representative governing body.

D

# Preliminary Studies in Bridge Design.

By REGINALD RYVES, Assoc.M.Inst.C.E.

(*Concluding Article.*)

As regards highway bridges, impact is often little more than a bogey. For the present purpose it will be sufficient to give the principal reasons why it is not necessary, as a rule, to make any considerable allowance for impact, the effect of which is best suggested by calling it "the suddenness with which a considerable proportion of the load has come upon the bridge."

In the first place, we have often the over ruling consideration that the swiftly-moving loads are much lighter than the slowly-moving loads. Another consideration, and a dominating one in the case of a town bridge, is that the crowd load is usually the maximum load, and there is then no possibility of impact.

For shorter spans and narrower bridges a procession of swift motor cars, even if they were given an impact allowance of 50 per cent, would not give so severe a loading as loaded motor wagons, or even one wagon; and the rubber-tyred motor wagon travelling at 15 miles an hour would be a less severe load than a traction engine, even if we gave it a large impact allowance. There is another very important consideration that must not be overlooked, especially when the practice of allowing for impact in the design of railway bridges is regarded as a kind of precedent for making a similar allowance in the case of a highway bridge. This consideration is that the proportion of dead load to live load is usually very much greater in a highway bridge than in a railway bridge. The effect of this is twofold. First, there is in the highway bridge a relatively large mass of inert matter which greatly deadens the effect of a sudden application of live load: the shock is absorbed by the mass. Secondly, the fact that the girders (to take the simple case of a girder bridge) are upholding a relatively large dead load means that they are relatively stronger to resist deflection by live loads in excess of that allowed for. If the stress in the outermost fibre of the flange of a railway girder is 1½ tons per square inch before the train comes on to it, and 5 tons per square inch when the train has come on to it, we have a sudden increase of stress from 1½ tons to 5 tons per square inch. If, on the other hand, in the girder of a road bridge the stress is 3½ tons per square inch before the load comes on, and 5 tons per square inch after it has come on, the increase is only from 3½ to 5 tons per square inch. The proportion is as from 21 to 70 in the case of the railway bridge compared with that from 21 to only 30 for the highway bridge. For quite light bridges which will be used by motor vehicles travelling fast, the "kick" after release of load may be of some importance if the dead load is very small.

### MAXIMUM LOADS.

As regards the effect of a crowd load, if we compare it, taken as 80 lb. per square foot, with a traction engine regarded as 16 tons of concentrated load, we find that the limiting span is just about 90 ft. for a ten-feet width of road. Loading equivalent to a central load of 12 tons would equal the crowd load on a span of about 67 ft., and be more severe for smaller spans.

The maximum loading on a highway bridge may be calculated as equivalent to a single concentrated load, or as a distributed load, for most purposes of general comparison, and when the most severe main girder load has been thus found, the actual loading for the particular kind of road train or vehicle may be worked out in detail. Some other kind of vehicle may, however, give the heaviest loading on a cross-girder, usually an axle-load, and the front roller of a steam roller may give the most severe floor load between cross-girders, under some conditions. Such points cannot be pursued further except in reference to definite designs, or at least well defined types of bridges. It is, however, a matter of general principle to consider how the loading may come on to the bridge as regards its centre line.

### THE LOADING AS REGARDS THE CENTRE LINE.

For instance, we must allow for the vehicles on a bridge with a roadway 12 ft. wide being nearer one side than the other, and we must allow for tilt due to camber, as well as for that due to a weak spring. When effects such as these coincide, which they tend to do, they may be important, especially if eccentric loading of the vehicle itself throws the weight still further to the same side. If one package among a number is heavy for its size, it is best put on the off side, and a package bulky for its weight is best on the near side, the incentive, from the point of view of the owner, being that camber tends to throw more weight on the near-side springs and wheels than on the others, and that a bulkily laden vehicle loaded down on the near side and swaying on a cambered road is unduly severe on the near-side spring, and may cause damage to the load itself by striking against an obstruction. Another point, as regards maximum loading, is that the width of our bridge will allow of certain loadings according to whether it permits of the passage of two lines of vehicles or of one line only, and that what these vehicles may be depends on whether the bridge is scheduled against traction engines, or against these and heavy motor cars, or whether it is a full highway for all vehicles. Very often the ordinary steam roller of the country gives the maximum loading. As regards the maximum loads permitted we must allow for these being exceeded in practice.

The allowance that must be made for one girder at a time having much more than half the load is greatest when the road is a good deal more than wide enough for one vehicle, but does not allow two to pass, or is nearly, but not quite, wide enough for three.

Fig. 31, compared with Fig. 30, shows how the actual live load which can come upon one girder is increased by 20 per cent by having a road 5 ft. wider than is necessary for the vehicle. Fig. 32 is a study of the effect due to the tilting of the vehicle. The camber shown, though not suitable, is by no means unusual. The increase due to camber alone is about 5 per cent. If the centre of gravity (P) of the load and vehicle were 6 in. to the left, about another 5 per cent would be added to the load on the left-hand wheel, and with this total of 10 per cent some further tilt due to depression of the spring would occur. It is clearly necessary to allow, say, 15 per cent, beyond the normal wheel load in such a case. It is seldom desirable to camber the surface of a road on a bridge more than a very little, but it is often done.

The greatest difficulty in assigning a maximum load is to decide to what extent the bridge under the heaviest line of vehicles may be loaded in addition by other vehicles, or animals, or a crowd. Are we to take the case of a traction engine and its trailers surrounded by a mob of strikers? Are we to take a light highway bridge in India, crowded with a packed throng around a sacred elephant? Such cases are worst when the bridge has been calculated for one line of vehicles, but is nearly

wide enough for two, the crowd load being then considerable. But young engineers must not fall into the error of allowing for the maximum possible loading for ordinary highway bridges of moderate span. It is *not done*. The chance of the maximum *possible* loading occurring is very small indeed, and the factor of safety is a good one. Important large-span bridges are quite a different class and their design involves a quite different

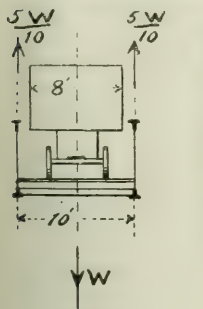


Fig. 30.

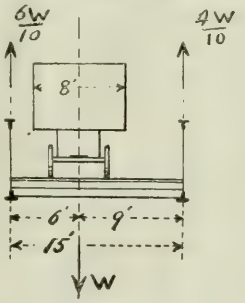


Fig. 31.

proportionate importance being assigned to the various factors.

EXCESSIVE METALLING.

Nevertheless, there are some kinds of excess loading which have to be considered. If the bridge has a metalled roadway it is desirable to guard against the overloading that may occur if unduly large quantities of stone are used in renewing it. It is reported that the recent failure of a suspension bridge—one cold morning when the cables were at their tightest—was due to the fact that according to standing orders, which it was assumed applied to the roadway on the bridge, definite quantities of road metal had been put into the road crust from time to time regardless of the rate of wear. There are sometimes reasons why the road crust wears more slowly on a bridge than on the

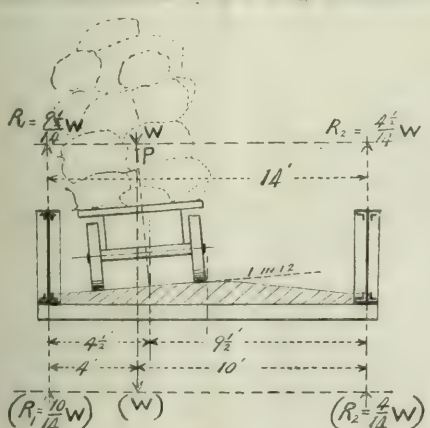


Fig. 32.

adjoining portions of the road. In the case of a wide girder bridge, or a suspension bridge, it is especially desirable to have some measure of the depth of the crust, such as its level in relation to that of some definite plates or angles, or other blocking course

Suppose that a bridge is 20 ft. wide and 60 ft. in span, an excess of 3 in. of road metal involves an excess load equivalent to a central load of about 8 tons.

SOME GENERAL COMPARISONS.

When a permanent bridge is called for, the great advantages of solid masonry arch bridges should always be kept in view. In a settled country, and in a situation where the bridge is likely to suit the requirements permanently, the lasting qualities of good masonry put bridges of this kind into a class by themselves, and most good masonry bridges would carry loads considerably in excess of those of the present day. In wilder places, where there is difficulty in getting the painting necessary for steel bridges carried out at the right times and in the right manner, the masonry bridge has the great advantage that it usually suffers little from neglect. For wide rivers which are liable to floods a bridge of masonry arches is sometimes at a serious disadvantage as regards the amount of obstruction which it causes; but if it is liable to be overtopped by the flood, it may be in better case than a girder bridge, which would either be one of light spans liable to be swept away or one of deep spans which would not allow of the passage of floating timber. In some countries there is often a very large amount of stuff coming down a river in high flood. The chief objection to short masonry bridges, especially those of one span, arises when there is a bump in the road caused by the rise of the arch. The difficulty is often more apparent than real, and many arches are placed too high because the designer of the bridge exaggerated the effects of heading up, or did not consider it worth while to incur the additional expense of making a small opening, or several, through the approach embankments.

Headway for navigation, when any considerable width is required, can only be gained by making the roadway over the arch at a considerably higher

Fig. 33.

level than would be necessary with a girder bridge; but if the roadway is very wide, the advantage to some extent disappears, because the cross-girders of the girder bridge have to be deep, unless they are very close together. In such a case a bridge of many beams close together may be suitable.

The thrusts from a single segmental arch with a very small rise are usually too great, having regard to economy and stability, for such a bridge to be a suitable type for a navigable waterway; but when the width of the canal or river is sufficient to demand the building of two spans, one of which would be sufficient for a vessel to pass through, the kind of bridge shown in the type diagram (Fig. 33) has considerable merits. If the middle span were much longer the thrust would be greater and a considerable amount of masonry in the abutments would be there to receive this thrust. In type shown in Fig. 33, however, the two side spans, cheap to build, usually provide effective abutments to take the thrust of the middle span; and even if we left thrusts out of consideration altogether, the bridge would not be far from the most economical design of its kind.

THE ARCH.

Great stability and permanence are valuable qualities of the semi-circular arch, and of segmental arches of moderate rise, and these qualities should not be lightly given up for the sake of saving a little material. Elliptic arches with cracks at the crown are sometimes to be seen, while such a thing as a crack is very rare with a segmental arch, though these are so much more numerous than elliptic arches. The idea that an elliptic arch allows of economy of material is to a great extent a fallacy, having regard to the manner in which an arch fails, if it fails at all, and taking into consideration the loading that is really the most severe. No reference is made here to bridges of really large span.

In practice there is a tendency for the crown of

an elliptic arch to be really a flat for some distance. Generally, the sharper the curve of the arch the better it resists single heavy loads and shocks.

In the case of a culvert under an embankment a single ring of half-brick thickness will often be enough, except at the ends, and provided that good mortar is available, or good bricks, for it is hardly necessary to have both.

If the culverts are large enough to be entered for repairs, the crumbling of a brick or two will not be a serious consideration. At the same time, if we are looking at the matter in the spirit in which a reference was made just now to masonry bridges, by all means let such culverts be made with no less number of rings of brickwork than will be *ultimately* economical and give the best security against accident. There are some cases in which we should aim either at great durability or at low first cost—not between the two. In situations where a possible breaching of the roads by floods may expose the culverts, these should be designed accordingly, for a breach in a road is a sufficiently troublesome matter in itself, and its repair could hardly wait for the rebuilding of broken culverts. In such a situation any temporary arrangement should be replaced by a permanent one as soon as may conveniently be done.

### STEEL BRIDGES AND TIMBER BRIDGES.

What often determines the choice of a steel girder bridge is the consideration that its life is likely to be about as long as the period during which it will be wanted, and that the cost is reasonable in the light of this fact. For ordinary highway bridges, however, away from towns, this consideration seldom applies, and bridges are replaced because they are too weak rather than because they are ugly. At the same time, a present saving is a very definite gain, and there is often a good deal to be said for a bridge which will last some fifty years.

We must draw a very strong distinction between bridges which are of sufficient size and importance and managed under sufficiently favourable circumstances to be regularly cleaned and painted and, on the other hand, highway bridges in thinly peopled districts where the enduring nature of the materials when left to themselves is of greater importance. In this connection it is desirable to form a clear idea as to the possible life of a timber bridge, and to take into consideration the possibility of repairs to such bridges being made with local timber. The lasting qualities of steel compared with timber should not be exaggerated. The same consideration which may make a steel bridge more economical than the more enduring masonry bridge would, in some cases, apply with even greater force to the shorter-lived, but cheaper, timber bridge. For timber bridges of considerable span it is sometimes economical to use steel for the tension members.

For small span steel bridges, in rough countries particularly, liberal allowances have to be made beyond the theoretical scantlings of the members. There should be two kinds of allowances, that given by a definite minimum thickness and that given by allowing a certain thickness beyond that demanded by the calculations. We must allow for a skin of steel rusting and becoming useless except as a protection for the rest; or we may regard this skin as what will eventually be removed by occasional scaling or by cleaning when the bridge is repainted. If these allowances are made fairly liberally in the case of an N-girder, for instance, it may be found that the economical span for rolled steel beams is considerably greater than it would have otherwise been, since in this case the allowances have less effect. As to the N-girders themselves, the economical design of Westminster is not necessarily the economical design for the jungle or the Indian village. Steel girders for such situations should be so designed that they can be easily painted with rough appliances. This consideration, in conjunction with the matter of scantling allowances, may make a plate girder a suitable design for a larger span than those assigned to it in the light of experience in England.

### FERRO-CONCRETE BRIDGES.

On the most pessimistic view—or almost that—ferro-concrete bridges may be expected to outlast steel bridges of the same or greater cost. On a more hopeful view they may last so long that they may prove satisfactory substitutes for solid masonry bridges. While the ferro-concrete arch may be, and no doubt often is, an inexpensive design, it can certainly be contended with much reason that where materials for making concrete are cheap there is seldom any considerable advantage in reinforcing the arches of small span highway bridges. For larger spans, and when, for instance, it is worth while making ferro-concrete ribs, the matter is on a different footing, and the use of steel may lead to economy by reducing the quantity of concrete used to an important extent. Where ferro-concrete seems likely to be specially useful for small-span road bridges is in those cases in which the roadway must not be raised nor the waterway (or the headway for barges) impeded. Here the type in which the parapets of the bridge are ferro-concrete girders has special merit for bridges of moderate width, through the rolled steel beam type—which dogs several other types with a kind of steady persistency—might have to be considered for a similar crossing with a wider roadway.

Another useful type is the plain concrete arch with reinforced abutments, wing walls and parapets, the reinforced parapet and side wall combined offering the very important advantage of considerable height with only moderate weight and cost, making it possible for the arch ring to be protected by a considerable depth of filling. To gain height by earth and sidewalls, with some reduction of arch thickness, may be cheaper than to gain the same height by making taller piers.

The use of ferro-concrete in such a way that the abutments are developed into cells or stalls filled with earth for the sake of stability was first proposed, it is believed, by the present writer, who at the same time drew attention to the fact that ferro-concrete permits of the application of the cantilever principle to quite small-span bridges. Both these considerations are vital, and their recognition means that the use of ferro-concrete has brought in two new and distinct types: that in which the abutment is solid with the span, and may be weighted for stability, and that in which the bridge may survive without collapse the undermining or even destruction of one of its piers.

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**Drainage Works and Sanitary Fittings.** A third edition, revised and brought up to date, particularly as regards the questions of concrete sewers, sewer ventilation and flushing, and the Public Health Acts Amendment Act of 1907, still further evidences the success of this little manual,* which manifestly deserves the attention and confidence of all concerned in the important subject with which it deals. *The Bookseller.*

**Parliamentary Memoranda.**—In the House of Lords recently the Belfast Corporation Bill, the Brighton Corporation Bill, the City of London (Various Powers) Bill, the Derwent Valley Water Bill, the Everton, &c., Drainage Bill, the Hove Corporation Railless Traction Bill, the Llanelly Rural District Water Bill, the North Ormesby, South Bank, Normanby, and Grangetown Railless Traction Bill, the Rhymney Valley Sewerage Board Bill, the Sidmouth Urban District Council Bill, the Stepney Borough Council (Spitalfields Market) Bill, and the Stockport Corporation Bill were accorded a second reading.

* "Drainage Work and Sanitary Fittings." By Wm. H. Maxwell. Price 2s. nett. London: St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, E.C.

# The Trolley Vehicle System of Railless Traction.*

By HENRY C. ADAMS, Assoc.M.Inst.C.E., M.I.Mech.L., A.M.I.E.E.

There are many localities where additional means of transport are urgently required, but the probable traffic is not sufficient to warrant the outlay necessary to construct an electric tramway. Now that people have become accustomed to the appearance of the overhead work most of the objection to tramways centres around the track, and its omission in the trolley omnibus system considerably facilitates negotiations for the adoption of the latter. Objection is raised on the part of the drivers of narrow-tyred horse vehicles to the presence of the grooved tram rails in the road and to the varying material forming the surface of the road in places, where the carriageway margins are constructed in macadam and the tramway track is laid with wood or granite blocks. The junction between the two materials along the whole route, on both sides of the tramway, requires constant attention and rarely remains in good condition for long, while in narrow roads the width of the macadam between the channel stones and the tramway margin is not sufficient to permit of steam rolling. If there is a frequent service of trams, horsed vehicles are perforce concentrated to a great extent on the narrow macadam portions, which thus have to carry a greatly increased traffic, as measured per foot in width of road utilised. The noise of the trams is also an objection to their use under certain circumstances. A trackless system can be installed without there being any necessity for expenditure in road widening, so frequently required in tramway schemes, and the flexibility of the system will allow tradesmen's carts to stand outside the shops without having to be moved out of the way, as is now required in narrow streets, every time a tramcar passes. In fact, this method of traction can be, and is, employed in roads which are too narrow even for a single line of tramway with passing-place loops.

Until recently the only alternative to a tramway was the self-propelled motor omnibus, and although at the present time in London the most recent additions to the service leave little to be desired in reliability, comfort, speed and economy, there is no doubt that the same result has not been obtained with the smaller fleets tried from time to time in provincial towns. It does not follow, however, that success is impossible, and better results may be obtained with a general adoption of the latest improved type of omnibus. The engine and fuel which all self-propelled vehicles have to carry add considerably to their weight, and consequently to the dead load to be carried, which involves an increased consumption of power. The extra load also increases the wear of the tyres, an important item of expense. It is cheaper to generate power in bulk for a whole fleet of vehicles than to do so separately for each individual vehicle, but in the former case it is necessary to add the cost of transmitting the power along the routes. There is the other aspect of the case—namely, that if the generating plant at the central station breaks down, the whole system is stopped, whereas if the motor of a self-contained vehicle breaks down, only that vehicle is put out of service; the former, however, is a much more remote contingency than the latter. The motor omnibus and the trolley omnibus can be steered with equal facility in crowded narrow streets.

In addition to those places where there are now no regular means of transport, the railless system of traction is specially fitted to form extensions beyond the termini of existing tramway systems. In these cases the trolley omnibuses would not only feed the tramways, but would create a traffic of their own, so that ultimately, when the time was ripe, tramway tracks could be laid down if desired, and provided the contingency has been anticipated in the design, the overhead work could be rearranged at very little cost to meet the requirements.

It is important when the railless routes are an extension of the tramway system that the trolley on the omnibus should be of such a pattern that provision is being made for the return current it can be used to obtain power from the overhead tramway supply, because in the near future instances will be found that such routes are at some distance away from the tramway depot to which the omnibus will have to return each night.

Doubtless some extra revenue might be obtained by supplying electric power to private consumers *en route*, by conveying goods and parcels through the streets, and also by permitting the use of the overhead wires and current by privately-owned vehicles fitted with the necessary equipment; but in this latter case stringent conditions would have to be framed to prevent any delay to, or disorganisation of, the public service. In a general way these possibilities might be somewhat remote, and therefore could hardly be considered as influencing the installation of a system, or the routes to be taken, but that is no reason why such sources of revenue should not be developed to the fullest extent.

There is no doubt that a judicious adoption of this method of traction will result in very considerable advantage to the dwellers in the smaller towns, also to those residing in the suburbs of the larger towns, and in the less remote rural districts in the vicinity of such towns.

### COST.

As regards capital cost there is, as would be expected, considerable variation in the figures.

The first eight systems installed by the Mercedes-Stoll Company up to January, 1911, aggregate a route length of 17·26 miles, and are worked by thirty cars, each capable of seating from eighteen to twenty-four passengers. The total capital invested in these lines amounts to £48,500, being at the rate of £2,800 per mile, or £1,600 per vehicle; but it must be remembered that should the traffic increase, additional vehicles can be put on the road for a further capital expenditure of, say, £600 each.

The total capital cost of the line from Ludwigsburg to Wurtemburg, working on the Lloyd-Köhler system, amounted to £16,000, being at the rate of £1,843 per mile, or £2,000 per passenger vehicle. The company estimates the cost of a scheme as follows: Overhead work, £900 to £1,100 per mile; cars, £900 to £975 each; trailers, £340 to £380 each; garage and workshop, £400 to £700.

The estimated capital cost of the proposed scheme at Aberdeen for a route 1 mile 33 yds. long is £3,050, made up as follows: 1 mile 33 yds. of route at £1,227 per mile, equals £1,250; two cars at £700 each, equals £1,400; cost of Provisional Order equals £400; total, £3,050. The capital cost is therefore equal to £3,000 per mile of route, or £1,525 per vehicle.

The estimated cost of construction at Nuneaton is £9,000 for a route of 3¾ miles and four cars, being equal to £2,400 per mile of route, or £2,250 per vehicle running.

A circular railless traction route of 9 miles at Krugersdorp is estimated to cost £50,000, being at the rate of £5,555 per mile, including cars and incidental expenses.

The capital expended on the 5-mile route at Drammen was £8,000, being equivalent to £1,600 per mile. The overhead wires are carried on span wires between the houses, and where this method is not convenient then on timber masts with side brackets.

The cost of 3¼ miles at Ramsbottom is estimated at about £9,250, being at the rate of £2,846 per mile, including overhead equipment, three cars, depots, shelters, and incidental expenses, against £28,000 (£8,600 per mile) for a system of electric tramways. Including the generating station, the cost will be £16,150, which is equivalent to £4,969 per mile of route.

At Stockport the railless traction scheme is estimated to cost £11,000 (of which £7,400 is for the overhead equipment) against £20,000 or £25,000 for electric tramways.

In some of the schemes abroad the overhead work, including cables, has been constructed for as low a figure as £700 to £750 per mile, timber posts and bracket arms being employed. It would be, however, a great mistake unless in very exceptional circumstances, to put up in this country such flimsy work as this cost represents, and further it is very doubtful if such could be done for these figures. A small addition to the capital cost would only an infinitesimal increase in the annual cost for interest and repayment of principal, but the depreciation and the cost of maintenance would be very heavy, so much so, perhaps, as to render the scheme unremunerative. The point was, there could be saved in connection with tramway construction, and the

* From a paper read on Monday evening at a meeting of the Society of Engineers.

same arguments apply to this system. The cost of the overhead work at Bradford is given as £1,734 per mile, and at Leeds £1,240 per mile, while the accepted tender for the work at Dundee is at the rate of, approximately, £1,000 per mile. If a cheap construction is adopted, its life will probably be short, so that it would not last long enough to be utilised subsequently for a tramway service. If by any reason a railless route is, or becomes, unremunerative, it is, of course, possible to take down the overhead work, remove the cables and refix the materials on another route, but the cost of doing so is very great, and the proposition should not be lightly entered upon; hence the necessity for good judgment in the initial installation.

Judged from the standpoint of seating capacity the price of railless vehicles is high, due perhaps to some extent to the high standard of luxury we have been trained to expect in public vehicles, and to the small number of them required at present. The price charged for a railless electric traction company's omnibus, having a seating capacity for sixteen passengers, is £600, for twenty-four passengers £675, for twenty-eight passengers £700, and for thirty passengers £750. The California open-type cars, seating sixteen passengers, weigh about 1½ tons unloaded, and cost £520. The cost of an omnibus of the Mercedes-Stoll type, seating from eighteen to twenty-four passengers, is about £600. The cost of a well-finished vehicle, to seat twenty-four and mounted on a "Brush" chassis, is approximately £750.

The cost of obtaining the necessary Parliamentary powers depends entirely upon the amount of opposition offered to the Bill; it might vary between, say, £400 and £5,000. Reasonable periods to allow for the repayment of the cost of installation would be as follows: The cost of the Bill, five years; vehicles, ten to fifteen years; overhead equipment and passenger street shelters, twenty to thirty years; lands, buildings and underground cables, forty years.

Ample data exists as to the cost of running railless schemes abroad, but the extent to which similar results will be realised in this country is more or less a matter of conjecture, as the only figures available are those relating to Leeds and Bradford, and, interesting and useful though they are, it must not be forgotten that they cover only a short period.

The cost of working by the Max-Schiemann system on the line at Ahrweiler, on the Rhine, was 5·38d. per car-mile, made up as follows: Management and wages, 2·86d.; electricity (576 watt-hours per car-mile), 0·95d.; tyres, 0·66d.; maintenance of line and vehicles, 0·25d.; stores, 0·27d.; insurance, sick fund, &c., 0·39d.; total per car-mile, 5·38d. It should be noted, however, that the rear wheels have steel tyres, so that the tyre maintenance rate only covers the front wheels.

The receipts per car-mile on the first eight lines constructed by the Mercedes-Stoll Company, to which reference has previously been made, vary from 5·6d. to 8·0d., the fares charged being approximately 1½d. to 2d. per mile. The average number of passengers carried per car-mile is 3·53. There is one small system at Judenburg, where the receipts amount to 10·75d., with working expenses at the rate of 4·8d. per car-mile, showing a profit of 5·95d. per car-mile. This is exceptional, the line being only 1·24 miles long and worked by one car, seating eighteen persons. The maximum gradient on this system is 1 in 6·66, whereas the maximum gradient in any of the other systems is 1 in 11. The cost of working varies from 4·16d. to 5·9d. per car-mile, the profit ranging from 0·8d. to 3·52d. per car-mile, but this does not include interest and sinking fund. It should be pointed out that the price paid for the current is high, and varies from 1¾d. to 3d. per unit.

The following figures show the result of working up to September, 1911, on the Wiedling line, near Vienna, which is 2·3 miles long, has a maximum gradient of 1 in 14·3, was opened for traffic in May, 1908, and is worked by five cars, each seating twenty-two passengers: The capital invested is £7,000; car-miles run, 194,783; total passengers carried, 796,514; receipts per car-mile, 8·00d. Expenses per car-mile: Management and wages, 1·56d.; electricity, 1·38d.; tyres, 0·69d.; repairs, including maintenance of vehicles, replacements, &c., 1·19d.; insurance and sick fund, 0·18d.; total cost per car-mile, including everything except interest on capital, and sinking fund, 5·00d. The price paid for electricity is 2·60d. per kilowatt-hour. The margin between receipts and running expenses available for interest on capital, depreciation, &c., is 3d. per car-mile, which is equivalent to £2,434 since the line was opened at an annual amount of £1,000 per annum, or, say, 14 per cent. upon the capital invested.

The Lloyd-Köhler Company state that the cost of sinking fund, depreciation, maintenance, electric current, tyres, management, wages, &c., varies from 4½d. to 7¾d. per car mile. This allows a somewhat wide margin, but the actual result of working on the Ludwigsburg route for its first complete year—namely, 1911—is set out hereunder. Expenses per car-mile: Management and wages, 1·43d.; electricity, 1·13d.; tyres, 0·95d.; maintenance of vehicles, 0·76d.; maintenance of line, 0·09d.; tickets, uniforms, &c., 0·44d.; insurance, &c., 0·15d.; total cost per car-mile, including everything except interest on capital, and sinking fund, 4·95d.

The receipts per car-mile were 7·03d., so that the margin between receipts and running expenses available for interest on the £16,000 capital, depreciation, &c., is 2·08d. per car-mile.

The cost of working for the year 1908 at Spezia, Italy, where the Filovia system is in operation on a route 4½ miles long, and where the cars seat eighteen persons, has been given as 5·645d. per car-mile, made up as follows: Management and office expenses, 0·594d.; wages, 1·400d.; electric current (564 watt-hours per car-mile), 0·415d.; tyres, 2·160d.; maintenance of cars and line, 1·076d.; total per car-mile, 5·645d.

The fares charged average 1d. for about 1¾ miles. The cost of tyres is high, due to the road surface being always in a very bad condition.

Another set of figures for this system, and relating more to an average over several routes, are: Management, salaries and wages, 1·6d.; electric current (485 watt-hours per car-mile, at 1¼d. per kilowatt-hour), 0·8d.; tyres, 1·7d.; maintenance of cars, 0·7d.; maintenance of overhead line, 0·2d.; total per car-mile, 5·0d.

The receipts at Leeds (R.E.T. system) have been at the rate of 10·75d. per car-mile, while the running costs are 4·50d., and the fixed charges, including interest, sinking fund and depreciation, 1·80d.; making a total of 6·30d. per car-mile, showing a nett profit of 4·45d. per car-mile. The receipts at Bradford have been 8·25d. per car-mile, and the costs 6·0d., showing a profit of 2·25d.

Strict caution has characterised the estimates of the cost of working and of the probable receipts for schemes projected in this country, the one generally being taken as approximately balancing the other, with very little margin for repayment of capital charges. The point is, of course, that the proposed routes are very thinly populated at present, but it is expected that the provision of travelling facilities will encourage the development of the districts through which the omnibuses pass, and the systems will ultimately prove fully remunerative.

The number of passengers carried per car-mile is generally low in railless schemes, the principal reason being that only single-deck cars are used, having a maximum possible seating capacity of about twenty-eight. These are amply large for ordinary working, but during the rush hours the capacity is too limited for the number then carried to raise the average to any considerable extent; consequently the margin between receipts and working expenses will in many cases be small, and very careful management will be necessary to ensure financial success. The general passenger fares proposed to be authorised in the various Bills before Parliament are at the rate of 2d. per mile. To a certain extent some improvement in the returns might be effected by putting on extra vehicles for an hour or so when required, but it involves capital lying idle during a great part of each day. Another objection to single-deck vehicles is the absence of any accommodation for smokers, but this could be overcome by forming two compartments, as is proposed in the Rotherham cars, or by constructing an open platform at one end of the omnibus, as is done in some of the vehicles on the Continent. The Board of Trade have not hitherto favoured double-deck vehicles, but in the Hove Corporation Bill, and doubtless in others, it is sought to obtain powers to run such vehicles.

Trailer cars are used to a considerable extent on the Continent in connection with trackless systems; but although the London County Council are seeking powers during the current Session to run trailers with the tramcars, it is very doubtful whether such a course would meet with any support in a trolley-omnibus scheme, at least at the present time. With trailers a tracking arrangement should be fitted so that they accurately follow all curves and windings of the tractor.

It is now generally conceded that owing to the smoother running of an electrically-driven vehicle

the tyres wear better in such case than on a petrol-driven vehicle of equal weight. The Railless Electric Traction Company state that the tyres on their vehicles will be maintained in perpetuity at a charge of 1d. to 2d. per car-mile, dependent upon the route and the nature of the road surfaces. Alternatively a set of new tyres would cost from £65 to £95 respectively. The author is informed that one of the largest tyre companies has undertaken to maintain the tyres on any of the Trackless Trolley Company's omnibuses (Mercedes-Stoll system) running on reasonably good roads at the rate of 1d. per car-mile. On the Kalsburg line, 2·4 miles long, worked on this system, and having a maximum gradient of only 1 in 50, it appears from the report of the superintendent that it has only been necessary to replace the rear tyres on two of the four 22-passenger cars after having run 28,000 and 24,000 miles respectively. The tyres on the other two cars were still in good condition after having run 22,000 and 17,000 miles respectively. The Lloyd-Köhler Company guarantee their tyres to run 12,500 miles, but the average distance actually run by the tyres before renewal has been over 15,500 miles.

It has been mooted by some district councils that whereas the construction of a tramway reduces the cost of maintenance of a road, a railless traction scheme would considerably increase the cost. Of course, if a private tramway company is called upon to maintain a width of, say, 16 ft. out of a 30-ft. road, it does not leave much for the local authority, and it is obvious that the cost to the rates is reduced, but the total cost is not usually affected to any appreciable extent. It is well known that the cost of maintaining country roads has considerably increased since the advent of motor cars, the reason being that the common method of construction was unsuitable for such traffic. Now, instead of prohibiting the use of motors, the roads in all parts of the country are being formed to carry them; and any road which can do this satisfactorily can also carry the light trolley omnibuses without further addition to the cost of maintenance. It is reported that certain payments for the user of the road have been demanded in some places, as, for instance, ¾d. per car-mile in Rotherham by the West Riding County Council, ½d. per car-mile in Brighton by the Sussex County Council, while at Keighley the rural district council are asking for payment by the town council, and in connection with the Stockport scheme the Marple Urban District Council suggest that ½d. per car-mile should be allocated to the respective highway authorities for the maintenance of the roads. This point was, however, fought very hard in the Aberdare Bill in both Houses of Parliaments, and in neither case would the Committee insert a clause requiring payment for the use of the roads. The petrol tax works out at about $\frac{3}{16}$d. per mile in the case of motor-'buses, which are very much heavier vehicles.

The main points to consider are the capital cost of installation, the cost of working and maintenance, reliability, and the public convenience. The author will content himself by giving utterance to the safe, and by no means novel, statement that there is no one method of traction that can be adopted with success under all conceivable circumstances. Each has its advantages, but which is the best to adopt in any particular case can only be arrived at after a careful investigation of all local conditions and with an intimate knowledge of the possibilities of the various systems; and, further, it by no means follows that the results obtained in one town will prevail in another. This system can be installed for a capital expenditure of about one-third to one-fifth of that required in the case of an ordinary overhead tramway system, and while the cost of maintenance of the road will not be unduly increased, and will continue more or less constant from year to year, it must not be forgotten that a tramway track requires entire reconstruction from time to time. On the other hand, the cost of maintenance of the vehicles with their rubber tyres would be higher than in the case of tramcars, and more electrical current would be consumed per passenger carried.

**Town Planning for Huddersfield.** Mr. W. P. Raynor, of Huddersfield, has written a letter to Mr. Alderman Carmi Smith, chairman of the Housing and Town Planning Committee of the Corporation, in which he says that on behalf of himself and a few friends he is enabled to offer £100 with the view of providing prize money for the best scheme or plan of town planning and housing applicable to the needs of Huddersfield.

## TAR-TREATED ROADS.

### REPORT BY THE BRISTOL CITY ENGINEER.

The city engineer of Bristol, Mr. Lessel S. Mackenzie, has presented to the Sanitary Committee of the town council a special report on the practical and economic aspects of the tar treatment of the roads under his charge. In this he states:—

"In accordance with the instructions of your committee, your engineer has carefully studied the results so far of the tar treatment of macadam road surfaces, and he has prepared a statement showing the cost of road maintenance each year since the tar-spraying was adopted in 1906, and for the sake of comparison he has also shown on the statement the average cost of maintenance during the three years prior to the system being adopted. The expenditure during the current year up till January 11th is also included, and on the basis of this expenditure he has estimated the total for the year, but although this shows some very satisfactory results, he does not propose to draw any comparisons from these estimated figures, but to limit his remarks to the period terminating on March 25, 1911.

"The average cost of cleansing the whole of the streets in the three years prior to the adoption of tar treatment was £29,072; for the year ending March, 1911, the cost was £28,175, showing a saving of £897; but a more striking and satisfactory result is that no fewer than 15,852 loads of slop and sweepings had to be carted to tip. This is very important, as a large proportion of this slop is pulverised road stone. The average cost of street watering in the three years above referred to was £4,251, while in the year ending March, 1911, it was only £2,807, a saving of £1,444. The cost of macadamising, however, shows an increase of £1,215, but, whereas the total quantity of hard stone is practically the same, the weight of limestone used was 5,599 tons less. However, included in the amount is the cost of converting nearly 3 miles of old pitching to tar-macadam, costing £1,600; also the laying down of an experimental length of 'Pitchmac,' costing approximately £600; so that in reality the cost of macadam maintenance for the year is £1,000 less than the average for the three years prior to tar treatment. Then, again, the cost of using tarred material for binding purposes has increased the cost of macadamising. The cost of the tar treatment for the year under consideration was £7,576, and the total cost of the work on the road was £67,193, against £60,743, the cost prior to the use of tar, showing an increased cost of £6,450, or, deducting the cost of special works, £4,250. During the period under revision 19 miles of private streets have been added to the highways.

"Although from these statistics no actual saving can be shown, your engineer submits the following points for consideration: (1) The dust nuisance has practically disappeared. (2) The surface of secondary roads has been enormously improved. (3) The streets generally are cleaner than ever they were before. (4) Watering and cleansing have been extended into outlying districts, where hitherto the water-cart had never been seen. (5) Tips are becoming fewer and farther away, tending to increase the cost of haulage. (6) Cost of material has increased. (7) Conditions of traffic have entirely changed, and it is impossible to say what extra cost the city might have been put to if the tar-spraying had not been introduced."

### FISH AND TARRED ROADS.

Owing to the destruction of fish in the river Itchen, and representations made to the Winchester City Council by the Itchen Trout Fishing Association, the council and the county authorities have offered to discontinue tarring the roads for a period of three years from March 31st next.

**Bradford's Cottage Baths.**—Last week the formal opening took place of new cottage baths in Beamsley-street, Heaton, that have been provided for the use of the neighbourhood by the Bradford Baths Committee. The policy of the committee in taking baths to the people has been most successful, and the converted cottages, equipped with slipper baths and douches, are now largely patronised. Four back-to-back cottages were acquired by the committee for the purpose of the new baths, the purchase price, cost of conversion, and other expenses amounting in all to £1,250. The accommodation includes twenty slipper baths, three douches, and seven children's baths. Separate entrances are provided for men and women. To school children the baths are open free. In the case of adults a small charge is made.

# The Chemistry of Modern Highway Engineering.*

By PREVOST HUBBARD.

The intelligent use of any material of construction depends to a great extent upon the knowledge possessed by the user regarding the characteristic properties of the material used. The more comprehensive his knowledge, the greater will be his assurance of success in any work of construction which he may undertake. A certain amount of information concerning the properties of materials may always be acquired by practical experience, and with some few types of materials, knowledge thus acquired, if properly applied, will prove sufficient to insure satisfactory results. When such is the case, however, it will be found that the materials vary within comparatively narrow limits in characteristics which materially affect their value for the uses to which they are put, and that they possess certain physical properties which are practically constant, and can be readily distinguished by those experienced in their use.

This state of affairs existed in the field of highway engineering until a comparatively recent date, and no great amount of scientific training on the part of highway engineers seemed essential to the construction of good roads. From this statement it should not be inferred that scientific training was of no value in road construction, for such was not the case. The entire development of the modern macadam road is undoubtedly based upon sound scientific principles, and a number of very able and carefully-trained minds played a most important part in this development. The work of such men as Macadam, Telford, and Trésagnet, as well as a number of their followers who developed and extended their theories, cannot be overvalued, but the principles which they taught were readily grasped by even the untrained mind and were applied with comparative ease. Certain requirements of construction were, of course, dependent upon a thorough knowledge of the materials of construction—earth, gravel and broken stone—but as these materials when used for a given road were almost always of local occurrence, their value as road material was soon learned by those who had to do with local construction.

Certain types of rock were found to be better suited for the construction of roads subjected to light traffic than for those more heavily travelled, and *vice versâ*. Climate and other local conditions aside from traffic, however, exerted but little effect upon the character of one material as compared with another once it was placed upon the road, and after the selection of a rock with regard to the volume and weight of traffic, its preparation and use according to approved methods made possible the construction of a satisfactory road. Four of the most important characteristics of road-making rocks—hardness, toughness, resistance to abrasion, and cementing value—were determined by purely physical tests, and while these properties were in a measure dependent upon the chemical composition of the rock, it was soon learned that a chemical analysis was of little service in their determination, owing to the fact that they were also dependent upon the mineral composition and the manner in which the mineral constituents were interlocked in the rock structure. Chemistry, therefore, played but little part in the art of road building, and a knowledge of chemistry seemed less essential to the education of the highway engineer than to-day.

### THE CHANGED CONDITIONS OF TO-DAY.

With the modern evolution of the ordinary macadam road to the bituminised or bituminous form, the old situation has entirely changed, and while it is still possible for an engineer with little or no knowledge of the chemistry of road materials to construct a good road, his chances of so doing are far less than they were in the old days. So much has already been written concerning the causes for bringing these new materials commonly known as bitumens into the field of highway construction that it seems unnecessary in this paper to discuss them in detail. It may be stated however that the development of a new class of traffic, the motor vehicle, has made it necessary to employ some form of binder other than road dust to hold the large stone fragments in place and preserve the integrity of the road. The bitumens as a class have given more promise of suitability than any other materials, and their utilisation for this purpose during the past few years has developed to an enormous extent.

Unlike road stone, the use of bitumens is not controlled by their local occurrence, as the amount required for the treatment or construction of a road is not so great as to make the cost of transportation prohibitive, except for very long distances. The utilisation of these materials is not, therefore, confined to localities in which they occur, except in rare instances. This fact makes it possible for the highway engineer to choose from a far larger number of materials than formerly, but owing to the complex nature and great variety of these materials, the selection of the best available for a given purpose is a much more difficult matter. These substances are, as a rule, new to him, and in the matter of selection he has been obliged either to depend upon the experience that a comparatively few have so far gained, or else to select a material at random and himself experiment with its use. Whichever he does, it is safe to say that unless he thoroughly understands the properties of the material which he uses he can never be certain of results.

At the present time many highway engineers know bitumens only as black, more or less sticky substances which range from fluid to semi-solid consistency. To some they are all tars, or all oils, or all asphaltes, the meaning of these terms being at best very vague. Trade products are known by name only, and when it is desired to describe these products in somewhat more detail, the use of such terms as "asphalte contents," "percentage asphalte," &c., are often used with rare indiscrimination.

The fact that bituminous road materials are subject to many changes, both during and after application, makes it impossible to determine by purely physical tests just what properties a given material will develop after being placed on or in the road, and a knowledge of the chemistry of such materials is therefore essential to their best use. The subject is a comparatively new one, both to the engineer and the chemist, and while a certain amount of progress along this line has been made by a few progressive men, there is much yet to be learned. And here we arrive at a very important fact. Neither the chemist nor the engineer can by himself secure the practical application of chemistry to road building, the former because he is ignorant of the principles of highway construction and the conditions which have to be met in practice; and the latter because he is deficient in chemical training. It is only by close co-operation on the part of chemist and engineer that ultimate success can be obtained. The subject is of considerable interest from the standpoint of industrial chemistry, but few chemists have given it serious consideration because of the lack of demand for their services on the part of engineers. To the author's mind the cause for this lies in the lack of chemical education of the highway engineer.

### THE CHEMICAL EDUCATION OF THE ENGINEER.

It is evident that the great majority of highway engineers cannot also become chemists, and the question at once presents itself as to just what extent his chemical education should be carried. The answer is not as simple as it might at first thought appear to be, but there are undoubtedly certain facts concerning the chemistry of bituminous road materials with which the highway engineer should be thoroughly familiar. In the first place he should have some knowledge of the origin, occurrence and production of various types of native and artificial bitumens. He should have a comprehensive idea of the processes of refining these products and of the methods of manufacture by which they are converted into road materials. He should acquire the fundamental principles of hydrocarbon chemistry to the extent of at least knowing the more important series of compounds which are at present in bituminous materials. He will then be able to appreciate their great complexity in comparison with the accountable for their widely varying behaviour in practical use. With this knowledge he will be in a position to intelligently study the methods of examination which have been devised for bituminous materials, and to correctly interpret the result of such examination as regard their identification. His engineering experience will then enable

* Address read before the American Association for the Advancement of Science, December 30, 1911

him to correlate the results of examination to those obtained in practical construction, and if he has an opportunity to conduct original experimental work the knowledge thus acquired will lead him to develop new fields in chemical investigations pertaining to highway work, and to co-operate with the chemist in such work.

Some few highway engineers have acquired, or are acquiring, this information, but to the rank-and-file the chemistry of the bitumens is a sealed book enshrouded in more or less mystery—something they feel that they should like to become acquainted with, but do not know just how to proceed. They read specifications for bituminous road and paving materials, and glimpse the purposes of those who have framed them; they perhaps study one of the few books that have been published on the subject, but fail to grasp it comprehensively enough to derive real benefit thereby. In fact, this smattering of knowledge is apt to prove more troublesome than otherwise when they attempt to utilise it in practical work. Such procedure may be compared to that of the layman who reads a *materia medica* and then attempts to practise medicine upon himself or his neighbours. The results are apt to be the same—injurious to the patient. The comparison may be carried further. An expert in the chemistry of road materials and its practical application is, in fact, a road doctor. He is called upon to inspect an old road in bad condition or the location of a new one, and prescribe a remedy in the one case or precautionary measures of construction in the other. He first of all diagnoses local conditions, available materials of construction, climate, character of the sub-grade and foundation, drainage, both natural and artificial, the kind and volume of traffic to which the road is or will be subjected, &c. He then writes a prescription in the form of a specification. Also, like the doctor of medicine, he promptly submits a bill for services rendered—but this is not pertinent to the present discussion. If his diagnosis is correct, and his experience sound, his prescription will act as a cure or preventive if properly applied, and perhaps his specifications will be published in some engineering magazine. The same thing will occur in other instances, and through the medium of the technical press the highway engineer finds himself in possession of a number of valuable specifications for bituminous road and paving materials.

### CONFUSION IN SPECIFICATION.

Now, in the case of a prescription, few people would care to apply it to a different type of sickness than that for which it was written, and fewer still would dare to combine two or more prescriptions into one. This, however, is just what has frequently been done by highway engineers in the matter of specifications for bituminous materials, and in many cases the results have proved the fallacy of such procedure. Either a totally unsuitable material has been specified, or else certain clauses in the specifications are incompatible, and the specifications therefore impossible. Frequent instances of this sort have come within the author's notice, and a number of cases might be cited where specifications have been framed by combining clauses from specifications of two such dissimilar materials as crude petroleum and residual coal tar. Such things would not occur if the highway engineer was more familiar with the chemistry of the materials specified. That these matters are receiving serious consideration is evidenced by the fact that the education of our highway engineers in this subject has recently been cared for in a post-graduate course in highway engineering by one of our leading educational institutions, Columbia University.

The chemistry which a modern highway engineer should know, according to the author's idea, has already been outlined in a general way; but in the matter of the examination of road materials, especially those coming under the classification of bitumens, it may not be amiss to enter into somewhat more detail. These products consist of a great variety of complex mixtures, solutions and emulsions of hydrocarbons and their derivatives, together with varying quantities of organic matter not bitumen, mineral matter, &c. They consist of petroleum and petroleum products, including residual petroleums, fluxes, oil-asphaltes, and fluxed or cut-back oil-asphaltes; malthas, native asphaltes, and other solid native bitumens and asphaltic cements produced by fluxing them; coal tars and water-gas tars, their distillates and residues; mixtures of tar with petroleum or asphalte products, bituminous emulsions and factitious asphaltes; bituminous aggregates including rock asphaltes, or bituminous rocks, bituminous concrete and asphalte or other bituminous topping.

It is often an exceedingly difficult matter for even the analytical chemist to differentiate between certain of these products, but the principal classes or groups can usually be identified with little difficulty. The engineer should be able to do this. He need not necessarily carry out the examinations himself, but he should know how to do so if occasion requires, and a laboratory course of instruction should therefore be included in his training. Such instruction should be given along broad, general lines, owing to the varying methods of examinations at present practised. Because of this lack of standardisation he should be given ample opportunity to compare the relative advantages and disadvantages of various methods, and to study their relation to each other.

He should learn the ranges in specific gravity of the various types of bitumens, and to what extent they are affected by non-bituminous matter of different sorts which are found in certain types of native asphalte, oil-asphaltes injured by overheating, tars, &c. He should understand the reason for using a number of solvents in determining the characteristics of these materials with relation to their identification, process of manufacture and behaviour after application. He should appreciate the difficulties of quantitatively determining all of the constituents of a road or pavement from the examination of a finished section; why, for instance, it may be impossible to extract all of the bituminous material if a large amount of finely divided mineral matter is present and why the recovery of the bitumen in its original condition is often impracticable.

He should learn to distinguish crude materials from cut-back products, and cut-back products from straight residuals; what qualitative tests may be made to determine the presence of tar in petroleum or asphalte products, and *vice versâ*; what tests indicate chemical stability; in what products chemical stability is a desirable feature, and in what products chemical changes are to be looked for and relied upon to improve the quality of the material for road purposes. He should understand the principles of fluxing; why the combination of certain bitumens will not produce a good road binder, and why the inferior quality of such combinations does not necessarily indicate inferiority in either of the constituents. These, and many other questions of a similar nature are matters which are of the greatest practical interest in modern highway work.

### CHEMICAL TESTS AND PHYSICAL TESTS.

It seems unnecessary to enter into a lengthy dissertation on all the chemical tests applied to bitumens with which the highway engineer should have a general acquaintance; but a few others of special interest may be mentioned, such as distillation, bromination, and sulphonation tests, determinations of phenols, naphthalene, paraffin scale, carbons, sulphur, &c.

The statement has been made by some that the more useful tests applied to bituminous road materials are not chemical, but physical, tests, and that the former, being of little value, should be eliminated and reliance placed upon the latter for obtaining necessary information regarding the properties of these materials. At a very recent gathering of highway engineers and others interested in road building, a statement of this nature was made from the platform, the speaker supporting his argument by reference to the customary methods of examining Portland cement. Reasons have already been advanced in the first part of this paper which disprove such statements, but for those engineers who hold similar views, of which these appear to be quite a few, attention should be called to the misapplication of such arguments.

In the first place it is safe to say that few industries are so completely dependent upon the application of chemical principles as the manufacture of Portland cement. This is so fully appreciated by the manufacturers that every cement mill of importance employs its own chemist. At almost every stage of the process of manufacture, chemical analyses are made—analyses of the raw materials which are used, of the mix before it is burned, and of the clinker after it has emerged from the kiln. The chemical composition of the finished product is very clearly fixed within certain narrow limits, and all of the physical properties of the cement are known to be controlled primarily by the relative proportions of the various elements present; and, secondly, by the peculiar combinations which these elements have

assumed during the process of manufacture. The second factor is of such importance that from the ultimate analysis of the cement no surety of its physical properties can be determined by the consumer, and so recourse is had mainly to physical tests. Could the mineral composition or peculiar chemical combinations which are present be quantitatively determined by chemical analysis, the entire method of examining cement would be revised and considerably shortened by the elimination of some of the physical tests. As it is, most specifications for Portland cement call for the determination of at least two chemical elements or radicals.

In the case of bituminous cements, as well as Portland cements, an ultimate analysis—*i.e.*, a quantitative determination of the elemental constituents, is seldom of value in determining the suitability of the product for practical use. With the former, however, it is possible to determine by chemical means many of the compounds which are present in the material, and to at least separate them into certain series of compounds which are known to possess, or to impart to the original substances, definite properties. The possibilities of the practical application of chemical analysis in the testing of bituminous cements is, therefore, much greater than in the case of Portland cements. This is due to the greater flexibility of bitumens, and their susceptibility to processes of distillation, sublimation, various kinds of fractionation, and to their solubility in menstruum.

The fact that different bitumens vary so widely in general characteristics makes a chemical examination more necessary. The chemistry of bituminous road materials has as yet received but little attention, but as the demand for knowledge on this subject increases, as it surely will, more chemists will enter the field, and much valuable information will be obtained to the benefit of highway construction.

The foregoing remarks should in no sense be construed as belittling the physical tests commonly applied to bituminous road materials. The value of many such tests is indisputable, and some of them, with perhaps slight modification, will continue to be used indefinitely. Their significance, however, will be much more clear when they are considered in connection with certain chemical tests. For instance, in a given piece of road construction or treatment, a certain fluid bitumen may be as suitable for use as a semi-solid bitumen of another type. In such cases what standard of purely physical properties can cover both and be of any value? It is evident that no one physical standard can be applied to both, but each can be covered by a physical standard if such standards are modified by chemical tests.

### THE NEED FOR THE CHEMIST.

In conclusion, one other question relating to the chemistry of road materials which has been accorded some recent discussion in engineering magazines may be touched upon. "Should the highway engineer do his own testing, or should it be placed in the hands of the chemist?" Arguments have been advanced in support of both sides of this question, but to the author's mind there is only one logical answer, in so far as the chemistry of the subject is concerned. Modern conditions are calling for the work of specialists in highway construction as in many other branches of engineering, and it is not reasonable to expect that the man whose training has been primarily developed along engineering lines can satisfactorily apply the principles of other highly specialised subjects to his work without the assistance of those who have specialised in such subject. It would therefore be as unwise for the average highway engineer to attempt the analyses and chemical testing of road materials as for the average chemist to attempt to construct a modern highway. As before stated, it is only by the close co-operation of engineer and chemist that ultimate success can be obtained and the construction of modern highways be placed beyond the experimental stage.

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**Address Wanted.**—"F.C." is informed that the secretary of the National Association of Local Government Officers is Mr. L. Hill, 24 Bloomsbury-square, W.C.

**The Diesel Oil Engine.**—At a meeting of the Institution of Mechanical Engineers, to be held on the 15th inst., Dr. Rudolf Diesel, of Munich, will read a paper on "The Diesel Oil Engine and its Industrial Importance, particularly for Great Britain." The chair will be taken at 8 p.m.

## THE SALARIES OF PUBLIC OFFICIALS.

By Arthur F. Wickenden, A.R.I.B.A., P.A.S.I.

It is surely time that this subject was enquired into by the Local Government Board and put upon a logical basis. At present the relative salaries paid to different officials engaged in municipal work are not only ridiculous but in many instances grossly unjust, being dependent entirely upon the caprice of local councillors, who, in nine out of ten cases, are absolutely ignorant both as to the quality and quantity of the work performed by individual officers, more especially subordinate officials.

I will quote only a few of the examples which have come before my notice; doubtless many of your readers can add equally glaring cases without number.

The town clerk of a certain council receives a salary of £500 per annum, and is allowed a private practice. The whole-time clerk and solicitor to the council of an urban district with a population more than twice as great receives the same amount.

The second assistant in the engineer and surveyor's department of a London borough commences with a salary of £180 per annum.

A gentleman in the same position, in the employment of a large and important district council within the Greater London area, starts at £100 a year, while the engineer and surveyor to a provincial council—a smaller district, it is true, but one possessing its own gas and water works—obtains a commencing salary of £150 per annum.

Again, for example, consider the salaries paid to officials under one authority. In the offices of a particular urban district council the chief assistant and deputy surveyor and engineer, who has received a technical training, and, by virtue of his position, is presumed to be, and no doubt is, able to take over the many and important duties carried out by the engineer and surveyor if occasion should arise, receives a maximum salary of £250 per annum. The first-class clerk, who carries out the ordinary routine clerical work connected with the same department, and who would with, say, a couple of months' experience, be equally useful in any other department, has his remuneration fixed at a maximum of £200 per annum. The architectural assistant, who is entrusted with many important public building schemes, and has charge of all council schools, accommodating some 13,000 children, is considered worth the maximum salary of £150 a year, which is precisely the same maximum as that of the second-class clerk, who is concerned chiefly with correspondence and duties of a similar character that involve little practical training and less responsibility.

It is needless to multiply the number of examples, which are matter of common knowledge, but it is an undeniable fact that the system under which local government officials are remunerated for their services calls for drastic revision. Would it be an impossible task for the Local Government Board to lay down an approximate scale, both as regards numbers of officials and salaries, based upon either the population, area or rateable value of districts; the local authority subject to the approval of the board to make such variations as would meet special local conditions? Surely not.

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**Another Grinnell Success.** Following upon the recent instances that were afforded of the remarkable efficacy of the Grinnell sprinkler and fire alarm in preventing serious fires comes the report of another case in which the prompt action of a Grinnell sprinkler installation limited what might have been a very serious outbreak. It appears that a fire broke out on January 31st in the cotton mixing room of the New Victoria Cotton Spinning and Manufacturing Company, Limited, Bury, Lancs. Nine sprinkler heads came immediately into operation and the fire alarm gong rang. The outbreak was rapidly extinguished, and the entire damage from fire and water was only about £250. The company have written to Messrs. Mather & Platt, Limited, sole proprietors of the Grinnell sprinkler, to say that this was the first occasion on which their sprinkler installation had been called into operation, and that they are delighted with the manner in which it works. They add that but for the prompt action of the sprinklers the fire might have reached serious dimensions. The number of fires extinguished in all classes of risks by the Grinnell sprinkler now exceeds 15,000.

## THE ROAD BOARD PERSONNEL.

### 3.—COLONEL R. E. CROMPTON, C.B., R.E., M.Inst.C.E., M.Inst.E.E.

The consulting engineer to the Road Board, Colonel R. E. Crompton, is a Yorkshireman, and was born in May, 1845. A son of Colonel Crompton, of Sion Hill and Azerley, he accompanied his father to the Mediterranean during the Crimean War, serving as a naval cadet on H.M.S. *Dragon*, and visiting the Crimea during the latter stages of the war. He returned to school on the conclusion of the campaign, and afterwards finished his education at Harrow. In 1864 he entered the Army, joining the Rifle Brigade, and proceeded to India, where he served at first with his regiment, but later was appointed to a position under the Indian Public Works Department, being engineer-in-chief of the Government steam train, an experiment in which the Indian Government engaged with the object of conclusively testing the relative merits of motor transport on the grand trunk roads as compared with narrow-gauge railways.

He retired from the Army in 1876, and shortly after became a partner in the firm of Dennis & Co., engineers, of Chelmsford, Essex. A year later he became engineer-in-chief of the Stanton Ironworks

Colonel R. E Crompton,
Consulting Engineer to the Road Board.

Company. In connection with the completion of the Stanton foundry the operations necessitated continuous night and day work, and this led to the introduction by him of the electric light, which, in 1877, as applied to practical illumination, was quite a novelty in this country. In 1878 he commenced the manufacture of electrical apparatus on a somewhat modest scale, supplying to work lamps of his own invention the dynamo machines of French construction which had not long before been invented by Gramme, and soon after he added to his small electrical department the manufacture of Burgin dynamos. Thus he was almost the first English electrical manufacturing engineer. For several years after he was actively engaged in the introduction of general electric lighting into England, and had a conspicuous share in a number of the largest enterprises connected with that work.

In 1895 Captain Crompton—as he then was—became president of the Institution of Electrical Engineers, and in 1898, when the scheme for utilising the services of trained electrical engineers for national defence was brought forward, he took an active part in assisting Dr. Hopkinson, who succeeded him as president, to embody the corps, of which he became major on the death of Dr. Hopkinson. Two years later he proceeded to South Africa in command of a contingent of the corps, and at the request of Lord Roberts, who was acquainted with the record of his previous work in India, took charge of a portion of the motor transport, subsequently assisting the War Office in further developing this important branch of the Army Service. He was favourably mentioned by Lord Roberts in despatches, and was created a C.B. for his services in South Africa.

Colonel Crompton was appointed a member of the Special Committee formed to deal with the development of Army motor transport, and the work on this committee, added to his experience in India on transport matters, has constituted him an authority on road-traffic matters. For a number of years past he has been chairman of the Improved Roads Committee of the Royal Automobile Club, but he is best known, of course, to municipal engineers as consultant to His Majesty's Road Board, a position in which he has displayed untiring energy and a genuine desire to arrive at a solution of the serious problems which have been created by the introduction of mechanically propelled vehicles.

## SOME RECENT PUBLICATIONS.*

Sewage Sludge: New York: McGraw Hill Book Company.

This book consists of the following four sections: Treatment and Utilisation of Sludge, by Mr. A. Elsner; the Drying of Sludge, by Mr. F. Spillner; the Operations of Mechanical Sewage Plants, by Messrs. Spillner and Blunk; and Sludge Treatment in the United States, by Mr. Kenneth Allen, M.Am.Soc.C.E. The first two of these have been translated from the German by K. and R. S. Allen, and the third by Emil Kuichling, M.Am.Soc.C.E. The whole question of the treatment of sludge is dealt with very fully in these various papers. It is impossible to deal with the subject in detail in this place, but it may be stated that the information which is given should be very useful to all sewage works engineers and managers, as practically every known process is dealt with, and results given, even where these have not proved satisfactory. The book is well got up, and has a useful index, but it is to be regretted that the proof-reading does not appear to have been carefully done.

In the February issue of "Garden Cities and Town Planning" the relation between the state of housing accommodation and the condition of the working classes is dealt with from different points of view in two of the longer articles. Mr. E. E. Hayward, M.A., writes on "Housing and Destitution," dipping into various official reports and other publications, and "seeking to establish a relation between the Housing Problem and what is known as Destitution." Mr. Hayward handles his matter well, and deals with his grim statistics in a manner which should render his article of considerable value to those who are concerned with these problems. The other article is by Mr. P. H. Houfton, who describes "The Woodlands Colliery Village," which was begun in 1907. The total area of the "Field Site" is 24 acres, of which 14 acres are reserved as open space. The houses number five to the gross acre and twelve to the nett acre. The other portion, the "Park Site," has an area of 70 acres, 19 acres open space, and 3½ reserved for the church, school and vicarage. This gives 7·6 houses to the gross acre, and 11·2 to the nett acre. Another 46 acres are reserved for plantations, club grounds and lake. The cost of building varied from £156 to £212 per house, the average being £178 10s. 7d. for building alone. The average cost of roads (per house) was £8 14s. 9d.; of water pipes, £3 9s. 5d.; of drains and sewers, £5 9s. 10d. These make, with the cost of building, £196 per house. The rents vary from 5s. 3d. to 6s. 9d. per week, rates included. The rates were recently 3s. 8d. in the £, but have since been raised.

**Conduits and Conduit Fittings.**—Messrs. Siemens Brothers' Dynamo Works, Limited, Caxton House, Westminster, London, S.W., give notice that, owing to the increase in cost of raw materials and wages, all their list prices for conduits and conduit fittings are advanced 5 per cent as from the 4th inst. Discounts and terms remain as at present.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

# What is Asphalt?

## THE NATURE AND OCCURRENCE OF THE NATURAL MATERIALS.

By CECIL NATHAN, A.I.E.E.

As so much misconception exists as to what really is asphalt, the present article has been written with a view to explaining as succinctly as possible the relative merits of the four separate materials which are known under the generic name of asphalt—*viz.*:—

(1) Pure natural asphalt or solid bitumen.
(2) Natural rock asphalt or calcareous rock impregnated with bitumen.
(3) Asphaltum or residuum obtained from the distillation of asphaltic or semi-asphaltic base oil.
(4) Artificial "asphalt," manufactured from coal tar products.

In considering these materials a distinction must be drawn between them, as the unfortunate popular lack of knowledge as to the real nature of asphalt has so far greatly militated against its universal adoption, notwithstanding that it is a material which has a reputation both ancient and honourable, it having been used long before the Deluge, and referred to by many ancient authors, such as, among others, Aristotle and Homer.

It is a well-known fact that asphalt was used as a durable and waterproof cement in the earliest constructions on record, as, for instance, in the erection of the Tower of Babel and in the construction of the walls of Babylon, also in the foundations of the Pyramids. Further, Egyptian mummies were always, and are to this day, preserved with this material.

During the Middle Ages, however, asphalt evidently fell into disuse, and it was not until recent years that it has again been prominently and successfully reintroduced.

As an absolutely reliable material a great future may now be safely predicted for it.

### NATURAL ASPHALT OR SOLID BITUMEN.

Pure natural asphalt or deposits of solid bitumen are found in different parts of the world.

Its uses when properly refined and fluxed are multitudinous, and it is very largely employed in the manufacture of paving materials, dampcourses and sheeting, varnishes, and as an insulating material for electrical purposes.

Lake Trinidad asphalt is the asphalt best known to-day. This deposit, which has been well called a lake, inasmuch as it occupies limits actually defined by shores, is the property of the British Crown, and is situated in the Island of Trinidad, British West Indies, just off the north coast of South America, near Venezuela.

Containing as it does an apparently inexhaustible supply of asphalt, this deposit may be regarded as one of Nature's wonders.

It is worked under a concession which provides for a royalty of 6s. 8d. per ton to the British Government.

Crude Lake Trinidad asphalt is of great uniformity in composition, but has only a moderately high softening point. It contains about 39 per cent of pure bitumen, about 29 per cent of water (probably sea water), which is expelled in refining, and about 32 per cent of organic and mineral matter, which latter is as much a fixed constituent of the asphalt as the bitumen itself, neither can it be accidental, as it does not vary in amount. It evidently became mixed with the bitumen under fixed conditions at some subterraneous point where the asphalt originates. As, however, it is composed principally of quartz with a clay in an extremely fine state of subdivision, and is so intimately mixed with the bitumen by Nature, it is consequently a very desirable constituent as a filler when this asphalt is employed in the manufacture of paving material.

During the past few years another vast deposit of natural asphalt near Mariel Bay, in the Island of Cuba, about 30 miles north-west of Havana, has been opened up in a substantial mining manner, and equipped with a railway, wharves and so forth, and it is estimated that several millions of tons of asphalt of excellent quality exist here.

The analysis of this Cuban natural asphalt shows that it contains as much as 60 per cent of pure bitumen, about 36 per cent of mineral matter, and only about 4 per cent of water.

It is of remarkable uniformity in composition, and has an exceedingly high softening point, in consequence of which it is not only of exceptional value for road-making purposes, especially in tropical climates, but can also be shipped in bulk in either its crude or refined state, as during its voyage it does not fall into a homogeneous mass and have to be dug out again at its port of destination. A saving in cost of barrels and extra freight is thereby effected.

Thousands of tons of this asphalt have been, and are being, regularly shipped to the United States of America, where miles of roads are constructed with this material; and it has also been successfully introduced in this country as a ductile and waterproof binder in the manufacture of a durable asphaltic mastic for resurfacing on the carpeting principle main country roads in an inexpensive manner.

It is quite probable that this vast deposit of Cuban natural asphalt will in the near future afford the best and cheapest source of supply of asphalt to the whole world, especially as there are no royalties or export duties payable upon it.

A few other minor deposits of asphalt exist, such as what has been called the "Bermudez Pitch Lake," in Venezuela, which lies in a very swampy district, about 30 miles from the coast. Unlike Lake Trinidad and Cuban asphalt, Bermudez asphalt is very variable in character and difficult to win, as it lies so low that in the rainy season it is flooded, and is at all times so wet that any excavation immediately becomes filled with water.

Maracaibo asphalt, which is also found in Venezuela, resembles and possesses many of the characteristics of the crude Bermudez asphalt, but is mainly distinguished from it by its rank sulphurous odour. Both of these Venezulan asphalts are used to a slight extent in the United States of America.

Manjak is the name given to another asphalt which is found in Barbados, and used in the manufacture of varnishes.

In Mexico, especially along the coast of the Gulf of Mexico, natural asphalts, in a more or less solid form, are of frequent occurrence, but at none of these deposits is there a sufficient quantity available to make them of commercial importance.

Numerous small deposits of solid bitumen are scattered throughout Lower California, none of which have proved of the slightest value, as the bitumen being found in fissures or veins in the shales it always pinches out at a very moderate depth, so that the quantity available at any one point is too small to pay for mining it. The only interest to the paving industry in these deposits lies in the fact that minute percentages of them have at times been added to the residuums distilled from the asphaltic base oils which are found in this district, merely in order to substantiate the claim that the latter contained native solid bitumen.

There are several small pockets of asphalt in Turkey and in Palestine which were originally worked by the ancients, but such deposits are now only of historical interest.

Although all the above-mentioned natural asphalts or bitumens are Nature's own products, they vary considerably in quality, and have to be handled according to their respective merits.

### NATURAL ROCK ASPHALT.

Natural rock asphalt is a lime ore, probably the remains of marine animal life, impregnated naturally by an unexplained geological phenomenon, with a small percentage of bitumen. It is found in strata like coal, and mined in a similar manner. Numerous deposits of it are scattered over France, Germany, Switzerland, Italy and Sicily. It is chocolate in colour, and varies in bitumen contents from 6 per cent to as much as 17 per cent.

Pavements made with this rock, after it has been reduced to a fine powder and heated, are called compressed asphalt pavements, as the powder, after being carefully spread and rendered even by tamping and smoothing with heated appliances, becomes reconsolidated into its original rock formation under traffic. The thickness which this asphalt is laid varies from 1½ in. to 2½ in., according to traffic conditions.

These pavements are very durable and dustless

but somewhat slippery for horses, especially under slightly humid atmospheric conditions; they are also inclined to "wave" in warm weather, owing to the asphalt not being sufficiently rich in bitumen to adhere to the substantial concrete foundations upon which of necessity it has to be laid.

This form of pavement, being initially expensive, has its limitations; nevertheless, for heavy traffic in cities it has proved economical, and at the same time very easy to repair and scavenge. Being impervious to moisture, and free from joints, it is also a perfectly sanitary paving.

Germany has undoubtedly taken the lead in laying compressed asphalt as in Berlin alone there are more compressed asphalt pavements than in France and England together.

Excellent mastic asphalt is also made with this powdered rock asphalt, and when enriched with natural asphalt and mixed with sharp sand, such mastic, when laid hot *in situ*, is durable, elastic and impervious to moisture, therefore suitable and largely employed for roofing purposes, bridges, cellars, courtyards, footpaths, &c.

ASPHALTUMS.

Asphaltos, an ancient Greek word, passed into the Latin as asphaltum (English "asphalt"), but the materials known as asphaltums to-day must not be confused with natural asphalts, which they resemble in appearance, as they are merely the pitchy residues obtained from the distillation of asphaltic or semi-asphaltic petroleums, such residues on cooling off after the process of distillation being practically solid bitumen, the properties of which, however, depend very largely upon the nature of the petroleums from which they are derived, and the care with which they have been distilled.

These residues, which are sometimes blown or oxidised into a solid residuum, contain no mineral matter, and can only be regarded as of any real value when used as a flux or as an amendment to a limited extent to some of the natural asphalts as, although they have the ability to retain their consistency within wide ranges of temperature, these so-called asphaltums by themselves are extremely short or brittle in nature, which prevents their use as the main cementing bitumen in the manufacture of paving materials.

Artificial "asphalt" so-called, must not be classed with the natural asphalts, to which it is inferior both as regards elasticity and with respect to behaviour under changes of temperature. The word "asphalt" should, in fact, never be applied to coal-tar products, the failure of which, or their partial success within narrow limits of usefulness, is no guide whatever to the behaviour of those greatly superior materials the natural asphalts.

**Institution of Civil Engineers: Students' Meeting.**—At the students' meeting held at the Institution of Civil Engineers on Friday last Mr. G. N. Yonder, M.INST.C.E., in the chair, a paper on "The Design and Construction of Masonry Dams" was read by Mr. H. J. F. Gourley, B.ENG., STUD.INST.C.E. The author dealt exhaustively with the questions of the selection of the site and the setting out of the work, together with the general considerations which govern the design and construction of such structures. The paper was illustrated by a number of lantern slides, giving details of dams both completed and in course of erection. The discussion was opened by Mr. T. J. Taplin, and continued by Messrs. R. S. Carrol, R. J. Samuel, R. V. Hutt, A. J. Hart, E. Howe, C. Mitchell, H. V. Hughes and S. J. Good. The author having replied, the proceedings closed with a vote of thanks to the chairman, proposed by Mr. H. V. Hutt.

**Workmen's Wages.**—The Maldon and Coombe Urban District Council have adopted the following sliding scale of wages: Sewage works labourers and sweepers, 23s., one to four years' service; 24s., four to eight years' service; 25s., eight years' service and upwards. Carters, 25s., 26s. and 27s. General workmen on roads and sewers, and dustmen, 24s., 25s. and 26s. Contact-bed men, one to five years' service, as now fixed, 4s. 6d. per day and 5s. 6d. per night. Engine drivers at sewage works, 5s. per day and 6s. per night. Steam-roller driver, 34s. Other recommendations were that no workman shall be appointed on the permanent staff in the works department of the council over forty years of age; that any workman hereafter taken into the employment of the council, whose age is above forty, shall be regarded as on the list of casual labourers, and that in respect to all temporary labour a workman be paid a maximum rate of 3s. 6d. per day.

## CAMBERWELL BOROUGH ENGINEER'S REPORT.

Public roads maintained and repaired by the metropolitan borough of Camberwell have now, according to the report of the engineer, Mr. Wm. Oxtoby, M.INST.C.E., a total length of 120¾ miles, an increase of ⅝ mile on the preceding year. The mileage of the various kinds of paving is as follows: Granite, 41⅛; flint, 61¼; wood, 12⅝; asphalte, 2¾; granite sett paving, 2¾. In this connection there is an increased mileage of 8½ miles, the granite and flint roads being reduced by ⅝ mile, while to the so-called permanent paving have been added 8⅞ miles.

The expenditure on highways maintenance approximates one-third the total expenditure on the various services controlled by the Works and General Purposes Committee. During the year the total outlay on maintenance, including capital expenditure charged to revenue account, street improvements, loans, interest, and repayments, was £46,850, of which £17,389 represented loans, interest, and repayments. The loan charges were incurred generally in the substitution of granite sett, asphalte, and wood pavings for granite and flint roads.

It is interesting to note that for the purpose of obtaining reliable data as to the cost of various classes of road pavings under varying conditions the whole of the roads in the borough are classified and grouped according to the character of road surface, and certain groups are again subdivided according to the class of traffic.

Large areas of the wood-paved roads, it is shown in the report, have survived the repayment of the original loans without any extraordinary expenditure on maintenance. In several instances the defective condition of the paving has necessitated subsequently the relaying of the whole of the surface of certain roads, and provision is now being made each year in the estimates to deal on the same lines with some portion of the remaining areas.

During the year covered by the borough engineer's statement an extensive programme of tar-coating metalled road surfaces was carried out. It is quite anticipated that this treatment, if continued year by year, will eventually effect a considerable saving in metal, the average in cube yards of metal expended per mile of road already showing a tendency to fall. The work is done by the council's own workmen by means of hand tar-spraying machines.

As regards footways, of which there is now a length of 233 miles, the expenditure during the year under review was £5,568. Of York stone paving there are 138 miles, tar 43½ miles, asphalte 41¾ miles, Caithness stone 1 mile, patent stone 2¾ miles, and gravel about 5½ miles; in addition to which there is a short length of Staffordshire brick paving.

The expenditure for the year on cleansing and scavenging (including collection and disposal, gritting roads, watering and plant charges) was £27,119, the average cost per mile of road being £224 11s. 10d. It is remarked by the borough engineer that the general tendency of the average cost per mile is to fall, this, it is suggested, being due in great measure to the substitution of permanent pavings in lieu of macadam roads, and the gradual displacement of horse traction by motor vehicles.

In connection with house refuse collection and disposal there was an outlay of £19,797, the average cost per load being 8s. 2¾d. The number of loads dealt with was 48,105. Tradesmen's refuse is collected at a charge of 1½d. per bushel, or 3s. 6d. per load. The work, however, is carried out at a loss to the council.

On public lighting the expenditure during the year was £11,843, the average cost per mile of road being £9 11s. 1d.

For administrative purposes the borough of Camberwell is divided into six districts, each under a superintendent, with a staff of workmen and its own local depot for stores, plant, and tools. The employees engaged upon sewer work and in the open spaces are under separate superintendents, while the mechanics employed in the workshops are under the control of the general manager at the central depot, an establishment fitted with the most modern machinery, where the council make their own vans, carts, harness, and working plant generally, and execute necessary repairs. Each of these districts, under the borough engineer's direction, thus becomes a separate organisation, responsible for the execution of all services within its own area, except in respect of sewers and open spaces. In the subdivision of labour each superintendent again allots the duties according to the qualifications of the men.

# Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 74 Bride-lane, Fleet street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

## QUESTIONS.

This week answers are invited to the following questions:—

**227. Refuse Disposal.**—Describe, with illustrations, the most efficient and economical form of refuse destructor for a village of 500 inhabitants. (M.Inst.Mun. and C.E., *Seccondee.*)

**230. Refuse Disposal.**—Describe, with sketches, a device for the mechanical sorting of house refuse.

**232. Books for Examination.**—What are the *best* and *cheapest* books to get for studying for the A.M.I.C.E. examination in the following subjects: Geography, history, literature, mechanics, strength and elasticity of materials, theory of structures, hydraulics, geology and mineralogy? ("Institute.")

**233. Tramways.**—Sketch a "turn out" or "passing place" on a single line of tramway; figure the leading dimensions, the angle of the crossings, and describe the length, position, and character of the "points" required for observing the traffic. (M. and C.E.)

**234. Pumping Station.**—Sketch and describe a small pumping station capable of lifting 100,000 gallons of water from a bore-hole in the rock and delivering through a rising main 500 yds. long into a reservoir, the total vertical lift being 100 ft. After working out the theoretical horse power required, state the brake horse power and type of engine you recommend, and give your reasons. (M. and C.E.)

## REPLIES TO QUESTIONS.

**229. Swimming Bath.**—Give sketches showing plan and cross-section of a covered swimming bath, say 70 ft. by 30 ft., with a detail of the roof. What method would you adopt for heating the bath? (M. and C.E.)

A public swimming bath should occupy a site fairly central in a town, and the importance of future extension should not be overlooked when mapping out a preliminary scheme. I propose to give a rough sketch (Fig. 1), and assume that land on one side can be readily acquired to enable another plunge bath to be added at B, and perhaps a Turkish bath at C. Slipper baths should be included, and these may be of cast-iron, with best enamel finish. Porcelain baths are better, but they are expensive and absorb a lot of heat.

To construct the bath I would suggest the following method: Excavate trenches for the four side walls and carry up concrete, say 12 in. thick; when concrete has set hard, remove the outside timbering and excavate for the bath. To allow these walls to be reduced to a minimum in thickness, wall ties may be inserted at suitable intervals, as indicated in Fig. 2.

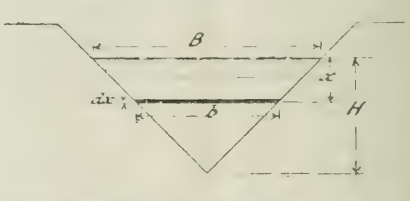
Top light and ventilation are most suitable for this class of building, and, where expense will permit, a "spectators'" gallery should be provided. See Fig. 3.

I am in favour of the Roeder system for the heating of water in swimming baths, and if the electric light station or other municipal work are near at hand waste water from these works may be utilised. Under this system of heating, Lancashire boilers 20 ft. long supply steam to an annular heater, from this heater the pipe is carried under the bath, which carries hot water to the spreaders marked "S.S." through which the water is forced under pressure. The overflow grating should extend the whole length of the bath, the shoulder should be placed at the shallow end and all waste pipes should be arranged at the bottom of the bath to ensure thorough circulation.

The heating of the Turkish bath would be on an entirely different principle, the radiating mediums being firebricks and fireclay. This surface, in the main, consists of a long flue of firebricks and slabs, which heats and becomes very hot, and the required amount of radiating surface is acquired. Faultless workmanship is imperative, otherwise sulphurous fumes will be emitted into rooms, which would prove fatal for this type of bath. Steam-heating may, however, be fitted in addition to these fireclay flues, but there is a danger of the pipes bursting and charging the already highly-heated atmosphere with vapour and seriously scalding the occupants. If pipes are used they should be at least $\frac{3}{8}$ in. thick of wrought-iron or copper, and severely tested by hydraulic pressure. These baths are sometimes heated through the floor; the advantage gained by this latter method is that you eliminate all risks of the head being in a warmer atmosphere than the feet. Whatever scheme is decided upon, great care must be taken that the temperature can be easily regulated by means of fanlights or hit-and-miss gratings. (A. G. A., *Colchester.*)

**231. Discharge of Sewage.**—What is a suitable formula for calculating the discharge of sewage having a variable velocity over a 90° V-notch? (H. E. R., *Barnard Castle.*)

Let B = width of orifice at surface of water in feet.
H = head of water on vertex in feet.
Q = theoretic discharge cubic feet per second.
$q$ = actual discharge cubic feet per second.
$c$ = coefficient of contraction.




The velocity of flow through an elementary strip of area $b.dx$ and under a head $x$ is $\sqrt{2gx}$, and the discharge through such strip is thus $b\sqrt{2gx}.dx$.

$$\therefore \quad Q = \sqrt{2g} \int_{x=0}^{x=H} x^{\frac{1}{2}}.b.dx \quad \ldots\ldots\ldots \quad (1)$$

Now, from sketch $\frac{B}{H} = \frac{b}{H-x}$, and in the case of a 90° notch B = 2H, and $\therefore b = 2(H-x)$ which substitute in (1)

$$\therefore \quad Q = 2\sqrt{2g} \int_{x=0}^{x=H} (H-x)x^{\frac{1}{2}}.dx$$

$$= \frac{8}{15}\sqrt{2g}.H^{\frac{5}{2}}$$

and $q = \frac{8}{15}c\sqrt{2g}.H^{\frac{5}{2}}$

The cross-section of the stream remains similar for all values of H, so that the value of $c$ varies but slightly, and for a right-angled notch may be taken as .617.

Then $q = 2.64\,H^{\frac{5}{2}}$

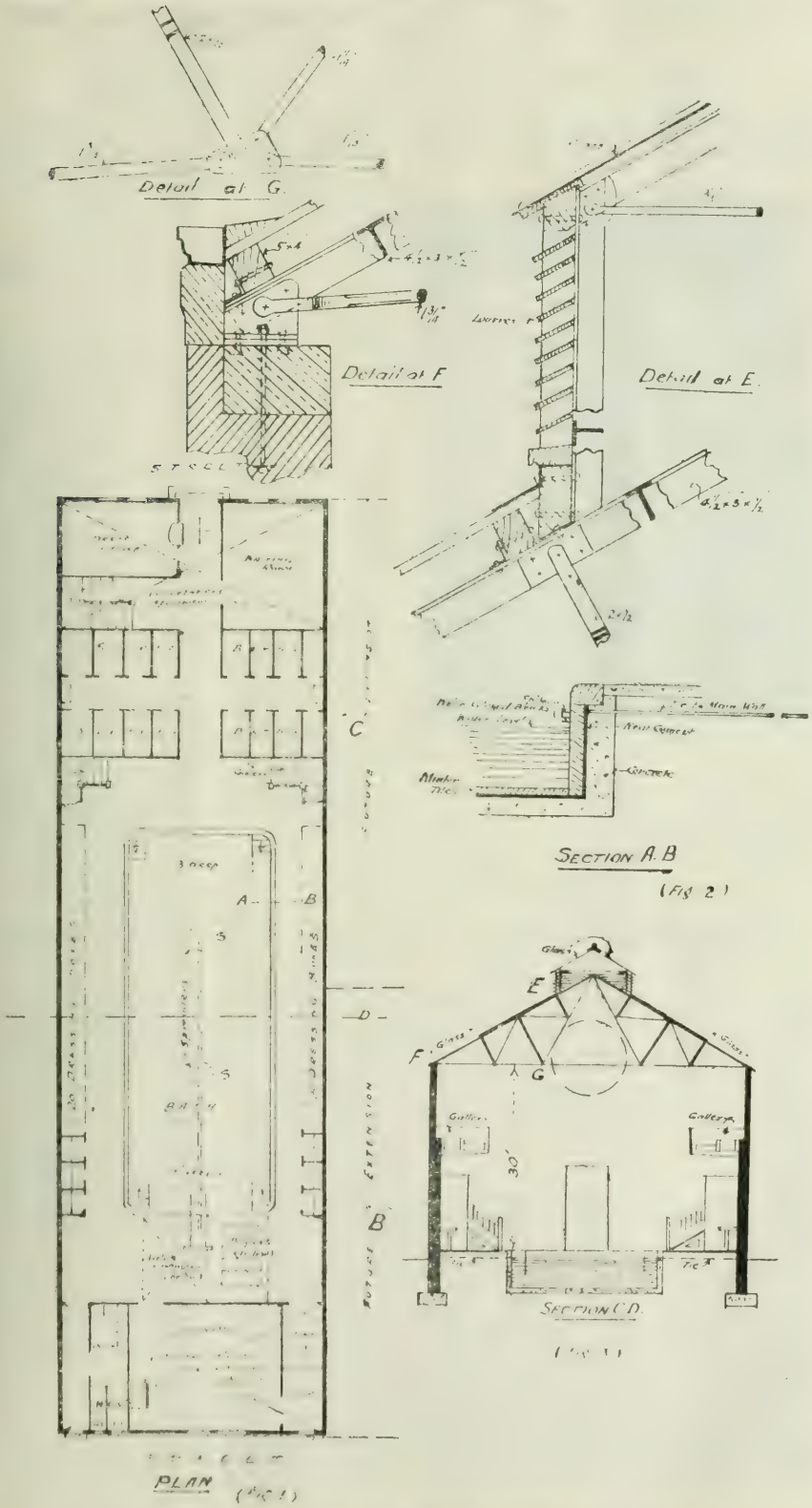
Where velocity of approach exists an allowance must be made for the additional head required to produce the velocity.

Let $v$ = velocity in approach channel.

$h$ = velocity head = $\frac{v^2}{2g}$

Then $q = 2.64\,(H+1.4h)^{\frac{5}{2}}$

Practical considerations control to a great extent the dimensions of such weirs and limit their use




Plan, Cross-Section and Roof Details of Covered Swimming Bath

to the determination of small and variable flows.—H. F. W., *Tottenham.*)

The formula for the discharge of a 90° V-notch, with no velocity of approach, is usually given as—

$$Q = 2{\cdot}635\,h^{\frac{5}{2}} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

where $Q$ = discharge in cubic feet per second.

$h$ = head of water in feet over the notch measured from the surface of still water.

When there is an initial velocity in the stream approaching the notch, the discharge is increased.

One formula for the discharge of a 90° V-notch, with an appreciable velocity of approach is—

$$Q = 2{\cdot}635\left\{(h + hv)^{\frac{5}{2}} - hv^{\frac{5}{2}}\right\} \quad . \quad . \quad . \quad . \quad . \quad (2)$$

where $hv$ = head necessary to create the velocity of approach as calculated from $hv = \frac{v^2}{2g}$

$v$ = velocity of approach in feet per second.

$g$ = acceleration due to gravity in feet per second = 32·2.

The second formula to allow for the velocity of approach is by altering the coefficient in the primitive formula—*e.g.*

$$Q = m \times \frac{bh}{2} \times k \times \sqrt{2gh}.$$

where $m$ = coefficient of contraction = ·616.

$b$ = breadth of notch at still-water level

= $2h$ in a 90° V-notch

$k$ = ratio of maximum velocity at apex to mean velocity = $\frac{8}{15}$

$$\therefore \quad Q = m \cdot \frac{2h \times h}{2} \times \frac{8}{15} \times 8{\cdot}02 \cdot h^{\frac{1}{2}}$$

$$= 4{\cdot}278\,mh^{\frac{5}{2}} \quad . \quad . \quad . \quad . \quad (3)$$

If we substitute $m$ we get (1).

When there is an appreciable velocity of approach

$$m_1 = m\left\{\left(1 + \frac{hv}{h}\right)^{\frac{5}{2}} - \left(\frac{hv}{h}\right)^{\frac{5}{2}}\right\} \quad (4)$$

where $m_1$ = altered value of coefficient ($m$) to allow for the velocity of approach.

Both methods give practically the same result.

The velocity of approach of the stream or sewage may be found by a current meter or Pitot tube, or otherwise; but in case of no other means being available, a fairly correct discharge can be obtained as follows:—

(A) Measure the sectional area of the stream at the point of observation.

(B) Calculate the discharge by the ordinary formula (1), neglecting the velocity of approach.

(C) Divide the discharge (B) by the sectional area, (A) getting an approximate mean velocity of approach in feet.

(D) Calculate the head ($hv$) to create this velocity, and use 2 or 3 to calculate the discharge.

(E) If necessary, repeat the process by recalculating the mean velocity from this discharge, and so finding a more correct estimate of $hv$. (J. A. R., *Milton Regis.*)

### Notes.

J. A. R. (*Milton Regis*) writes:—With reference to the reply to question No. 226, published in your issue of the 16th inst., it is stated that the period for the repayment of loans for sewerage purposes is sixty years, but, I believe, that the usual period allowed by the Local Government Board is thirty years.

The Local Government Board's requirements are that three times the dry-weather flow be treated fully, and a further three times the dry-weather flow is to be partially treated on storm beds. The figures should be based upon the average dry-weather flow, and not upon an assumed maximum dry-weather flow, as stated by your correspondent.

This gives for a population of 14,470 at 16 gallons per head per day an average dry-weather flow of 4·25 c. ft. per second, and as three times this quantity is to be pumped at a speed of 4 ft. per second, it will require a pipe of 7·66 in. diameter, say 8-in. pipe.

If six times the dry-weather flow is to be pumped the pipe must be 11·42 in. diameter, say 12-in. pipe.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

### NEW PRESIDENT AND COUNCIL.

The subjoined return, showing the names of those elected as president, vice-presidents, hon. secretary, hon. treasurer and ordinary members of the council (other than district representatives) for 1912-13, will shortly be issued to members of the Institution of Municipal and County Engineers, together with forms for the nomination of district chairmen, secretaries and representatives to serve on the council.

President: Mr. R. J. Thomas (Bucks County).

Vice-Presidents: J. W. Cockrill (Great Yarmouth), J. S. Pickering (Cheltenham), and T. W. A. Hayward (Battersea).

Honorary Treasurer: Sir James Lemon.

Honorary Secretary: Mr. Charles Jones.

Ordinary Members of Council: Messrs. J. Patten Barber (Islington), J. A. Brodie (Liverpool), J. S. Brodie (Blackpool), A. H. Campbell (Edinburgh), G. F. Carter (Croydon), A. E. Collins (Norwich), W. Harpur (Cardiff), W. T. Lancashire (Leeds), H. P. Maybury (Kent County), and C. F. Wike (Sheffield).

The institution by-laws provide that each district committee shall elect annually its district chairman and district secretary, and that each district committee, except those for India and Africa, shall also elect a district representative or representatives to serve on and be members of the council. The North-Western, North-Eastern, Eastern and Metropolitan Districts are entitled to elect two such representatives, and all the other districts one each. The Scottish and Irish District Committees respectively are entitled, in addition, to elect one of their members to serve as a vice-president of the institution, and, as such, as an ex-officio member of the council.

Nomination papers must be returned to and received by the secretary not later than seven days from the date of issue.

### COUNCIL MEETING.

At a meeting of the council held at the offices of the institution on Saturday last there were present: Mr. A. D. Greatorex (president, in the chair), Messrs. W. N. Blair, T. W. A. Hayward, W. Harpur, W. T. Lancashire, G. F. Carter, E. J. Elford, E. B. B. Newton, R. J. Thomas, J. W. Cockrill, W. Stubbs, J. Patten Barber, A. Gladwell, Thomas Cole (secretary), and H. A. Giles (assistant secretary).

A vote of condolence and kindly sympathy was unanimously passed to Mr. A. Gladwell in the loss he had sustained by the death of his son.

Elected as Members: Messrs. H. Inglis, burgh engineer, Aidrie; R. C. Moon, chief assistant, Nuneaton; and T. Harrop, surveyor to the Bispham-with-Norbreck Urban District Council.

Elected as Associate Members: Messrs. H. C. Rimmell, senior engineering assistant, Cardiff Corporation Waterworks; J. E. Cardell, assistant road surveyor, St. Ives and Ramsay, Hunts; J. T. Dewhurst, assistant engineer to the Audenshaw Urban District Council; and A. W. Panton, engineering assistant, Liverpool.

Elected as Student: Mr. G. W. Chandler, borough surveyor's office, Tewkesbury.

Transferred from Associate Member to Member: Messrs. A. M. Ker, deputy engineer, Warrington; W. C. Persey, chief assistant, Barrow-in-Furness; F. J. Thackray, surveyor to the Hoyland Nether Urban District Council; W. H. A. Court, chief assistant, Leicester; and A. E. Smith, surveyor to the Hay Urban District Council.

The General Purposes Committee reported the completion of the draft arbitration clause, and the secretary was instructed to send a copy to each member of council for consideration for the next council meeting.

The Standardisation Committee reported progress as to standardisation of vitrified ware pipes. Satisfactory sale of the standard specification for concrete flags was reported.

The Tramways Committee reported progress as to the tabulation of replies received in relation to the corrugation of tramway rails.

On the recommendation of the Roads Committee the council resolved with regret that the resolution sent up from the Lower Thames Valley District Surveyors' Association as to "powers to enable local authorities to define routes (other than county main roads) to be taken by any service of motor-omnibuses or other

# The Surveyor

And Municipal and County Engineer.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motor vehicles licensed for hire, or for the carriage of goods into or through their respective districts, is of so far-reaching a character as to lend itself to unreasonable application, and having regard to the representations made by the institution to the Local Government Board as to the pressing necessity of an amendment of the Highways and Locomotive Acts and the Heavy Motor Car Order of 1904, do not see their way at present to take further steps in the direction suggested by the resolution.

It was unanimously resolved to convey the hearty congratulations of the institution to Mr. Brodie on his being selected by the Government of India to report on the laying-out of Delhi.

THOMAS COLE.
11 Victoria-street, S.W. *Secretary.*

**Regina Water Scheme.** The water scheme which Mr. R. O. Wynne-Roberts, M.Inst.C.E., has been engaged to carry out for the Canadian city of Regina has been enlarged so that it will now cost something like £900,000 in all.

**London's New County Hall.**—The King will, at noon to-morrow lay the foundation-stone of the new London County Hall, which, when completed, will be the finest municipal building in the world. The new hall will occupy nearly 9 acres of land on the south side of the Thames, near Westminster Bridge, with a river frontage of 800 ft. The estimated cost is well over £1,000,000.

**Motor Fire Engine for Southend.**—Southend-on-Sea is the first Essex town (outside Greater London) to possess a motor fire engine. This machine, which has just been put into service, is a Merryweather petrol "Hatfield" pump, driven by a 42-horse power R.A.C. rating, four-cylinder motor. The capacity of the pump is 350 gallons per minute, and the chassis also carries a 50-ft. fire escape. The journey from the makers' works at Greenwich to Southend was undertaken by road on Wednesday of last week. An excellent run was made, the entire trip being carried out without a hitch. The public trial took place on Saturday, and at the pumping test in the park, one, two, three and four jets were shown at work. With a single 1-in. jet a pressure of 180 lb. was registered on the pump. Subsequently a run was made along the sea front, and a speed of 40 miles an hour attained. The Mayor, the chairman of the Fire Brigade Committee, and other councillors and officials of the corporation who were present expressed themselves as thoroughly well satisfied with the capabilities of the machine.

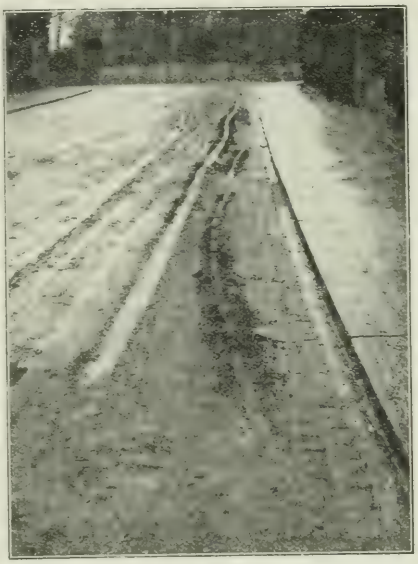
## CORRESPONDENCE.

*"All truth is precious, if not all divine."*—COWPER.

### THE USE OF SKIDPANS.

*To the Editor of* THE SURVEYOR.

SIR,—I forward a photograph, showing the effect of skidding with a chain-locked wheel on a highway with an incline of 1 in 8, which I consider an argument against what is often stated—that a skidpan



DAMAGE DONE BY SKIDPAN ON A WIMBLEDON ROAD.

does little injury to a highway. No doubt in this case the skidpan was not properly adjusted.—Yours, &c.,

C. H. COOPER,
Engineer and Surveyor.

Town Hall,
Wimbledon.
March 4, 1912.

## FREE CARBON IN TAR OR PITCH.

### THE ROAD BOARD'S SPECIFICATIONS.

Colonel Crompton, consulting engineer to the Road Board, writes:—

"Representations having been made to the Road Board as to the difficulty at the present time of obtaining from gas-works a coal tar of fixation and at some other districts, tar or pitch which complies in percentage of free carbon with the Road Board Specifications for pitch and for tar No. 1 and tar No. 2, the board, as a temporary measure, in order to allow time for arrangements to be made for the supply of tar and pitch containing no more than the specified percentages of free carbon, have, on the advice of their Advisory Engineering Committee, decided to modify the percentages of free carbon as follows:—

In tar No. 1 (Specification No. 4) the percentage should not exceed 20 per cent.

In tar No. 2 (Specification No. 5) the percentage should not exceed 24 per cent.

In pitch (Specification No. 6) the percentage should not exceed 31 per cent.

"These modifications will be operative until December 31, 1913.

"It should be distinctly understood, however, in contracting for the purchase of tar or pitch that the value of the material for road purposes lessens with the increase of the proportion of free carbon which it contains. A fair estimate would be that each 1 per cent of free carbon in excess of the percentages mentioned in Road Board Specifications 4, 5 and 6 lessens the value to the extent of from 5 per cent. to 7½ per cent. of the price."

# Law Notes.

Edited by J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

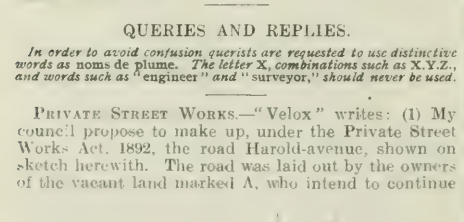
*The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, one side only) should be addressed to "The Law Editor," at the office of* The Surveyor, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

Bursting of Drain: Embankment Raised by Landowner: Damage to Adjoining Land.—An interesting point as to the rights of landowners to protect their land from anticipated flooding was decided in *Massey Drainage Board* v. *Great Northern Railway Company* (King's Bench Division, Mr. Justice Hamilton and Mr. Justice Lush, January 26th). This was an appeal by the railway company from the Peterborough County Court. The defendant company were owners of a triangular piece of land adjoining their railway. From the lie of the ground it was at times flooded. In order to protect it from flood water the company erected an embankment round it, with the result that the flood water flowed off into a drain and burst the embankment, doing injury to adjoining land belonging to the plaintiff board. The County Court Judge gave judgment for the plaintiffs. The High Court allowed the appeal, and entered judgment for the defendants. Mr. Justice Lush, in the course of his judgment, referred to the rule laid down by Lord Tenterden in *Bee* v. *Commissioners of Sewers for Bagbam* (8 B. and C., 355) *etc.*, that each landowner for himself may erect such defences as the necessity of the case requires, leaving it to others in like manner to protect themselves against the common enemy. His lordship said that he thought Lord Tenterden, in using that language, was not speaking only of land which is subject to inroads from the sea, but of the right which each landowner possesses to protect his land against any common danger, whether it is flooding by sea water or flooding in time of storm. That was really all that the defendants had done. If they had brought water on to their land by artificial works, and then discharged it on to their neighbour's land, or if, when water or filth was on their land, they had by artificial means discharged it on to their neighbour's land, or if in doing what they had done they had not used proper care or skill—in either of these cases they would have been liable. But, in fact, they had done nothing more than was reasonably necessary, and they had done that in a reasonably careful and prudent manner in order to protect their land against the flood.

## QUERIES AND REPLIES.

*In order to avoid confusion querists are requested to use distinctive words as* **noms de plume.** *The letter* **X,** *combinations such as* **X.Y.Z.,** *and words such as* "**engineer**" *and* "**surveyor,**" *should never be used.*

Private Street Works.—"Velox" writes: (1) My council propose to make up, under the Private Street Works Act, 1892, the road Harold-avenue, shown on sketch herewith. The road was laid out by the owners of the vacant land marked A, who intend to continue



[illegible] the future [illegible] Shall I be right in apportioning them with the frontages [illegible] land [illegible] (2) The two houses marked B are exactly similar to those marked C. Would it be fair to apportion them with the same [illegible] frontages [illegible] (3) Any land [illegible] made up and taken over by the public along this road will not be chargeable in respect to such land in Harold-avenue. The right of way [illegible] a public [illegible] land maintained by the county. Who is liable in respect to the frontage of the right of way to Harold-avenue?

(1) Yes. (2) In *Newquay U.D.C.* v. *Rickard* (1911, 2 K.B., 30) it was held that premises, access to which is obtained from a private street through a public street or road, ought not to be included in the apportionment. It would appear therefore that these two houses are not chargeable, the right of way being a public one. (3) No, except as to property fronting on both roads. (4) No one is chargeable, and the proportion assignable to this frontage must be borne by the local authority. The right of way must, however, be included in the provisional apportionment. See *Herne Bay U.D.C.* v. *Payne* (1905, 2 K.B., 139).

Damage by and to Traction Engine. — "G. P." writes: A traction engine which complies with the law as to construction, &c., and which has a perfect right to be running on the roads, in passing over a valve-box belonging to a water company, smashes the iron cover of same. (*a*) Is the traction engine owner liable for this damage? or (*b*) if the traction engine is damaged by reason of it falling into the broken valve-pit, is the water company liable? The same engine in passing along a road crushes a water main belonging to the water company, the pipe not being deep enough beneath the road, apparently, to withstand the weight of the engine. (*c*) Is the traction engine owner liable for damages?

(*a*) and (*c*) In my opinion the owner of the traction engine would not be liable in the absence of negligence on the part of himself or his servants. (*b*) I do not think the water company would be liable if the valve box was in a condition to sustain the ordinary traffic of the road.

Highway: Water from Roof. — "W. J." writes: In an adjoining rural district a shed of about 30 ft. long abuts on a public highway. The roof of this shed, which is tiled, has no eaves gutters, and in wet weather the rain drips from the eaves on to the highway, damaging the latter by forming grips or gutters in the surface, as well as falling on to pedestrians using the road, which is constantly used by children going to and from school, causing a considerable nuisance. It would appear that nothing can be done under sec. 72 of the Highway Act of 1835, or the Public Health Acts. What course could you suggest to remedy the nuisance? If damage to the highway can be proved, can an injunction be obtained?

If the dripping prevents the public from freely, safely, and conveniently passing along the highway so as to be a nuisance, the owner can be indicted, or (with the concurrence of the Attorney-General) an injunction can be applied for, whether the highway is damaged or not.

New Building: Flat over Stables. — "Diz" writes: My council have received plans for the proposed erection of a dwelling-house over existing stables. The stables at present face one another, and have a covered way between and a loft over the whole. It is proposed to remove the loft and carry up walls and form a dwelling flat, the stables and covered way remaining. There will be no communication between the flat and stables, and no staircase, as the flat will be reached by raised ground at the rear. The plans conform with the by-laws as to air space. (1) Can my council pass these plans, seeing the house will be over stables? (2) Is there any Act that will cover this? I forward copy of by-laws.

(1) There does not appear to be anything in the by-laws prohibiting the erection of a house over stables, and if the plans are in conformity with the by-laws the council have no alternative but to pass them. (2) I am not aware of any such Act.

Sewage Disposal Works: Restrictive Covenants. — "Nonplussed" writes: Land is required for the erection of sewage disposal works. The site selected is partially on a building estate, the roads of which have been [illegible] some of the plots sold but no houses built. The plots of the estate have been sold subject to [illegible] or other objectionable buildings being erected thereon. If the land is purchased by compulsion [illegible] the owner of the building estate

If the stipulations subject to which the lots have been sold were meant by the owner of the estate and understood by the purchasers to be for the common advantage of all purchasers on the estate in pursuance of a general building scheme (no power being reserved to the estate owner to sell the unsold portions of the estate free from such stipulations) the local authority, on purchasing part of the estate for sewage disposal works, would have to compensate such purchaser for the use of the land in breach of the stipulations (*Mackey* v. *Corporation of Nelson Local Board*, 1891, 1 Ch., 1).

Pollution of Well.—"Kent" writes: A notice has been served on the owner of some property to provide a wholesome supply of water owing to the well being polluted. The well is within 20 yds. of the council's stables and manure pit, and as the pollution is likely to be caused by the existence of the manure pit, I shall be glad to know if the council are in any way liable? I may say that all the well within 200 yds. have been condemned. The water company's main runs past the property.

If the well is a "public" one, it is vested in the local authority under sec. 64 of the Public Health Act, 1875. A well is "public" within the meaning of this section if it has been used for domestic purposes gratuitously by the inhabitants of the vicinity for twenty years, even if it is on private ground. See *Smith* v. *Archibald* (5 App. Cas., 489). The section empowers the local authority to cause public wells to be maintained and plentifully supplied with pure and wholesome water, but it is doubtful whether they are bound to do so (Lumley's "Public Health Acts," 7th edition, p. 149); and if a well (whether public or private) is so polluted as to be injurious to health, a closing order can be obtained under sec. 70. If, however, the well is not "public" (in the above sense) the local authority would be liable to the owner for its pollution, unless they have acquired the right to pollute it by prescription. See *Turner* v. *Mirfield* (34 Beav., 390); *Womersley* v. *Church* (1867, L.T., 190); *Ballard* v. *Tomlinson* (29 Ch.D., 115).

Telephone Wires.—"Trus'ee" writes: Two houses, of which the writer is owner as trustee under a will, are situated in an "unadopted" road. The road is repaired by the various owners, and they have always exercised a right to refuse to allow the road to be used other than as a means of access to the houses in the road, if they thought fit. The writer wishes to know whether the Post Office has the right to carry telephone wires above that part of the road in front of the two houses without paying any acknowledgment to the owner?

*Primâ facie*, in the absence of evidence to the contrary, the soil of the road belongs to the owners on each side, each of such owners owning the portion between the middle of the road and the boundary of his land. Each owner is entitled to the space above his portion *usque ad coelum*, and it is therefore a trespass against him to carry wires in the air above that portion without his consent (Pratt and Mackenzie's "Law of Highways," 15th Edition pp. [illegible]).

Building Restrictions: Sewage Disposal Works.—"Nonplussed" writes: In the "conditions of sale" of a certain building estate the following clause is inserted: "No bricks shall be burnt or made, and no noxious or offensive trade, business or manufacture carried on upon any plot." A part of this estate is required for the erection of sewage disposal works. Do sewage disposal works come under the heading of "noxious, trade, business or manufacture"? In my opinion they do not, but are town improvements.

I do not think sewage disposal works constructed by a local authority in exercise of their statutory powers can be properly described as a "trade, business or manufacture." The making of works of distribution and sewer for the supply of sewage to lands for agricultural purposes is an "improvement of land" within the meaning of the Improvement of Land Act, 1864 (see sec. 31 of the Public Health Act, 1875).

House Drainage.—"Sham" writes: An owner of a house has recently fixed a bath in a room on the first floor of his house, and conducted the waste through and down the external wall, and caused it to discharge over his neighbour's gulley, thus making the portion of drain from the gully a sewer, as the two houses have different owners. No plan has been deposited, and I shall be pleased to know if this is a new building, and under what Act we can make the owner connect the bath waste to his own drain?

In my opinion the fixing of the bath and the waste-pipe do not constitute the erection of a new building for the purposes of the by-laws. In the absence of any by-law dealing with the matter I do not think the owner can be compelled to connect the waste pipe to his own drain.

Model By-laws, Clause 37 Window.—"Carlan" writes: The Model By-laws state with regard to habitable rooms that every window shall be so constructed that one-half at the least may be opened, and so that the opening may extend in every case to the top of the window. Does this admit of a window in which the top portion only may be opened to such an extent as, measured downwards, will equal one-twentieth of the floor space, the remaining lower portion of the window being fixed?

This would appear to be so. The total area of the window is to equal one tenth of the floor area.

**We have to draw the attention of querists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6 in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.**

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Blackburn T.C.** (February 28th. Mr. T. C. Ekin).—£45,170 for the purposes of the electricity undertaking.

Replying to an observation from the inspector as to the desirability of a reserve fund, the town clerk said the corporation were in the position of having a good deal of plant which was bought at a time when not so much was known about electrical engineering as at present, and which would probably have to be scrapped. Having inquired into other details of the application, the inspector said he did not think the board would grant the loan until something definite was done in regard to providing water for the extension scheme. In regard to this the town clerk stated that there were immense difficulties in the way.

**Burton-on-Trent T.C.** (February 29th. Mr. T. C. Ekin).—£15,000 for the extension of the electricity system.—The town clerk, Mr. J. B. Chapman, explained that the proposed extension was primarily to duplicate the existing machines in the works, as the demand upon them during the past winter had been such that they had not sufficient spare plant to take the load in the event of one of the machines breaking down.

**Cambridge T.C.** (February 16th. Mr. H. R. Hooper).—£7,246 for the construction of a duplicate rising main from the sewage pumping station, near Stanley-road, to the borough sewage farm, in the Chesterton urban district.—The borough surveyor, Mr. Julian Julian, stated that the proposed main would cross the river and the railway line. The new pipe would cross the same line as the old, within 2 ft. The new pipe would be ⅝ in. thick, a little thicker than the old one. It would weigh 24 cwt. to the 12-ft. length, whereas the old one weighed 22 cwt. The flow in dry weather would be 2,200,000 gallons. The population was 59,000 in Term.

**Darwen T.C.** (February 22nd. Mr. R. C. Maxwell).—This was an inquiry with respect to the council's application to borrow money for the conversion of the pail and waste-water system for closets to that of the water-carriage system, and to amend the Darwen Corporation Act, 1899, to preclude the construction of further waste-water closets within the borough.—Mr. W. P. Halliwell, town clerk, stated that it was estimated that the cost of the conversion of the system would be between £18,000 and £20,000. The council had become thoroughly dissatisfied with the waste-water system. During the years 1900 to 1911 they had already spent £2,350 in erecting 1,000 water-closets. They now proposed to divide the town into ten districts, and to try the experiment on a larger scale. This money had been taken out of revenue, and an expenditure of about £200 per year had been saved in connection with the scavenging department. Mr. R. W. Smith Saville, borough surveyor, stated that when the closets were converted they would use 80,000, to 100,000 gallons of water per day, and with the additional supply from Bolton they had sufficient water for all reasonable requirements. It would take at least six years to convert the present closets.

**Dublin T.C.** (February 14th. Mr. A. D. Price).—£700 and £300 for the purposes respectively of widening Philipsburgh-avenue, Fairview, and Grattan-crescent, Inchicore.—The city engineer, Mr. J. G. O'Sullivan, put in a map and plan showing the nature of the proposed improvements.

**Leicester T.C.** (February 23rd. Mr. Edgar Dudley). £1,414 for the purchase of two houses in St. Nicholas-street.—The object of the purchase is to acquire for the town a handsome Roman tesselated pavement which is preserved in the basement of one of these houses. It was stated by the town clerk that if the purchase was not made the site would in all probability be taken for the building of a factory. The price asked was stated to be a reasonable one, about £450 having been spent on making the chamber where the pavement was preserved. There were no opposition to the application.

**Macclesfield T.C.** (February 21st. Mr. W. C. E. Meade-King). £1,485 for works of sewerage and surface-water drainage.—The town clerk, Mr. F. E. Oldfield, stated that the town was a very old one and some of the streets were not already drained. The old privy middens system was in vogue, but when the

became dilapidated and a nuisance arose, notices were served to abate the nuisance, and the owners were asked to put in water-closets and dry-ash places. It was to enable the council to deal with the sewage from those places they had to construct the sewers.

**Marlborough T.C.** (February 14th. Mr. C. Clifton).—£1,500 for the paving of London-road, Salisbury-road and Bath-road.—The town clerk, Mr. E. L. Gwillim, asked that the period of repayment should be ten years. The footways, he stated, were in a part of the borough which was included on the extension of the boundary. They now desired to bring these footways into uniformity with the rest of the borough footways, and they claimed a right to incur this expense under what was called the "Marlborough Case," which was decided in the Divisional Court in 1894, and also to call upon the county council to repay them the amount by ten annual instalments of £150. They had asked the county council to include that amount in the annual contract which they made with them for the upkeep of the main roads in the borough.

**Turton U.D.C.** (February 14th. Mr. F. H. Tulloch).—£1,404 for works of private street improvement in Rugby-lane.—The loan was asked for a period of ten years. The surveyor, Mr. V. W. Laithwaite, explained the scheme in detail, and there was no opposition.

**Yarmouth T.C.** (February 27th. Mr. Edgar Dudley). £10,000 for the purchase of land in Caister under the Military Lands Act, 1892, for the purpose of golf links.—The town clerk said it was asked that the loan should be granted for sixty years, which was the term allowed in 1902 for a similar land purchase of 120 acres, part of which was used for a rifle range, part for golf links, and some as building sites. The borough surveyor, Mr. J. W. Cockrill, said that some land in the vicinity was sold in small plots at the rate of £600 per acre. The land forming the site of the corporation cemetery at Caister cost £75 per acre.

### APPLICATIONS FOR LOANS.

**Belfast T.C.**—£88,500 for the completion of the villas at Purdysburn Asylum, £25,813 for the completion of the branch sewers in the Sydenham district, and £4,986 for a new trunk sewer at Ballymacarrett.

**Bexhill T.C.**—£140 for widening Collington-lane.

**Carlisle R.D.C.**—£1,250 for the completion of the Stanwix sewerage scheme.

**East Suffolk C.C.**—£2,072 for the enlargement of the Ramsholt School.

**Falmouth T.C.**—£600, the council's contribution to the improvements at Greenbank.

**Kingston T.C.**—£12,500 for wood paving of main roads, and £2,650 for wood paving of non-main roads.

**St. Helens T.C.**—£16,000 for a public school.

**Scalby U.D.C.**—£200, the council's share of the Burniston-road improvement.

**Shillelagh R.D.C.**—£10,553 for the provision of labourers' cottages.

**Stamford T.C.**—£850 for a public swimming bath.

### LOANS SANCTIONED.

**Bexhill T.C.**—£4,275 for the construction of a sea-wall.

**East Suffolk C.C.**—£3,436 for the purchase of land and the erection of a grammar school at Eye, £1,241 for a site at Mutford and £8,000 for main road improvements.

**Haslingden T.C.**—£1,244 for the purchase of a school site, and £2,710 for street improvement works.

**Hull T.C.**—£26,413 for completing the extension of the town hall.

**Limavady U.D.C.**—£900 for the purchase of a site for a cattle market.

**Shoreham U.D.C.**—£200 and £500 for street works and sewerage.

**Thurstonland (Yorks) U.D.C.**—£1,008 for water supply works.

**Walsingham R.D.C.**—£10,260 for sewage disposal works.

**York T.C.**—£1,108 for the purchase of property in connection with the reconstruction of a new street.

### FORTHCOMING INQUIRIES.

MARCH.

| | | £ |
|---|---|---|
| 11.— | **Bermondsey.** For the purposes of the electricity undertaking (Mr. T. C. Ekin) | 18,563 |
| 11.— | **Walthamstow.** For recreation ground, depot, and fire station purposes (Mr. Edgar Dudley) | |
| 12.— | **Bispham-with-Norbreck.** For street and sewerage purposes (Mr. F. H. Tulloch)... | 2,295 |
| 12.— | **Bournemouth.** For sewerage and surface-water drainage purposes (Mr. W. O. E. Meade-King) | 7,150 |
| 12.— | **Coventry.** For the extension of the market-house (Mr. M. K. North) ... ... | 7,000 |
| 12.— | **Finchley.** For the construction of a sewage pumping station (Mr. R. H. Bicknell). | 900 |
| 12.— | **Hornsea.** For the erection of a pavilion (Mr. Courtenay Clifton) ... ... ... | 1,600 |
| 12.— | **Watford.** For the provision of a band-stand and public conveniences (Mr. A. A. G. Maley) | 3,431 |
| 13.— | **Bromley.** For private street works (Mr. R. H. Bicknell) | |
| 13.— | **Dewsbury.** For the provision of a fire brigade station (Mr. Courtenay Clifton) | 1,503 |
| 13.— | **Festiniog.** For water purification purposes (Mr. P. M. Crosthwaite) | 2,650 |
| 13.— | **Lowestoft.** For the electricity undertaking (Mr. T. C. Ekin) | 4,500 |
| 13. | **Oswaldtwistle.** For street improvement purposes (Mr. F. H. Tulloch) ... ... | 2,690 |
| 13.— | **Tipton.** For the purposes of the gas undertaking (Mr. M. K. North) ... ... | 10,500 |
| 13.— | **Weymouth.** For refuse destructor and lavatory purposes (Mr. W. O. E. Meade-King) | 4,700 |
| 14. | **Barnoldswick.** For works of sewerage (Mr. F. H. Tulloch) ... ... ... ... | 925 |
| 14. | **Bridgwater.** For water supply and sewerage purposes (Mr. P. M. Crosthwaite)... | 5,000 |
| 14.— | **Doncaster.** For the purposes of the gas undertaking (Mr. H. Shelford Bidwell) | 33,000 |
| 14.— | **Ipswich.** For electricity purposes (Mr. T. C. Ekin) | 9,130 |
| 14. | **Wellington.** For street and water supply purposes (Mr. W. O. E. Meade-King) ... | 3,800 |
| 15. | **Bridgwater.** For works of water supply (Mr. W. O. E. Meade-King) | 2,860 |
| 15 | **Hornsey.** For the purpose of the electricity undertaking (Mr. T. C. Ekin) ... | 8,941 |
| 15.— | **Leyton.** For the purchase of land for a recreation ground (Mr. M. K. North)... | 3,150 |
| 15. | **Manchester.** For open space purposes (Mr. F. H. Tulloch) | 2,500 |
| 15.— | **Mansfield.** For cattle market purposes (Mr. Courtenay Clifton) | 1,100 |

**Summer Amusements in Public Parks.**—Mr. Reginald Brown, Assoc.M.Inst.C.E., F.S.I., engineer and surveyor to the Southall-Norwood Urban District Council, writes: My council are desirous of providing amusements in the public parks during the summer months (in addition to bowls and tennis). I shall be glad if any of my colleagues, whose councils have done anything similar, will be good enough to let me have particulars.

**Superannuation and Security of Tenure.**—Mr. A. Winter Gray, who read the paper on "Superannuation and Security of Tenure" at the recent meeting of the Institution of Municipal Engineers, wishes to make it clear that when he spoke in his reply of "the difference between the Poor-Law officer and the local government officer" he was alluding to the difference between the contributions made respectively under the Poor-Law Officers' Superannuation Act, and to be made under the Local Government Officers' Bill—as, indeed, was obvious from the context. He also points out that he could not give a better definition of the term misdemeanour than that contained in the N.A.L.G.O.'s Bill—*viz.*: "Any offence of a fraudulent character or of grave misconduct in relation to his service or employment."

# Municipal Work in Progress and Projected.

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The following are among the more important projected works of which particulars appear below: Buildings—Birmingham £9,140, Eccles £3,200, Edinburgh £8,400, Kettering £1,600, St. Helens £16,000; roads and materials—Birmingham, Dover £9,000, Dundee, Kingston £12,500, Poplar £10,000; sewerage and sewage disposal—Audley £9,840, Birmingham £1,127, Gloucester; water, gas and electricity—Merthyr £2,000, Nuneaton £15,000; miscellaneous—Belfast £100,390.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

## ADMINISTRATION.

**St. Germans R.D.C.**—At a recent meeting a letter was read from the county surveyor, Mr. A. E. Brooke, recommending certain changes in the method of book-keeping as regards main roads and team labour. The clerk said it would mean extra work for their highway surveyor. Mr. T. Vosper thought it was a case of "new brooms sweeping clean." Mr. Harold Hosking, surveyor, said he would fall in with the suggestions, but he hoped the council would appreciate the fact that it would mean a considerable amount of external labour. What the county surveyor asked was only reasonable. The proposed changes would facilitate Mr. Brooke's work, but would add to his (Mr. Hosking's) duties. The clerical work was increasing by leaps and bounds. Mr. Spear moved that their surveyor should meet the county surveyor with a view to their discussing the matter and arriving at a compromise, and this was agreed to.

## BUILDINGS.

**Birmingham T.C.**—The Public Works Committee have been authorised to carry out an arrangement with the Birmingham and Warwick Canal Company and others for the improvement of Witton Canal Bridge and Brook Vale-road, Erdington, at a cost to the corporation of £2,890, and to proceed with the erection of a new bridge over the river Cole at Forman's-road, Sparkhill, at a cost of £6,250.

**Devizes T.C.**—The new hospital is being supplied with Shorland's warm-air ventilating patent "Manchester" grates, by Messrs. E. H. Shorland & Brother, Limited, of Failsworth, Manchester.

**Eccles T.C.**—The boiler-house at the electricity works is to be extended and an additional chimney erected, at an estimated cost of £3,200.

**Edinburgh T.C.**—A town hall is to be erected in Portobello, at an estimated cost of £8,400.

**Exeter T.C.**—A sum of £429 is to be spent upon the improvement of the slaughter-houses.

**Folkestone T.C.**—The tender of Messrs. G. Castle & Son, at £7,508, has been accepted for the erection of the new Harvey Grammar School.

**Kettering U.D.C.**—The surveyor, Mr. T. R. Smith, has received instructions to obtain tenders for the erection of a corn exchange, at an estimated cost of £1,600.

**Machynlleth U.D.C.**—A committee has been appointed to discuss with a committee of the rural district council the desirableness of providing a joint isolation hospital.

**Nottingham T.C.**—It has been agreed to spend £6,000 on repairing the bank of the Trent, by the construction of embankment steps from Trent Bridge to the suspension bridge, similar to those on the opposite side of the river. Owing to the action of the stream, a considerable amount of damage has been done to the south bank.

**St. Helens T.C.**—The education authority, having bought an open space, together with a number of shops and dwelling-houses, in Liverpool-road, in the heart of the town, have prepared plans for a large new elementary school, estimated to cost £16,000.

**Stamford T.C.**—A public swimming bath is to be constructed in the George Paddock.

**Wandsworth B.C.**—The borough engineer, Mr. P. Dodd, has prepared plans showing how a plot of land adjoining the Larch-road depot, Balham, could be utilised for public baths, and the Baths and Wash-houses Committee recommend the council to take the necessary steps to acquire the land. The price is £800.

**Worcester T.C.**—It has been decided to build an additional elementary school.

## HOUSING AND TOWN PLANNING.

**Bridlington T.C.**—The question of the provision of workmen's dwellings has been referred to the Sanitary Committee for consideration and report.

**Greenwich B.C.**—The Public Health and Housing Committee has been instructed to consider whether steps should be taken for the preparation of a scheme under the Housing and Town Planning Act, dealing with land in the borough likely to be developed in the future.

**Hampton Wick U.D.C.**—The application of the National Housing and Town Planning Council, asking for the appointment of representatives to attend a conference to be held next month, at a fee of one guinea for each representative, has been declined.

**Rhymney (Mon.) U.D.C.**—It has been agreed to erect thirty workmen's houses.

## REFUSE COLLECTION AND DISPOSAL.

**Southampton T.C.**—A weekly collection of house refuse is to be made throughout the borough, at an estimated additional annual cost of £1,685.

## ROADS AND MATERIALS.

**Aberdeenshire C.C.**—A sum of over £6,000 has been received from the Road Board for the improvement of the Ballater-Braemar road and of the Cairnwell-road, and the Deeside District Committee have decided to submit an application for a further grant towards the same purpose. With the sum already received and the additional sum provided by the committee itself, it will be possible to rebuild a certain section of the two roads in question, but a great deal more remains to be done.

**Beckenham U.D.C.**—Under an arrangement with the Kent County Council, it has been decided to pave the east side of High-street with the same material as that used on the opposite side—*viz.*, Victoria Stone.

**Birmingham T.C.**—The Public Works Committee have been authorised to pave the carriageway of the upper portion of Bennett's-hill with prismatic oak blocks, at an estimated cost of £514. It has also been agreed to pave a portion of Great Charles-street with the same material, at a cost of £1,020, to continue the granite-sett paving in Landor-street and Arden-road, at an estimated cost of £7,533, to widen Sandy-lane, at a cost of £3,655, to widen Alum Rock-road, at a cost of £6,386, to improve Treaford-lane, at a cost of £2,974, to improve the junction of Easy-row and Edmund-street, at a cost of £1,700, and carry out the improvement of Hockley Brook (adjoining the tramcar depot), at a cost of £1,270. The committee have also been authorised to acquire land at Bromford for continuing a new road from Salford Bridge to Kingsbury-road, at a cost of £750.

**Buckie (Banffshire) T.C.**—The proposed new road from Buckie to Rathven is to be constructed, the necessary money for the cost having at length been subscribed.

**Cuckfield R.D.C.**—The highways surveyor, Mr. A. McArthur, in submitting to the council a recommendation (which was approved) that £134 should be spent in extending tarring operations, stated that tar-painting had had a very good test in the district, and its immense advantages, both in regard to abating the dust trouble and from a point of economy in maintenance, could scarcely be over-estimated, for, where a sound top crust obtained, a tar dressing not only made an ideal all-the-year-round surface, but its effect on the road was that frictional wastage almost entirely disappeared, and as a consequence the cost of upkeep became reduced to a minimum. Indiscriminate tarring, however, was a wasteful and destructive policy—*e.g.*, tar over a thin crust presented a pleasing and what appeared to be a more or less perfect surface in the dry summer weather, but in the winter came disillusionment, especially in the case of roads that had little sun and air, or insufficient under-drainage.

The contrast then was striking, as after the first heavy rain the road remained throughout the winter months in a heavy, sodden condition, completely perishing whatever crust previously existed, and leaving a foundrous and sometimes dangerous roadway. Further, in connection with this work, he recommended that lengthy stretches should be carried out, and the work restricted to the more heavily-trafficked first-class roads, as to do this would, he thought, be cheaper and better in effect than treating short lengths in different parts of the district. Later, other less important roads could receive attention as the condition and class of road warranted the work. For the present the roads through populous parts, with the exception of Balcombe, which he proposed dealing with next season, required little beyond what was already done.

**Dover R.D.C.**—The surveyor, Mr. F. Sargeant, has prepared a plan showing the sections of the Alkham Valley-road needing improvement and widening, and the council are now considering the matter. The cost of the work, including the purchase of land for widening, would be about £9,000, and the council would probably have to find £5,000.

**Dundee T.C.**—A scheme for the improvement of the centre of Dundee has been prepared by the city engineer, Mr. James Thomson. The scheme practically involves the reconstruction of a large central area. Vast improvements in the way of street widening and laying and property demolishing in the vicinity of the railway stations are outlined. The property marked for demolition yields a rental of £24,800, but the engineer states that by the scheme land of the value of £200,000 would be acquired, and expresses the opinion that the project could be financed. A supplementary scheme is also submitted for the reclamation of 85 acres of ground from the Tay in front of the existing Esplanade, and for a variety of improvements in that quarter.

**Cainsborough R.D.C.**—During a discussion with regard to tar-macadam roads at the council meeting this week, the surveyor, Mr. R. Maxwell, stated that eight years ago he laid tar-macadam on the Cliff roads, and it was as good to-day as the day it was laid down. It was "washed" every three years, at a cost of about ¼d. a yard. It was decided to lay tar-macadam in all villages where councillors were favourable to the system.

**Hampshire C.C.**—The Main Roads Committee lately received a claim for compensation from Major Berkley, owner of Rookesbury Mill Trout Hatchery, near Andover, for the loss of a large number of fish in the months of September and October last, which it was alleged was due to washings from the tarred roads being carried into the river. The claim was investigated and as it appeared to the committee that there were no grounds for attributing the mortality among the fish to the tar on the roads, they had informed Major Berkley that while regretting the loss which had occurred they were unable to recommend the county council to entertain the claim.

**Hampton Wick U.D.C.**—The surveyor, Mr. P. Taylor, has been authorised to obtain 1,000 wood blocks for paving in the Upper Teddington-road.

**Holborn B.C.**—The Works Committee have been authorised to enter into negotiations with the London County Council with respect to a scheme for widening High Holborn between the Holborn Empire Theatre and the Inns of Court Hotel.

**Ipswich T.C.**—The widening of Bramford-lane is to be carried out at an estimated cost of £211, and further improvements are to be effected in Grey Friars-road.

**Kent C.C.**—The expenditure has been sanctioned of a sum not exceeding £1,550 on new plant for main road purposes, viz., a petrol motor lorry to be purchased from Messrs. J. & E. Hall, Dartford, for £750; six tar boilers of 600 gallons each at a cost of £58 each, and three mixing vessels and three drying vessels, the cost of which will not exceed £452. The Road Board have paid the sum of £4,520 for the experimental work carried out on the main road between New Eltham and Sidcup.

**Kingston T.C.**—Wood paving, to cost an aggregate sum of £12,500, is to be laid on the main roads of the borough, and the portion of the Surbiton-road south of Surbiton Park-terrace is to be treated with a bituminous surface. The County Highways and Bridges Committee have decided to recommend the county council to maintain the whole of the borough main roads for a period of five years for a sum of £2,550 per annum, this to include the county council's contribution of two-thirds of the annual loan repayment of principal and interest in respect of the wood paving. It has also been agreed to pave Market-place, Church-street and Thames-street with wood, at a cost of £2,650.—The quotation of the Ocean Accident and Guarantee Company, Limited, has been accepted for insurance against third-party risk in respect of the council's steam-water wagon, with a limit of £250 for any one accident, at an annual premium of £5.—The surveyor, Mr. R. Hampton Clucas, has been authorised to prepare plans for the making up of St. Alban's-road and Studland-road, under the Private Street Works Act.

**Loddon and Clavering R.D.C.**—It was stated at the meeting of the council on Monday that the new road from Burgh St. Peter to Lowestoft was estimated to cost £2,600. One mile and a third would be in the council's district, and £116 had been apportioned for the work.

**Longford C.C.**—At the last meeting the county surveyor was instructed to obtain particulars of the direct labour schemes existing in the counties of Leitrim, Roscommon and Westmeath, with a view to preparing steam rolling schemes for co. Longford. Resolutions authorising the purchase of steam-rolling machinery, at a probable cost of £2,250, were also passed.

**Poplar B.C.**—With the sanction of the county council the borough council are borrowing £6,761 for paving works. This is the third and last instalment of a scheme to be spread over the three years 1910-12 of paving in place of macadam, at a total estimated cost of £33,000. As the result of experience gained of various paving materials, and improvements in laying macadam with a bituminous binding, the council have decided to make some variations in regard to the kind of paving to be adopted, which will, it is estimated, reduce the expenditure to £6,426. The council propose, however, to extend the work to seven other thoroughfares which, in their opinion, also require paving. This extension will, it is estimated, involve an expenditure of £3,574, making a total expenditure of £10,000. The total sum of £10,000 is allocated as follows: Granite setts, £1,027; asphalte blocks, £5,734; tar or pitch macadam, £3,239.

**Sedgley (Staffs) U.D.C.**—The Road Board have intimated that they are prepared to make a grant of £217 for the purpose of tar-spraying 46,440 ft. of roads.

**Southampton T.C.**—Howard's-road is to be made up with tar-macadam, at an estimated cost of £1,043, and the footpaths on each side of the avenue are to be paved with concrete slabs for a width of 9 ft., at an estimated cost of £740.

**Worthing T.C.**—The Road Board have agreed to advance on loan, free of interest, £762 for the purpose of carrying out required improvements to that portion of the Brighton-Portsmouth road which is within the borough, the loan being repayable in four annual instalments. The danger of encroachment by the sea on the main road between Shop's Dam, Lancing, and the Norfolk Bridge, owing to the want of repair and maintenance of the sea defence works, has been before the council in committee. The West Sussex County Council have advised the town council to convene a conference of local authorities to consider the matter, but the corporation have replied that they consider that the county council, having regard to their preponderant interests, should convene the conference as early as possible.

**Yarmouth T.C.**—In order to relieve existing distress, the council have resolved to carry out works which will necessitate the expenditure of not less than £1,500 in unskilled labour, and application is to be made to the Local Government Board for a loan of £1,000 for the extension of the Marine-parade North.

## SEWERAGE AND SEWAGE DISPOSAL.

**Ashton-in-Makerfield U.D.C.**—We understand that Dr. Grossmann's process and plant for the disposal of sludge will be incorporated in the council's new sewage scheme.

**Audley U.D.C.**—The surveyor (Mr. A. Cotton)) has gone into the question of dealing with the sewage of the Audley, Bignall End, and Miles Green districts, at an estimated cost of £8,050. The total cost of a scheme with one outfall dealing with the entire district (excepting Wood-lane) he estimates at £9,840.

**Birmingham T.C.**—The sewering of Woodthorpe road, King's Norton, is to be completed at a cost of £1,127.

**Epping R.D.C.**—The tender of Mr. T. Pedrette, Enfield, at £6,578, has been accepted for the execution of sewerage works.

**Gloucester T.C.**—The city surveyor, Mr. Richard Read, is engaged on the extension of the sewer outfall, including a syphon under the eastern branch of the river Severn. Tenders will be advertised for after Easter.

**Newton Abbot R.D.C.**—The tender of Messrs. Best Brothers, of Teignmouth, at £390, has been accepted for sewerage works.

## WATER, GAS, AND ELECTRICITY.

**Alnwick R.D.C.** A scheme has been approved for the improvement of the water supply, at a cost of £550.

**Hereford T.C.**—The connecting up of the water mains to the new filter-beds has been effected. The work has cost nearly £7,000, and the contract was carried out by Mr. George Law, of Kidderminster. The construction of the beds is of concrete, bitumen lining, and faced with local brick.

**Kingston (Surrey) T.C.**—The tender of the Craigpark Electric Cable Company for 440 yds. of ·2 concentric, paper-insulated, lead-sheathed and armoured low-tension cable has been accepted, as the lowest of six, at £164 10s.

**Merthyr T.C.**—The high-level aqueduct is to be extended to Senghenydd, at an estimated cost of £2,000.

**Nuneaton T.C.**—The corporation are being recommended by the Water Committee to extend the headings, lay a pumping main 3¼ miles in length, and equip the pumping station, at a total estimated cost of £15,000.

**Rawtenstall T.C.**—The scheme for the extension of the electricity works has been approved.

**Sedgley (Staffs) U.D.C.**—The gas manager has been instructed to prepare a report upon the extension of the gasworks.

## MISCELLANEOUS.

**Belfast T.C.**—The tender of Messrs. Dick, Kerr & Co., Limited, at £100,390, has been accepted for the work in connection with the extensions of the tramway system.

**Hull T.C.**—The Tramways Committee have recommended several extensions of the tramway lines.

**Shoreditch B.C.**—The council have accepted the tender of Messrs. Le Grand & Sutcliffe for converting the existing steam section of the deep well pump at the Hoxton Baths into an electric motor drive.

## PERSONAL.

Mr. F. Heather, of Winchester, has been appointed district surveyor of highways to the South Stoneham Rural District Council.

Mr. R. H. Dymond, chief assistant in the Exeter surveyor's department, has had his salary increased from £150 to a maximum of £200.

Mr. Egbert Rushton, engineer and surveyor to the Cleethorpes Urban District Council, has resigned owing to continued ill-health.

Mr. T. S. Grellin has been appointed assistant engineer and highway surveyor to the Cannock Rural District Council, at a salary of £120 a year, rising to £150.

Mr. W. C. Brown, engineer and surveyor to the Edmonton Urban District Council, is to have his salary increased by £100 per annum as from March 25th.

Mr. Ernest A. Borg, borough surveyor of Margate, has, we regret to state, suffered a great loss by the death of his wife, which took place after a long illness.

Mr. Thomas Rickman, past-president of the Surveyors' Institution, whose death was announced recently in these columns, left property of the gross value of £16,931.

Mr. William Wallace Copland, formerly surveyor to the Sheerness Urban District Council, and now engineer at Gibraltar, has been created by His Majesty the King a member of the Victorian Order (Fourth Class).

Mr. H. Percy Boulnois, M.INST.C.E., chairman of council, will, at the annual meeting of associates of the Royal Sanitary Institute on Tuesday, the 26th inst., deliver an address on "Sanitary Legislation and Education."

Mr. G. A. Ballard, engineering assistant to the city engineer of Birmingham, and Mr. R. H. Jenkins, assistant to the borough engineer of Hemel Hempstead, have been appointed engineering assistants to the city engineer of York.

Messrs. W. H. Nicholl, of Epsom, and G. F. Walton, main drainage works, Colombo, have been elected members, and Mr. H. Peake, borough engineer's office, Leamington Spa, has been admitted as a student, of the Institution of Civil Engineers.

Mr. C. H. Priestley, the borough waterworks engineer of Cardiff, will on Friday, April 12th, at a meeting of the Royal Sanitary Institute, to be held in that city, open a discussion on the subject of the development of the undertaking under his control.

Mr. Richard Pilling Hirst, on his retirement from the position of borough engineer and surveyor of Southport, was presented with a gold watch by the officials and workmen of the combined highways, cleansing, and sewage works departments of the corporation.

Mr. E. Johnson, highways surveyor to the Uckfield Rural District Council, has had his salary increased from £185 to £250 per annum, conditional upon his providing and maintaining a motor car and remaining in the service of the council for three years from the 25th March next.

Hampshire County Council, having decided to take over the control of main roads in the county, have appointed the following divisional road surveyors: Mr. J. S. Hall, King's Norton, Birmingham; Mr. J. A. Manning, Redruth, Cornwall; Mr. G. H. C. Mottershead, Castle Bromwich, Birmingham; and Mr. W. J. Potter, Old Portswood, Southampton. The salaries are £220, rising by annual increments of £10 to a maximum of £260 (£40 will be allowed for travelling expenses).

Messrs. J. T. Alexander, city building surveyor, Liverpool; Chas. G. Henzell, waterworks engineer, Leeds; J. Parry, chief engineer, Liverpool Corporation waterworks; S. S. Platt, borough surveyor, Rochdale; Henry Price, city architect, Manchester; and James Watson, waterworks engineer, Bradford, are among those who are expected to take part in the discussions at the meeting of the Royal Sanitary Institute, which, as announced on another page, will be held this evening at Manchester.

Mr. J. A. Brodie, the city engineer of Liverpool, whose appointment as adviser to the Indian Government as to the best means of laying out the new capital of Delhi was announced recently, is credited by a writer on football with being the inventor of the goal net. Mr. Brodie saw his device first tried at Bolton, where a single net was put up in a match and so satisfactorily did it prove that Mr. Brodie was advised to place the idea before the Football Association, the result being that that body at once authorised its use.

Mr. R. Hampton Clucas, surveyor to the Kingston (Surrey) Town Council, was eulogistically referred to at a recent meeting, Councillor Francis, chairman of the Sanitary and Drainage Committee, referring especially to his services as effecting a reduction in the rates, and expressing his opinion that it would be a graceful act to award Mr. Clucas the maximum provided for his salary. Councillor Burge stated that by the manufacture of alumino-ferric the committee believed a saving of from £600 to £800 a year would be effected, and the whole of that was due to Mr. Clucas and to Mr. P. G. Lloyd, the sewage works manager.

Recent lectures to highway engineering students at Columbia University have dealt with the inspection of sheet asphalt pavements, the design of highways and systems of highways, Trinidad and Bermudez asphalts and their use in highway construction, and technical literature, the lecturers being Messrs. A. W. Dow, M.AM.INST.CHEM.ENGRS., Nelson P. Lewis, M.AM.SOC.C.E., Clifford Richardson, M.AM.SOC.C.E., and John M. Goodell, ASSOC.AM.SOC.C.E., respectively.

## MUNICIPAL WORK IN CANADA.

*(From a Surveyor Canadian Correspondent.)*

Mr. Henry Hague Vaughan, who has been elected vice-president of the Canadian Society of Civil Engineers, beating Mr. Louis A. Vallee, chief engineer of Public Works for the Province of Quebec, by over 150 votes, is a native of Kent, England. He was born in 1868, was educated at Forest Hill School, Woodford, and matriculated at King's College, London, when just over sixteen In 1891 Mr. Vaughan went to the United States, and later came to Canada; he has been for a number of years connected with the Canadian Society of Civil Engineers, and for the past three years has been a member of the council.

* * * *

One of the foremost Canadian civic administrators and engineers, Mr. F. L. Wanklyn, a member of the Montreal Board of Control, has resigned, after two years' service. He has had an offer from a big company, and has accepted it. His resignation is due to two causes—ill-health caused by continuous work combined with worry, and the inadequate remuneration now paid him. Mr. Wanklyn is a man of great administrative ability, wide technical knowledge, and immense energy; but he is tired of the ceaseless wire-pulling of certain French-Canadian aldermen. Since he became the head of the civic engineering department there has been a wonderful improvement in the administration of the city.

* * * *

Mr. A. N. Stokes, president of the Royal Institute of British Architects, has accepted the position of assessor in connection with the competition for the new Manitoba Parliament building plans. The competition is confined to architects in the British Empire, and this bars out several Americans who were anxious to send in plans.

* * * *

A Bill has been introduced into the Senate which is designed to check the spread of typhoid. It amends the criminal code by making it an indictable offence, with liability of one year's imprisonment, to endanger life or health by emptying or depositing any excreta, whether solid or liquid, from a typhoid fever patient (*a*) into, or on the banks of, or near to, any lake, pond, well, river, stream or other water from which, either directly or at any place lower down in the waterflow therefrom, any city, town, or village is supplied with water for drinking or domestic purposes, or (*b*) into, or on the banks of, or near to, any water discharging into such lake, pond, well, river, stream or other water, or (*c*) into any water-closet, drain, ditch, conduit, or sewer so discharging, or (*d*) into any privy or cesspool, or (*e*) by making any other disposition of such excreta except as hereinafter specified. Every one is guilty of an indictable offence, and liable to one year's imprisonment, who (*a*) being a medical or other attendant upon any person, and knowing that person to have typhoid fever, fails or neglects to give notice immediately to the health officer of, or to the mayor or other head officer of, the municipality in which that person is being attended, or was attended, that the person had typhoid fever; or (*b*) being such health officer, mayor, or other head officer, and having received such notice, fails or neglects to make promptly effectual arrangements to have the excreta, both solid and fluid, of such person treated with carbolic acid or such other disinfectant as will effectually destroy all bacilli and germs therein, and to have the said excreta, after it has been disinfected, buried in the earth at least 3 ft. below the surface of the ground and at least 300 yds. from any lake, river, pond, stream, drain, ditch, conduit, sewer or other waterway. Some sanitary engineers consider the measure too sweeping, and a committee from the Canadian Society of Civil Engineers has been appointed to wait upon the Senate. Municipal engineers are anxious to support any measure to prevent typhoid spreading, but it is held that the Bill may prove too sweeping in its operations.

* * * *

Some 300 delegates have waited upon Mr. Borden, the Dominion Premier, and asked for the appointment of a Good Roads Commissioner. The question is one of great interest throughout the country, and associations from all parts of Canada were represented on the deputation. In many sections the roads are atrocious, and this notwithstanding the agitation which is being carried on under the name of the Good Roads Movement. Help from the Federal Government is wanted, and the deputation asked for it. Mr. Borden admitted that Canada is far behind other countries in this matter, and stated that a Bill had been introduced for making grants to the various provinces. He does not favour the Federal Government maintaining provincial roads, but stated that they would try to work out a plan between the provinces and the Dominion by which they could secure co-operation.


## FOR OTHER ADVERTISEMENTS

See End of Paper.

RURAL DISTRICT OF DROXFORD.
SUPPLY OF GRANITE OR HARD STONE.

The above-named Council are desirous of receiving Tenders for the Supply and Delivery of Granite or Hard Stone.

Forms of Tender may be obtained of Mr. A. V. Carter, Surveyor, Droxford, near Bishop's Waltham, Hants.

Tenders must be delivered to me in an envelope, sealed and endorsed "Tender for Granite," not later than Monday, the 1st April, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
H. GODFREY PEARSON,
Clerk.

Bishop's Waltham, Hants.
March 5, 1912.

KIDDERMINSTER RURAL DISTRICT COUNCIL.

*HIGHWAYS DEPARTMENT.*

TENDER FOR ROAD MATERIALS FOR THE YEAR ENDING 31st MARCH, 1913.

The above Council invite Tenders for the Supply of Broken Granite, Granite Screenings, Broken Slag and Slag Screenings, delivered to the various Stations and Wharves in the district.

Sealed Tenders, endorsed "Tender for Materials," to be sent to the undersigned not later than 10 a.m. on Tuesday, the 19th day of March, 1912, from whom Specification, Schedule and Forms of Tender may be obtained.

G. J. SHEPHERD.
Surveyor.

86 Chester-road.
Kidderminster.

URBAN DISTRICT COUNCIL OF THAME.

ROAD MATERIAL.

Tenders are invited for the Supply of Road Material for the year ending March 31st, 1913.

Particulars and Form of Tender may be obtained from Mr. James T. Robinson, Surveyor to the Council, Town Hall, Thame, to whom samples of the material tendered for must be sent.

Sealed Tenders, endorsed "Road Materials," must reach me on or before Monday, the 25th day of March inst.

The Council do not bind themselves to accept the lowest or any Tender.

EDWARD N. PURCELL,
Clerk to the Council.

2 High-street.
Thame.
March 6, 1912.

JUNIOR ASSISTANT (21) seeks appointment: four years' experience, including three years' articles with Borough Surveyor; good surveyor (chain and theodolite), leveller and draughtsman; all-round experience, and especially in sewerage and roads, water supply; quantities; certificated building construction; office work; control of workmen. Capital testimonials. Small salary.—G. W. C., care of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

FOR SALE about 120 volumes of "Minutes of Proceedings of the Institute of Civil Engineers," including some of the earlier volumes, all bound in cloth. What offers?—Whiteman, Greyfriars Chambers, Hertford-street, Coventry.

## BUILDING TRADES EXHIBITION, RUSHOLME, MANCHESTER.

### LIST OF EXHIBITORS.

The following is the list of firms who have taken space at the Building Trades Exhibition which opens to-morrow at Rusholme, Manchester:—

Anderson, D., & Son, Limited, Roach-road Works, Old Ford, London, E.
Austral Window-Balance Company, Limited, 3 McDonald's-lane, Corporation-street, Manchester.
Baxendale & Co., Miller-street, Manchester.
Bell's United Asbestos, Northern Agency, 8 South-parade, Manchester.
Bispham Hall Colliery Company, Orrell, Wigan.
Burton & Rake, Chapel-street, Salford.
Callender, G. M., & Co., Limited, 25 Victoria-street, London, S.W.
Chadwick & Shapcott, Limited, Acorn Works, 56 Durham-road, Holloway, N.
Chubb & Sons, 128 Queen Victoria-street, London, E.C.
Collier, S. & E., Grovelands, Reading.
Crittall Manufacturing Company, Limited, Manor Works, Braintree.
Dean, Hetherington & Co., Cawdry Buildings, Leek, Staffs.
Dolberg, R., 31 Budge-row, Cannon-street, London, E.C.
Elliott's Moulding and Joinery Company, Limited, Albert Works, Newbury.
Empeco Metal Decoration Company, Limited, 97 Queen Victoria-street, E.C.
Enderby and Stoney Stanton Granite Company, Limited, Narborough, Leicester.
Etchells, Congdon & Muir, 15 Cannell-street, Ancoats, Manchester.
Goodall, Lamb & Heighway, Limited, King-street, Manchester.
Guildecor Hinge Company, Limited, 29 Newman-street, Oxford-street, London, W.
Gypsum Mines, Limited, King-ton-on-Soar, Derby.
Hammond & Champness, Limited, Alfreton-street, Old Kent-road, London, S.E.
Harrison, John, & Co., Station Works, Camberwell, S.E.
Hayward Brothers & Eckstein, Limited, 187-201 Union-street, Borough, S.E.
Heywood, John, Limited, Deansgate, Manchester.
Higgins, Wm., & Sons, Broughton-street Brickworks, Cheetham, Manchester.
Hilton & Co., 15 Sugar-lane, Manchester.
Howlett, H., & Sons, Bryanswood and Beaconsfield-street, Hanley, Staffs.
Hulme & Quick, 35 Arcade Chambers, St. Mary's Gate, Manchester.
Inverawe Granite Company, 118 London-road, Derby.
Jackson, G., & Sons, Limited, 49 Rathbone-place, London, W.
Jennings, C., & Co., Pennywell-road, Bristol.
Johnson Brothers, 79 Mark-lane, London, E.C.
Jones & Attwood, Limited, Stourbridge.
Jones, Fredk., & Co., Limited, 39 Duncan-street, Salford.
Kennedy, W., 11 Furzeham-road, West Drayton.
Kerr, John, & Co., 8 South-parade, Manchester.
Kleine Patent Fire-Resisting Flooring Syndicate, Limited, 133 High Holborn, London, W.C.
Leeds Sand and Gravel Company, Limited, 2 Crown Point-street, Hunslet-road, Leeds.
Llewellins & James, Limited, Castle Green, Bristol.
Locan, C., & Co., 23 Strutt-street, Manchester.
Machin & Koenig, 13 Granby-row, Manchester.
Major & Co., Limited, Hull.
Manchester Paint Brush Company, 13 Greenheys-street, Cheriton-on-Medlock.
Manchester Stone Company, Longsight.
Martyn, H. H., & Co., Limited, Cheltenham.
Mosley Construction Company, 6A Gresham Chambers, Deansgate, Manchester.
Musselwhite, C. H., & Son, Grand Surrey Canal, Deptford, S.E.
Neele, E., Velinheli Slate Quarries, Port Dinorwic, North Wales, R.S.O.
Nicholson, W. F., Clipper Company, Liverpool Lane, Salford, Manchester.
Orme & Sons, St. Mary's Parsonage, Manchester.
Parkinson, J., & Sons, Blackpool.
Parsons, Thos., & Sons, 8 Endell-street, London, W.C.
Patent Tip-Up Bath Company, Broadstreet, Birmingham.
Patterson, J. & H., 96 Oxford-road, Manchester.
Peach, H. H., Nicholas-street, Leicester.
Peters, C. A., Limited, Derby.
Pinchin, Johnson & Co., Limited, Minerva House, Bevis Marks, London, E.C.
Ragosine & Co., Limited, Albion Wharf, Bow Bridge, London, E.
Ransome ver-Mer Machinery Company, Caxton House, Westminster, S.W.
Ravenhead Sanitary Pipe and Brick Company, Limited, St. Helens, Lancs.
Ripolin, Limited, 35 Minories, London, E.C.
Roberts, W. E., 172 Deansgate, Manchester.
Robeson Process Company, 17 Fenchurch-street, London.
Ronuk, Limited, Portslade, Brighton.
Samuel Brothers, Limited, 65 Ludgate-hill, London, E.C.
Shark-Grip Tiling Company, 64 Newman-street, Oxford-street, London, W.C.
Sissons Brothers & Co., Limited, Hull.
Speaker, G. R., & Co., 29 Mincing-lane, E.C. (4 St. Anne's-square, Manchester).
Sussex Brick and Estates Company, Limited, 52 North-street, Horsham.
Taroads Syndicate, Limited, 9 Victoria-street, Westminster, S.W.
Waygood, R., & Co., Limited, Falmouth-road, London, S.E.
White, John P., & Sons, Pyghtle Works, Bedford.
Yates, Holden & Co., 30 Brown-street, Manchester.

A special account of the various exhibits will appear in next week's Surveyor.

## ROAD BOARD'S INCOME.

### LONDON'S SHARE OF GRANTS.

In the House of Commons on Monday the Secretary of the Treasury was asked what was the total income of the Road Board up to date, how much of that income had been derived from London; what was the total amount of the grants made by the Road Board up till now, and what amount had been allocated to the improvement of road communications in London.

In reply, Mr. Masterman said the total sum paid to the credit of the Road Improvement Fund up to date was £1,765,449; the amount derived from London was not known; the total amount of the advances made up to the present time was £510,887 (£485,584 by way of grant and £27,303 by way of loan), including a small grant for experimental work in London; in addition, further advances, amounting in the aggregate to £560,000, had been indicated to local authorities towards works of improvements, the details of which were now under consideration and discussion. The board had also intimated that they were prepared, if application were made to them by the local authorities concerned, to contribute, subject to the approval of the Treasury, £875,000 towards the construction of a new western approach road to London.

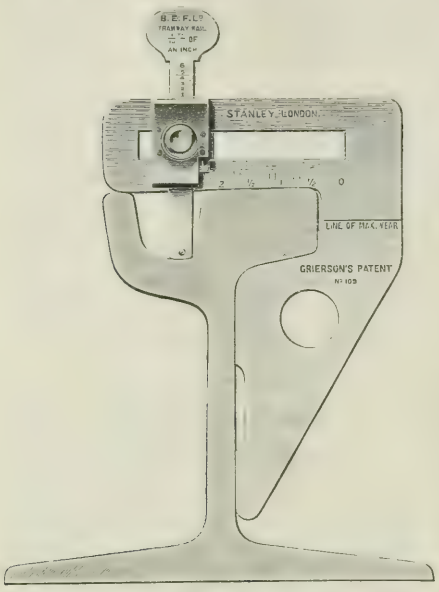
**The Surveyors' Institution.** The annual dinner of this body will be held at the Whitehall Rooms, Hotel Metropole, on Tuesday, April 23rd, at 7 o'clock.

**Law of Private Street Works.**—It is surely a commentary on our system of legislation relating to what may be termed domestic matters that the owner of house property (to say nothing of the occupiers of his houses) has to thread his way through a maze of statutes and decisions to ascertain his rights and his liabilities in connection with questions which may arise every day. Such, however, being the case, text-books dealing with what on the face of them might be deemed to be simple matters have become an actual necessity, although the owner of property is lucky if the text-book suffices and he is not driven to consult a specialist. The work before us* deals with one of such subjects, private street works under the Public Health Acts and the Private Street Work Act, 1892, but not with the Metropolitan Management Acts; the statement in the text are supported by decided cases with references printed in the text; there is also a table of cases and an index, and it should prove a useful hand-book. We find the recent decisions included, and the work seems to have been carefully prepared.—*The Builder.*

* "Notes on the Law of Private Street Works under the Public Health Acts." By J. B. Reginald Corder, a Solicitor of the Supreme Court. 3s. 6d. nett. London: St. Bride's Press, Limited, 24 Bride-lane, E.C.

## WEAR OF TRAMWAY RAILS.

With tramway rails it has been found that to ascertain the rate of wear of the rails is much more important than the ascertaining of their weight per yard resulting from that wear. The gauge illustrated herewith has, therefore, been devised to measure the rate of wear, both in English and metric measure, simply by removing a couple of paving setts from




Grierson's Tramway Rail Gauge.

the outer side of any rail, and applying the gauge to the rail.

The indicator has both vertical and transverse movements over the head of the rail, and this enables the wear of the top table to be ascertained at any point in its width, and also the depth of the groove in which the wheel flanges run, to be measured.

The sole manufacturers of the gauge are Messrs. W. F. Stanley & Co., Limited, Great Turnstile, Holborn, London, W.C.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President*—Mr. Albert D. Greatorex, M.Inst.C.E., Borough Engineer and Surveyor of West Bromwich.

### FORTHCOMING MEETINGS.

The following meetings are reported as fixtures: June 7th and 8th, Scottish meeting at Stirling; Eastern District, June 15th, at East Ham; Eastern District meeting on June 22nd, at Lowestoft.

A West Midland District meeting will be held at Stourbridge, April 13th, the Paris meeting at Whitsun, and the annual meeting will probably be held July 11th, 12th and 13th.

Provincial members who propose to take part in the visit to Paris will, in cases where the journey exceeds a distance of 30 miles, be able to obtain return tickets to London at a single fare and a quarter.

Members desirous of submitting a paper at the forthcoming annual meeting are requested to give early information of their desire.

Premiums not exceeding 30 guineas are awarded by the council for the best papers read by members and associate members during the year.

Thomas Cole,
*Secretary.*

11 Victoria-street,
London, S.W.

## INSTITUTION OF MUNICIPAL ENGINEERS.

*President*—Mr. E. A. Stickland, Assoc.M.Inst.C.E., Borough Surveyor, Windsor.

### COUNCIL MEETING.

At a meeting of the Council held on February 24th the following applicants were recommended for admission:—

(*a*) To Membership: Messrs. A. Goddard, resident engineer, Windermere Urban District Council; E. Madin, surveyor, Irthlingboro' Urban District Council; John Haslam, surveyor, Tickhill Urban District Council; and R. M. Smith, surveyor, Ottery St. Mary Urban District Council.

(*b*) To Associate Membership: Mr. J. D. Hurst, surveyor's office, Hindley Urban District Council.

(*c*) Transfer to Membership: Messrs. G. B. Chilvers, engineer and surveyor, Oundle Urban District Council; and E. H. Radcliffe, harbour engineer's office, Douglas, Isle of Man.

(*d*) Transfer to Associate Membership: Messrs. C. C. Hancock, surveyor, Warminster Rural District Council; and G. H. Baxter, surveyor's office, Newton Abbot Urban District Council.

(Under the new by-laws these elections will be ratified at the next council meeting if no written objections are lodged within fourteen days.)

New Members, &c. From the applicants recommended for admission at the last meeting four were elected.

Security for Officials. — The correspondence between a member of the institution and one of the societies giving bonds on behalf of municipal officials was again considered, in conjunction with the report of the secretary, who had interviewed the secretary of the society in question, and it was resolved to refer the matter to the N.A.L.G.O.

Special Purposes Committee.—A Special Purposes Committee, to which matters of importance shall from time to time be referred for preliminary investigation and subsequent report to the council, was formed. Messrs. H. C. Adams, A. Winter Gray, H. J. Farmer, T. Mundy, and E. Whitwell were elected members of the committee.

Examination Certificates.—The sketch designs of certificate and diploma were approved, and instructions were given to the engraver.

Council Meeting.—The next meeting will be held on Wednesday, March 27th, at 6 o'clock.

### SOUTH-EASTERN DISTRICT.

A discussion evening has been arranged for Tuesday, March 19th, the subject for consideration being "The Size and Design of Street Gullies, Grates and Weirs."

Bernard Partridge,
*Hon. District Secretary.*

Town Hall,
Walthamstow.

### VISITS.

A visit will be paid to the International Building Trades Exhibition at Rusholme, Manchester, on Saturday, March 16th, at 2 o'clock.

Programme.

2 p.m. Meet at the Exhibition entrance, Old Hall-lane.

2.15 p.m.—Informal meeting within the Exhibition.

3 p.m.—Proceed to inspect the various exhibits.

5 p.m.—Tea, at the kind invitation of Mr. H. Greville Montgomery, director of the Exhibition.

A visit will be paid to the showrooms and works of Messrs. Doulton & Co., Limited, Albert Embankment, London, on Wednesday, March 27, at 2.30 p.m.

Members will assemble in the showrooms at 2.30, and the processes to be seen during the round of visits will include the manufacture of drain pipes and other sanitary stoneware, fireclay stoves, architectural terra-cotta, and Doulton and other art ware.

### EXAMINATIONS.

The next examination will be held in May next, at centres to be arranged. The papers set at the November examination may be obtained in book form, price 1s., post free.

B. Wyand,
*Secretary.*

39 Victoria-street, S.W.

## ROYAL SANITARY INSTITUTE.

### MEETING AT MANCHESTER.

At a meeting of the Royal Sanitary Institute, to be held at Manchester this (Friday) evening, discussions will be opened on "The Application of the Housing and Town Planning, &c., Act, to the Development of Suburban Areas now in Process of Transition," by Mr. F. W. Platt, building surveyor, Salford, and on "The Quantity of Water Available from Upland Drainage Areas," by Prof. J. Radcliffe, M.Sc. To-morrow visits will be made to places of local interest.

## FORTHCOMING "SURVEYOR" ARTICLES.

The following matters will be dealt with in early issues of THE SURVEYOR:—

"Petrol Air Gas." By F. T. Baines Hewitt, F.S.I.

"Main Levelling of Copenhagen." By C. F. V. Boock, surveyor-in-charge and municipal engineer-in-charge of Division B, Copenhagen.

"Breeding Grounds of Mosquitos." By Dr. Elwin H. T. Nash, medical officer of health, Wimbledon.

"Mirrors at Street Corners."

"Chemistry of Modern Highway Engineering." By Prevost Hubbard.

## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned* (*No.* 1359 *Holborn*), *subject to later confirmation by letter.*

CLERK OF WORKS.—March 9th.—Chester-le-Street Rural District Council. £2 10s. per week.—Mr. R. V. Dickinson, clerk.

CLERK OF WORKS.—March 9th.—Corporation of Coventry.—Mr. J. E. Swindlehurst, city engineer and surveyor.

SURVEYOR AND INSPECTOR.—March 9th.—Llandilo-fawr Town Council. £75 per annum.—Mr. A. Davies, town clerk.

JUNIOR CLERK.—March 12th.—In the office of the engineer to the Willesden Urban District Council. 10s.—20s. per week.—Mr. O. Claude Robson, engineer.

ENGINEERING AND SURVEYING ASSISTANT.—March 13th.—Corporation of Huddersfield. £140 per annum.—Mr. K. F. Campbell, borough engineer and surveyor.

ROAD SURVEYOR.—March 13th.—Denby and Cumberworth (Yorks) Urban District Council.—Mr. Wilfred Barnes, clerk.

INSPECTOR OF NUISANCES.—March 14th.—Redruth Rural District Council. £120 per annum.—Mr. T. Peter, clerk.

SANITARY INSPECTOR.—March 15th.—Camberwell Borough Council. £117—£200.—Mr. C. William Tagg, town clerk.

CLERK OF WORKS.—March 16th.—Corporation of Eccles.—Mr. E. Parkes, town clerk.

SURVEYOR.—March 16th.—Cleethorpes Urban District council. £200—£300.—Mr. B. Greaves, clerk.

CLERK OF WORKS.—March 18th.—Horbury Urban District Council. £3 per week.—Mr. J. H. Drew, engineer.

ENGINEERING ASSISTANT.—March 19th.—Southport Corporation. £160.—Mr. J. E. Jarratt, town clerk.

SURVEYING ASSISTANT.—March 19th.—Southport Corporation. £120.—Mr. J. E. Jarratt, town clerk.

ASSISTANT SURVEYOR.—March 23rd.—New-on-the-Makerfield Urban District Council. £70—£75.—Mr. Cornelius Cole, clerk.

CHIEF ENGINEER.—April 15th.—Board of Trustees for the Improvement of Calcutta. 2000 rupees per mensem, rising to 2,500 rupees.—Mr. C. H. Bompas, chairman, 5 Clive-street, Calcutta.

LAND VALUER.—April 15th.—Board of Trustees for the Improvement of Calcutta. 1,250 rupees per mensem, rising to 1,500 rupees.—Mr. C. H. Bompas, chairman, 5 Clive-street, Calcutta.

ASSISTANT ENGINEERS.—May 1st.—Indian Public Works and State Railway Departments.—Secretary, Judicial and Public Department, India Office, London, S.W.

## MUNICIPAL COMPETITIONS OPEN.

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WARRINGTON.—March 9th.—Schemes for installation of power-stoking machinery, mechanically dealing with coke, and for coke or breeze washer, for the Gas Committee.—Mr. W. S. Haddock, gas engineer.

ST. HELENS.—March 13th.—Designs for a park conservatory, for the corporation.—Chairman, Parks and Public Buildings Committee.

HARROW-ON-THE-HILL.—March 16th.—Enlargement of public offices, for the urban district council. Cost not to exceed £4,500. Premiums of 30, 20 and 15 guineas are offered.—Mr. J. P. Bennetts, engineer and surveyor.

PORTLAND.—April 4th.—Designs and plans for council offices, for the urban district council. Premiums of £50 and £10 are offered.—Mr. R. A. Colenutt, clerk.

WOMBWELL.—May 1st.—Designs for public swimming bath, for the urban district council.—Prizes of £40, £30 and £20 are offered.—Mr. W. Quest, surveyor.

HALE.—June 28th.—Designs for a town planning scheme for the urban district council. Premiums of £50 and £25 are offered.—The Clerk.

DUSSELDORF.—July 1st.—Plan for the extension of the city. Premiums of £1,000 and £375 are offered.—The Chief Burgomaster.

## MUNICIPAL CONTRACTS OPEN.

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### Buildings.

WEST RIDING.—March 9th.—For the erection of a school, by the Education Committee.—The Clerk, County Hall, Wakefield.

CORNWALL.—March 9th.—For the erection of two schools, for the Education Committee.—Mr. F. R. Pascoe, secretary, Education Office, Truro.

SOUTH WESTMORLAND.—March 9th.—For the erection of a public convenience, for the rural district council.—Mr. A. Milne, clerk, 12 Lowther-street, Kendal.

BIRMINGHAM.—March 11th.—For bridge widening, girder work, and making up roadway, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

HALIFAX.—March 11th.—For the erection of two shelters, for the corporation.—Mr. H. Ostler, secretary, Education Offices.

MALDENHEAD.—March 11th.—For closing in existing open shed and constructing new shed, for the corporation.—Borough Surveyor.

OLDHAM.—March 11th—26th.—For the extension of town hall and municipal buildings, for the corporation.—Mr. J. H. Hallsworth, town clerk.

DERBYSHIRE.—March 11th.—For the erection of a school at Ilkeston, for the county council.—Mr. George H. Widdows, architect, St. Mary's-gate, Derby.

GRANGE.—March 11th.—For the erection of public conveniences, pavilion, and shelter, for the urban district council.—Mr. Thomas Huddleston, surveyor, Council Offices, Grange-over-Sands.

WEST HAM.—March 12th.—For the erection of a building to contain twelve slipper baths, &c., for the corporation.—Mr. Fred. E. Hillcary, town clerk.

LITTLEHAMPTON.—March 14th.—For the erection of stables and cartsheds, for the urban district council.—Mr. Arthur Shelley, clerk.

Birmingham. March 14th—April 1st.—For the erection of a boiler-house, &c., for the corporation.—Secretary Electric Supply Department, 14 Dale-end.

Bangkok.—March 15th.—For the erection of an electric power station, for the municipality.—Mr. F. B. Shaw, engineer-in-charge, Municipal Electric Power Station, Local Sanitary Department, Bangkok.

Gloucester. March 16th.—For the erection of boundary and retaining wall, for the Education Committee.—Mr. R. S. Phillips, architect, Shire Hall, Gloucester.

Southampton.—March 18th.—For the reconstruction of superstructure of Brockenhurst Bridge, for the county council.—Mr. H. Barber, clerk, The Castle, Winchester.

Grimsby. March 18th.—For building latrines, for the Education Authority. Mr. D. Chandler, Education Offices, Grimsby.

Durham. March 19th.—For the erection of three schools, for the county council.—Mr. J. A. L. Robson, county secretary for higher education, Shire Hall, Durham.

Leeds.—March 20th.—For the extension of a school building, for the Education Committee. — Mr. J. Graham, secretary.

Portsmouth.—March 20th.—For the erection of two shelters, for the corporation.—Mr. G. H. Etherton, town clerk.

Finchley. March 23rd.—For the erection of an elementary school, for the urban district council.—Mr. E. H. Lister, clerk.

Hanwell. March 25th.—For alterations to free library, for the urban district council.—Mr. P. Scott, clerk.

Salop. March 25th.—For the erection of a secondary school, for the Education Committee.—Mr. W. H. Pendlebury, secretary.

West Sussex. March 26th.—For the erection of a school, for the Joint Education Committee.—Mr. L. Thompson, secretary, Thurloe House, High-street, Worthing.

Glasgow.—March 27th.—For the construction of swing bridges over Forth and Clyde Canal, for the corporation.—Mr. John Bowers, town clerk.

## Iron and Steel.

Swaeani.—March 11th.—For the supply of spigot and socket water pipes, connections, valves, &c., for the rural district council.—The Clerk.

London.—March 12th.—For the supply of fire hydrants, for the county council.—The Clerk.

Goole.—March 13th.—For the supply of pipes and specials, for the urban district council.—Mr. R. Tyson, clerk.

Auckland (New Zealand).—March 13th.—For the supply of wrought-iron gates and fencing, for the Harbour Board.—Messrs. W. & A. McArthur, Limited, 18-19 Silk-street, Cripplegate.

Glasgow.—March 16th.—For laying water mains, for the corporation.—Mr. John Bowers, town clerk.

Watford.—March 19th.—For the supply of paper-insulated cables, for the urban district council.—Mr. W. Hudson, clerk.

## Roads.

Droitwich.—March 8th–9th.—For the supply of granite and slag macadam, for the corporation. Mr. S. J. Toombs, town clerk.

Hastings.—March 9th.—For the supply of unbroken bluestone, for the rural district council.—Mr. D. Paine, district surveyor, Stonelynk Farm, Fairlight, Hastings.

Alverstoke.—March 9th.—For the supply of one traction engine and trailer, sleeping van and a water cart, for the county council.—Mr. Joseph Atkinson, secretary.

Margam.—March 9th.—For laying 4-in. water mains, for the urban district council.—Mr. D. E. Isaac, clerk.

Clapham.—March 9th.—For paving 2,300 ton of roads with pudding concrete foundations, for the county council.—Mr. E. F. Garbutt, clerk and surveyor.

Leeds.—March 9th.—For the supply of granite, whinstone, limestone, shovels, brooms, sewer pipes, kerbs, &c., for the rural district council.—Mr. J. S. Horn, clerk.

Ware.—March 9th.—For the supply of road materials, for the rural district council.—Mr. E. Lawrence, clerk.

Brumby and Frodingham.—March 9th.—For the supply of whinstone, for the urban district council.—Mr. Joe Green, surveyor.

Willingdon.—March 9th.—For constructing asphalte footpath, for the urban district council.—Mr. J. G. Wilson, clerk, 5 North Bailey, Durham.

Leyland.—March 9th.—For the supply of road materials, for the urban district council.—Mr. M. H. Wilkinson, surveyor.

Clown.—March 9th.—For the supply of granite and slag, for the rural district council.—Mr. J. S. Whall, clerk, 66 Bridge-street, Worksop.

Staffs.—March 9th.—For the supply of materials, tools and implements, for the county council.—Clerk, County Buildings, Stafford.

Knutsford.—March 11th.—For the supply of road materials, for the rural district council.—Mr. G. Leigh, clerk.

Horsham.—March 11th.—For the supply of granite, team labour, hire of two steam rollers, and two tar boilers, for the rural district council.—Mr. A. C. Coole, clerk.

Wandsworth.—March 11th.—For the making up of a road, for the borough council.—Mr. Henry George Hills, town clerk.

Billericay.—March 11th.—For the supply of granites, flint, and gravel, for the rural district council.—Mr. C. E. Lewis, clerk, New-road, Brentwood.

Rye.—March 11th.—For the supply of road materials.—Mr. H. J. Elliott, district surveyor, Winchelsea.

Dartford.—March 11th.—For the supply of road materials, maintenance, and steam rolling, for the rural district council.—Mr. Eustace J. Hobbs, clerk.

Bourne.—March 11th.—For the supply of granite, for the urban district council.—Mr. S. R. Andrews, clerk.

Aylesbury.—March 11th.—For the supply of flints and granite, for the rural district council.—District Surveyor.

Goole.—March 11th.—For paving work, for the urban district council.—Mr. R. Tyson, clerk.

Hastingden.—March 11th.—For the supply of road materials, for the corporation.—Mr. W. Musgrove, town clerk.

Todmorden.—March 11th.—For the supply of setts, flags, kerbs, channels, granite, limestone, &c., for the corporation.—Town Clerk.

Kent.—March 11th.—For laying tar-paving, for the county council.—Mr. F. W. Crook, secretary, Caxton House, Westminster.

Basford.—March 11th.—For the supply of granite, slag and tar-macadam, for the rural district council.—Mr. G. W. Hawley, highway engineer, Burton Buildings, Parliament-street, Nottingham.

Birmingham.—March 11th.—For widening approach to railway bridge, for the corporation.—Mr. H. E. Stilgoe, city engineer.

Wandsworth.—March 11th.—For making up part of Upper Richmond-road, for the borough council.—Mr. Henry George Hills, town clerk.

Leeds.—March 11th.—For paving and flagging works, for the corporation.—Town Clerk.

Newark.—March 11th.—For the supply of granite, slag and tar-macadam, for the rural district council.—Mr. A. J. Franks, clerk.

Leamington.—March 11th.—For the supply of road stone, for the corporation.—Mr. L. Rawlinson, town clerk.

Fleetwood.—March 11th.—For the supply of kerbs, channels, flags, limestone macadam, &c., for the urban district council.—Mr. A. Cottam, clerk.

Perthshire.—March 11th.—For quarrying, carting, breaking metal, use of traction engine, &c., for the Eastern District Committee.—Mr. J. B. Miller, Blairgowrie.

Wisc.—March 11th.—For the supply of granite, slag and road gravel, for the rural district council.—Mr. W. W. B. Chaldecott, clerk.

Sussex (East).—March 11th.—For the supply of flints, for the rural district council.—Mr. G. W. Warr, surveyor, Town Hall, Southwick.

Milton.—March 12th.—For the supply of flints, gravel, Cheltenham quartzite granite, Kentish tar, horse labour and steam rolling, for the rural district council.—Mr. E. Cecil Harris, clerk.

Aberdeen.—March 12th.—For the construction of 3 miles of the Braemar-road, for the Deeside District Committee.—Mr. J. Murray, clerk, 22 Bridge-street, Aberdeen.

Sculcoates.—March 12th.—For the supply of stone, gravel, asphalte, coal and team labour, for the rural district council.—Mr. Jas. Fras. Robinson, clerk.

Weetslade.—March 12th.—For paving a certain street, for the urban district council.—Mr. William Webb, clerk.

Docking.—March 12th.—For the supply of road materials and labour, for the rural district council.—Mr. J. A. Stoughton, clerk.

Lanark.—March 12th.—For the supply of tar and tar-macadam, for the Middle Ward.—Mr. W. E. Whyte, district clerk, Hamilton.

Maidstone.—March 12th.—For the supply of road materials, for the corporation.—Mr. S. Lance Monckton, town clerk.

Faversham.—March 12th.—For the supply of pit flints, shingle and gravel, for the rural district council.—Mr. G. Tassell, clerk.

Maidstone.—March 12th.—For the supply of road materials, and works of levelling, paving, flagging, &c., for the corporation.—Mr. S. Lance Monckton, town clerk.

Uppingham.—March 12th.—For the supply of broken granite and screenings, for the rural district council.—Mr. F. Oakley, clerk.

Maldens and Coombe.—March 12th.—For works of road construction, for the urban district council.—J. W. Johnson, clerk.

Southwell.—March 12th.—For the supply of road materials, for the rural district council.—Mr. John Ellis, clerk.

Swansea.—March 12th.—For work of road widening, for the rural district council.—Mr. E. Harris, clerk.

Mountain Ash.—March 12th.—For the supply of broken mountain limestone, gravel and haulage, for the urban district council.—Mr. H. P. Linton, clerk.

Twickenham.—March 13th.—For making up works in three roads, for the urban district council.—Mr. H. Jason Saunders, clerk.

Reigate.—March 13th.—For tar-washing certain roads, for the corporation.—Mr. Alfred Smith, town clerk.

Hartismere.—March 13th.—For the supply of granite and pit stones, for the rural district council.—Mr. Harold Warnes, solicitor and clerk.

Kingston-upon-Thames.—March 13th.—For the supply of Swedish yellow deal blocks, for the corporation.—Mr. Harold A. Winser, town clerk.

Dalton-in-Furness.—March 13th.—For the supply of new 10-ton steam roller, for the urban district council.—Mr. J. Tyson, clerk.

Hoyland Nether.—March 13th.—For the supply of broken slag, granite and tar-macadam, for the urban district council.—Mr. Fred J. Thackray, engineer and surveyor.

Wheatenhurst.—March 13th.—For the supply of stone and haulage, for the rural district council.—The Clerk.

Yeardsley (Cheshire).—March 13th.—For the supply of granite, for the urban district council.—Mr. S. Taylor, clerk, Buxton.

Havant.—March 13th.—For the supply of hand-picked stones, chalk flints, granite, &c., for the rural district council.—Mr. E. R. Longcroft, clerk.

Stroud.—March 13th.—For the supply of road materials, for the rural district council.—Mr. J. E. Povey, clerk.

Kirkcaldy.—March 13th.—For work of road making, for the corporation.—Mr. W. L. Macmedoe, town clerk.

Uxbridge.—March 14th.—For the supply of granite, gravel, flints and haulage, for the rural district council.—Mr. J. W. Harrison, engineer and surveyor.

Chelmsford.—March 14th.—For the execution of street works, for the corporation.—Mr. W. Smith, town clerk.

Chatham.—March 14th.—For the supply of road materials, for the corporation.—Mr. C. Day, borough surveyor.

Sedgefield.—March 14th.—For the supply of road materials, for the rural district council.—Mr. W. R. Plews, highway surveyor.

Lanchester.—March 14th.—For the supply of limestone, whinstone, and slag, for the rural district council.—Mr. W. Cumming, highway surveyor, Lanchester, Durham.

Wortley.—March 15th.—For the supply of road materials and cartage, for the rural district council.—Mr. F. A. S. Crawshaw, surveyor, 45 Exchange-street, Sheffield.

Caister.—March 15th.—For the supply of granite and slag, for the rural district council.—Mr. A. A. Padley, clerk.

Tonbridge (Kent).—March 15th.—For the supply of Quenast, rag, quartzite, tarred ragstone macadam and team labour, for the rural district council.—Mr. N. R. Stone, clerk.

Crompton.—March 15th.—For the supply of flags, kerbs, grit setts and shippings, granite and limestone macadam, pitch and oil, road tars, pipes, for the urban district council.—Mr. F. F. Gartside, clerk.

Preston.—March 15th.—For work of making up, for the corporation.—Borough Surveyor.

Sevenoaks.—March 15th.—For the supply of materials, steam rolling, team labour, &c., for the rural district council.—Mr. F. H. Vibert, clerk.

Bolton-upon-Dearne.—March 15th.—For supply of broken granite, granite chippings, broken slag, slag screenings, flags, kerbs, &c., for the urban district council.—The Clerk.

Dartford.—March 16th.—For the supply of road materials, for the rural district council.—Mr. E. J. Hobbs, clerk, Sessions House, Dartford.

Southborough.—March 16th.—For the supply of basalt, granite, or other suitable stone, for the urban district council.—Mr. P. Hanmer, clerk.

Nelson.—March 16th.—For the supply of granite macadam, limestone macadam, limestone paving chippings, Barns flags, Yorkshire flags, grit setts, kerb, Portland cement, and oil for the corporation.—Mr. J. H. Boldwick, town clerk.

Burnley.—March 16th.—For the supply of setts, flags, kerb, channel, gravel, &c., for the corporation.—Mr. P. Thomas, town clerk.

Chadderton.—March 16th.—For the supply of road material, kerbs, &c., for the urban district council.—Mr. H. Hoyle, clerk.

Pontefract.—March 16th.—For the supply of road materials, for the rural district council.—Mr. J. D. Smith, clerk.

Bridge.—March 18th.—For the supply of flints and gravel, for the rural district council.—Mr. T. L. Collard, clerk, The Workhouse, Bridge, near Canterbury.

Thurnscoe.—March 18th.—For the supply of broken granite, granite chippings, broken slag, slag screenings, flags, kerbs, setts, channelling, asphalte, and pipes, for the urban district council.—Mr. J. Ledger Hawksworth, clerk, Bolton-upon-Dearne.

Easington.—March 18th.—For paving certain streets, for the rural district council.—Mr. J. M. Longden, clerk.

Llanfrechfa Upper.—March 18th.—For road metalling, hauling, &c., for the urban district council.—Mr. W. Clark, clerk, Cornat-cottage-road, Cwmbran, Mon.

Altrincham.—March 18th.—For the supply of road materials, for the urban district council.—Mr. H. E. Brown, surveyor.

Hornsey.—March 18th.—For making up work, for the corporation.—Mr. F. D. Askey, town clerk.

King's Lynn.—March 18th.—For the supply of road materials, for the corporation.—Mr. Alfred J. Smith, borough surveyor.

Bilston.—March 19th.—For the supply of broken Rowley rag or granite, for the urban district council.—Mr. John D. Wassell, clerk.

Shardlow.—March 19th.—For the supply of Leicestershire granite, ironstone slag, granite kerbing and sanitary pipes, for the rural district council.—Mr. J. S. Wooddisse, surveyor, Aston-on-Trent, Derby.

Abergavenny.—March 19th.—For the supply of broken and unbroken stone, for the rural district council.—Mr. A. J. Willcox, district surveyor.

Lexton and Winstree.—March 19th.—For the supply of materials, team labour and road-roller, for the rural district council.—Mr. G. E. Thompson, clerk, Victoria Chambers, Colchester.

Tutbury.—March 20th.—For the supply of broken granite and limestone, for the rural district council.—Mr. H. S. Tebbitt, surveyor, Tatenhill, Burton-on-Trent.

Hallaton.—March 20th.—For the supply of broken granite, for the rural district council.—Mr. J. L. Douglass, clerk, Market Harborough.

Devizes.—March 21st.—For the supply of material, team haulage and manual labour, for the rural district council.—The surveyor.

Tring.—March 21st.—For the supply of kerb, setts, broken granite and flints, for the urban district council.—Mr. S. S. Gettings, surveyor.

Ormskirk.—March 21st.—For the supply of road materials, for the urban district council.—Mr. H. W. Chadwick, surveyor.

Chester-le-Street.—March 21st.—For the supply of Northumberland whinstone, broken slag, tarred slag, limestone, &c., for the urban district council.—Mr. F. J. Gray, clerk.

Pontefract.—March 22nd.—For making up a street, for the rural district council.—Mr. J. D. Smith, clerk.

Whitby.—March 22nd.—For the supply of broken whinstone and mixed screenings, for the rural district council.—Mr. J. Lyth, surveyor.

Wood Green.—March 22nd.—For street improvement work, for the urban district council.—Mr. W. P. Harding, clerk.

Cambridgeshire.—March 22nd.—For the hire of steam rollers, for the county council.—Mr. J. E. Blackwall, county surveyor.

Pocklington.—March 23rd.—For the supply of blue stone and slag, for the rural district council.—Mr. Thomas Robson, clerk.

Claypole.—March 25th.—For the supply of granite and slag, for the rural district council.—Mr. F. C. Meyrick, district surveyor, Beckingham, Newark.

Malling.—March 26th.—For the supply of quartzite, basalt or granite, for the rural district council.—Mr. F. J. Allison, clerk.

Croydon.—March 26th.—For work of street repair, for the corporation.—Mr. F. C. Lloyd, town clerk.

Worsley.—March 27th.—For the supply of macadam, granite setts, lonkey setts, grit setts, granite chippings, &c., and making up certain streets, for the urban district council.—Mr. J. P. Monks, clerk.

Barnet.—March 27th.—For making up a private street, for the urban district council.—Mr. Hy. W. Poole, clerk.

Market Harborough.—March 28th.—For the supply of granite, for the rural district council.—Mr. W. H. Blount, surveyor, Loughton, Rugby.

Magor.—March 30th.—For the supply of broken stone and gravel, for the rural district council.—Mr. A. H. Rees, clerk.

Mothram.—April 11th.—For the supply of rock setts, for the urban district council.—Mr. F. Thompson, clerk, 123 Stamford-street, Stalybridge.

## Sanitary.

Bakewell.—March 9th.—For the construction of sewers, manholes, &c., for the rural district council.—Mr. A. Hawes, clerk.

Margam.—March 9th.—For the construction of stoneware and cast-iron sewer, for the urban district council.—Mr. D. E. Jones, clerk, Port Talbot.

Neath.—March 9th.—For the construction of sewage disposal works, for the rural district council.—Messrs. Cuthbertson and Powell, clerks.

Luton.—March 11th.—For removal of refuse, &c., for the rural district council.—Mr. W. Austin, clerk.

Bellington.—March 11th.—For work of scavenging, for the urban district council.—Mr. C. D. Forster, joint clerk, 24 Grainger-street West, Newcastle-on-Tyne.

Worksop.—March 11th.—For work of scavenging, for the urban district council.—Mr. J. H. White, clerk, Bank Chambers, Mansfield.

Durban (Natal).—March 11th.—For the supply of stoneware sewerage pipes, for the corporation.—Messrs. Webster, Steel & Co., agents to the corporation, 5 East India-avenue, Leadenhall-street, E.C.

Alnwick.—March 11th.—For cleaning out ashpits, for the rural district council.—Mr. H. W. Walton, clerk.

Stroud.—March 12th.—For work of scavenging and hauling, for the urban district council.—The Surveyor.

Birmingham.—March 12th.—For the supply of iron, steel, tools, ironmongery, oils, paints, drysaltery, timber, brushes, cement, lime, &c., for District Drainage Board.—Mr. John D. Watson, Tyburn, Birmingham.

Edmonton.—March 12th.—For the supply of stoneware pipes, for the urban district council.—Mr. W. F. Payne, clerk.

Coventry.—March 12th.—For the supply of engine coal to the pumping station, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

Grimsby.—March 13th.—For the supply of stoneware pipe sewer, with manholes, flushing chambers, &c., for the corporation.—Mr. H. Gilbert Whyatt, borough engineer and surveyor.

Brightlingsea.—March 13th.—For the removal of sludge and house refuse, for the urban district council.—Mr. W. I. Osborn, clerk.

Kirkcaldy.—March 13th.—For work of sewerage, for the corporation.—Mr. W. L. Macindoe, town clerk.

Carshalton.—March 13th.—For work of scavenging, for the urban district council.—Mr. C. P. Lovelock, clerk.

Llandaff.—March 13th.—For the construction of earthenware pipe sewer, manholes, &c. for the rural district council.—Mr. M. Warren, clerk, Park House, Cardiff.

Littlehampton.—March 14th.—For the construction of earthenware pipe sewers, manholes, outfall sewer, &c., for the urban district council.—Mr. Arthur Shelley, clerk.

Manchester.—March 14th.—For the construction of main drainage work, for the Rivers Committee.—Mr. Thomas Hudson, town clerk.

Manchester.—March 15th.—For work of sewerage in several streets, for the corporation.—Manager, Drainage Office.

Benfieldside.—March 16th.—For work of scavenging, for the urban district council.—Mr. J. B. Lazenby, clerk, Spencer-street, Consett.

East Ham.—March 16th.—For the collection and removal of refuse, for the corporation.—Mr. C. E. Wilson, town clerk.

Raunds.—March 18th.—For the construction of sewage disposal works, for the urban district council.—Mr. W. F. Corby, clerk.

Mirfield.—March 18th.—For laying pipe sewer and manholes, for the urban district council.—Mr. E. B. Wilson, clerk.

Erith.—March 18th.—For laying cast-iron sewer, air main, &c., for the urban district council.—Mr. J. Kennedy Allerton, clerk.

South Mimms.—March 18th.—For the construction of stoneware pipe surface-water sewer, gullies, &c., for the rural district council.—The Clerk, High-street, Barnet.

Stirlingshire.—March 18th.—For laying sewers at Rumford, for the Eastern District Committee.—Mr. J. H. Burns, district clerk, Falkirk.

Mitcham.—March 19th.—For scavenging work, for the rural district council.—Mr. E. John Gowen, clerk.

Wendover.—March 20th.—For the construction of sewage disposal works, for the rural district council.—The Clerk.

York.—March 21st.—For the construction of sewage disposal works at Naburn, for the corporation.—Mr. F. W. Spurr, city engineer.

Wenlock.—March 21st.—For the construction of sewers and sewage disposal works, for the corporation.—Mr. F. H. Potts, town clerk.

Huntingdon.—March 22nd.—For scavenging work, for the rural district council.—Inspector of Nuisances.

Hindley.—March 23rd.—For the construction of cast-iron main sewer, for the urban district council.—Mr. Thomas Robey, clerk.

Orsett.—March 26th.—For the construction of sewage disposal works, main sewerage, machinery, ejectors, air mains, &c., for the rural district council.—Mr. James Beck, clerk.

Oswestry.—April 1st.—For the construction of stoneware pipe sewers, manholes, &c., for the rural district council.—Mr. C. H. Bull, clerk.

## Stores.

Colne.—March 9th.—For the supply of cement, granite macadam, limestone macadam, lime, ironwork, repair of highways, team labour, pitch, creosote oil, pipes and gullies, brushes, &c., for the corporation.—Mr. A. Varley, town clerk.

Broadstairs.—March 11th.—For the supply of Portland cement, tools and castings, oils, brushes and stoneware pipes, for the urban district council.—Mr. L. A. Skinner, clerk.

Derby.—March 11th.—For the supply of bar iron, bricks, brushes, castings, cement and lime, disinfectants, earthenware, freestone, gritstone, granite, gravel, sand, hardware, ironmongery, glass, limestone, paints, oils, pitch, tar, slag, soap, soda and timber for the corporation.—Mr. John Ward, borough surveyor.

Eastbourne.—March 11th.—For the supply of Portland cement, cast-iron goods, wrought-iron goods, tools, ironmongery, oils, timber, broken granite, granite kerb and setts, bricks, pipes, brooms, &c., for the corporation.—Mr. A. Ernest Prescott, borough surveyor.

Rochdale.—March 13th.—For the supply of lime, engine and other oils, wrought-iron tubes and fittings, cast-iron mains and specials, bar and sheet iron, &c., for the corporation.—Chairman of the Gas and Electricity Committee.

Twickenham.—March 13th.—For the supply of ballast, shingle, granite cubes, cement, coal, street gullies, drain pipes, broken granite, &c., for the urban district council.—Mr. H. Jason Saunders, clerk.

Exeter.—March 14th.—For the supply of bricks, brooms, Portland cement, building lime, cast-iron pipes, channelling, kerb, stoneware pipes, iron castings, sand, stone, timber, ironmongery, &c., for the corporation.—Mr. H. Lloyd Parry, town clerk.

Gainsborough.—March 15th.—For the supply of granite, whinstone macadam, whinstone setts, slag, kerbs, flags, earthenware and cast-iron pipes, tarmacadam, &c., for the urban district council. Mr. Sam W. Parker, engineer and surveyor.

Lanark.—March 15th.—For the supply of tools and implements, fencing materials and drain pipes, for the District Committee of Middle Ward.—Mr. W. E. Whyte, district clerk, Hamilton.

East Ham.—March 16th.—For the supply of glazed stonework pipes, gulley fittings, Portland cement, greystone, chalk, lime, bricks, Thames ballast, engineer's sundries, ironmongery, granite setts, kerbs, gulleys, hire of horses and carts, uniforms, paving flags, &c., for the corporation.—Mr. C. Eustace Wilson, town clerk.

Coventry.—March 16th.—For the supply of broken roadstone, granite kerbs, granite setts, stoneware pipes, castings, and workmen's tools, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

Leek.—March 18th.—For the supply of flags, kerbs, grit setts, Portland cement, bass brooms, macadam stone, cast manhole covers, grids, &c., for the urban district council.—Mr. W. E. Beacham, surveyor and water engineer.

Sutton Coldfield.—March 19th.—For the supply of granite macadam and kerb, limestone macadam and setts, gravel, Yorkshire or Pennant kerb, Rowley setts, earthenware pipes, cement, lime, castings, iron, steel, &c., for the corporation.—Mr. W. A. H. Clarry, borough surveyor.

## Miscellaneous.

Stoke-on-Trent.—March 9th.—For the supply of Portland cement, paving and common bricks, sanitary pipes, gullies, kerbs, setts, macadam, chippings, pitch, oil, cast-iron work, ironmongery, disinfectants, &c., for the corporation.—Mr. A. Burton, borough surveyor.

Coventry.—March 9th.—For the supply of waterworks stores (cast-iron pipes, lead pipes, solder, &c.), for the corporation.—Mr. J. E. Swindlehurst, water engineer.

Ramsgate.—March 11th.—For the supply of brimstone acid, for the Gas and Water Committee.—Mr. W. Thomson, Gas and Water Offices, Ramsgate.

Limerick.—March 11th.—For the supply and fixing of four beds of retorts and building four regenerators, for the Gas Committee.—Chairman of the Gas Committee.

Aberdeen.—March 12th.—For the reconstruction of 7 miles of the Braemar-road, for the Deeside District Committee.—Mr. John Murray, clerk, 22 Bridge-street, Aberdeen.

Westminster.—March 15th.—For the supply of tip vans, for the borough council.—Mr. John Hunt, town clerk.

Kent.—March 23rd.—For the supply of shovels, forks, scavenging brooms, scoops, scrapers, cart grease, tallow and oil, for the county council.—Mr. W. B. Prosser, clerk.

Penarth.—March 30th.—For the supply of a steam or petrol motor wagon, trailer, and water van, for the urban district council.—Mr. George Wainwright, clerk.

## TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BARKING.—For alterations to the delivery pipe from the sludge pumping engines at the outfall works, for the London County Council:—

Steel Pipes.

T. Piggott & Co., Limited, Birmingham, riveted flanges, £98.†
Stewarts & Lloyds, Limited, Glasgow, welded, £125, less 2½ per cent; riveted £157, less 2½ per cent.
Clayton, Son & Co., Limited, Leeds, welded, £137; riveted, £156.
J. Spencer, Limited, Wednesbury, welded, £170; riveted, £145.
British Mannesmann Tube Company, welded, £173, less 2½ per cent.

Cast-iron Special Pipes.

Stanton Iron Works Company, Limited, Nottingham, £85.†
Holwell Iron Company, Limited, Melton Mowbray, £68.

CHELMSFORD.—For sewerage work, for the town council.—Mr. P. T. Harrison, borough surveyor:—

| | |
|---|---|
| A. T. Catley, London | £180 |
| Wilson, Border & Co., Romford | 151 |
| R. A. Bonnett, Chelmsford | 145 |
| G. Impey, Wanstead | 142 |
| W. J. Lingwood, Romford | 140 |
| J. Jackson, Forest-gate | 129 |
| G. Porter, Hackney* | 109 |

CLAPHAM.—For alterations at Ponton-road Industrial School, Clapham, for the London County Council:—

| | |
|---|---|
| Lathey Brothers, Battersea-park | £1,849 |
| Rice & Son, Stockwell-road | 1,847 |
| J. Garrett & Son, Balham-hill | 1,822 |
| G. Munday & Sons, Eastcheap | 1,419 |
| J. & C. Bowyer, Limited, Upper Norwood | 1,373 |
| W. Johnson & Co., Limited, Wandsworth-common | 1,362 |
| Triggs & Co., Clapham† | 1,319 |

Architect's estimate, £1,500.

CRICK.—For the supply of Hartshill granite, Mancetter, or Mountsorrel stones, for the rural district council.—Mr. W. W. Band, surveyor:—

C. Abell, Limited, Atherstone.
Judkins, Limited, Nuneaton.*
Jee's Hartshill Quarry Company, Limited, Atherstone.
Hartshill Quarry Company, Atherstone.*
Groby Granite Company, Leicester.
Mountsorrel Granite Company, Loughborough.
B. I. Forder & Son, Limited, Nuneaton.*
Enderby and Stoney Stanton Granite Company, Limited, Leicester
Whitwick Granite Company, Leicester.
Cliffe Hill Granite Company, Leicester.
J. Ellis & Sons, Limited, Leicester.
Clee Hill Granite Company, Limited, Ludlow, Salop.
W. L. Ireland, Atherstone.

ESSEX.—For the erection of a school, for the education committee.—Mr. E. J. Bond:—

| | |
|---|---|
| F. B. Self, South Hackney | £2,498 |
| T. Osborn & Sons, Woodford | 1,996 |
| Fitch & Cox, Enfield | 1,949 |
| Knight & Son, Tottenham | 1,841 |
| C. S. Foster & Son, Loughton | 1,836 |
| F. J. Coxhead, Leytonstone | 1,798 |
| W. J. Maddison, Canning Town* | 1,788 |
| J. Oram & Son, Waltham Abbey (withdrawn) | 1,656 |

FOLESHILL.—For the supply of granite, for the rural district council.—Mr. A. E. Newey, surveyor:—

Midland Quarry Company, Nuneaton, various prices to stations and wharves.

FRIERN BARNET.—For making up Torrington-park (Eastern portion of), for the urban district council.—Mr. E. J. Reynolds, engineer and surveyor:—

| | |
|---|---|
| H. Farrow, Strand | £4,047 |
| T. Adams, Wood Green | 3,780 |
| W. Iles, Southend-on-Sea | 3,750 |
| W. Griffiths & Co., Bishopsgate | 3,459 |
| A. T. Catley, Lloyd-square | 3,360 |
| J. Mowlem & Co., Limited, Westminster | 3,253 |
| E. Free & Son, Maple-road | 3,245 |
| Bell & Sons, Limited, Tottenham | 3,239 |
| Grounds & Newton, Tottenham* | 3,224 |

Engineer and Surveyor's estimate, £3,182.

FYLDE.—For the supply of a steam traction engine convertible to a roller, for the rural district council.—Mr. T. H. Maxwell, surveyor:—

W. Allchin, Limited, Northampton.
Aveling & Porter, Limited, Rochester.
C. Burrell & Sons, Limited, Thetford.
J. Fowler & Co., Limited, Leeds.
T. Green & Sons, Limited, Leeds.
Marshall, Sons & Co., Limited, Gainsborough.
Rushton, Procter & Co., Limited, Lincoln.

HEAVITREE.—For making up certain streets, for the urban district council:—

| | |
|---|---|
| Setter & Son, Exeter | £339 |
| H. Berry, Crediton | 333 |
| F. E. Sleeman, Heavitree | 298 |
| T. Westcott, Heavitree | 260 |
| T. Hooper, Heavitree* | 259 |

HITCHIN.—For the Ickleford water supply scheme, for the rural district council:—

| | |
|---|---|
| Innes | £333 |
| Turner | 322 |
| Redhouse & Son, Stotfold | 318 |
| Porter | 310 |
| Thompson & Co. | 301 |
| Martin* | 273 |

Surveyor's estimate between £280 and £290.

HODDESDON.—For providing horses and men for dust removal, for the urban district council.—Chairman, Public Health Committee:—

Dust Removal.—E. Childs, Amwell-street, £2 9s. 6d.; P. Tofts, Amwell-street, £2 12s.
Street Watering.—P. Tofts, Amwell-street, £4 8s.; E. Tingay, Hertford-road, £5 5s.; E. Childs, Amwell-street, £5 17s.

HORNCASTLE.—Accepted for the supply of granite and slag, for the rural district council:—
Cliff Hill Granite Company, Limited, 800 tons granite at 11s. 7d. and 11s. 5d.
A. Dunham, Horncastle, 2,000 tons Bardon Hill granite at 12s. 5d. and 12s. 3d.
Groby Granite Company, Limited, 2,000 tons granite at 11s. 8d. and 11s. 6d.
C. Hensman & Son, Horncastle, 800 tons Croft granite at 11s. 8d. and 11s. 6d.
Ord & Maddison, Limited, 1,000 tons Whinstone granite at 13s. and 13s. The prices were for one X and double X respectively.
Renishaw Iron Company, Limited, 500 tons slag at 6s. 2d. for 2½-in., 6s. 2d. for 1¼-in., and 6s. 2d. rejections.
Stainton Iron Works Company, Limited, 500 tons slag at 6s. 1d., 6s. 1d., and 5s. 7d. respectively.
Staveley Coal and Iron Company, Limited, 600 tons slag at 7s. 8d., 6s. 8d., and 6s. 8d. respectively.

LANCHESTER.—For the construction of pipe sewer, manholes, &c., for the rural disirict council.—
J. W. Henderson, Newcastle, £139.

LONDON.—For the provision of concave ceilings and the execution of general repair to the bandstands at Brockwell park and Chissold-park, for the County Council:—

| | Brockwell-park. | Chissold-park. |
|---|---|---|
| A. Roberts & Co., Limited, Kensington | £285 | £285 |
| J. C. Mather, Islington | 292 | 272 |
| W. Downs, Walworth | 284 | 274 |
| F. & G. Foster, Norwood junction | 277 | 261 |
| J. Grover & Son, Islington | 265 | 253 |
| F. & T. Thorne, Isle of Dogs | 238 | 243 |
| Marchant, Hirst & Co., Kentish-town | 238 | 223 |
| W. J. Mitchell & Son, Dulwich-village | 220 | 235 |
| Rowley Brothers, Wood-green | 218 | 224 |
| J. Garrett & Son, Balham-hill | 200 | 215 |
| G. Godson & Sons, Kilburn-lane | 205 | 194 |
| F. W. Fletcher, Tooting | 189 | 199 |

Architect's estimate, £200.

MUTFORD AND LOTHINGLAND.—For the supply of material, for the rural district council:—
Granite.—J. R. White & Co.
Flints.—C. R. Ayton (by rail), and E. J. Edwards (by water).

NORTHWICH.—For alterations to sewage outfall works, for the urban district council.—Mr. W. M. Beckett:—

| | |
|---|---|
| Sangwin & Co., Hull | £4,896 |
| Sanders & Torrance, Stoke-on-Trent | 4,236 |
| G. Bell & Sons, Limited, Manchester | 3,712 |
| W. Morley & Sons, Keighley | 3,691 |
| S. Appleton, Northwich | 3,607 |
| W. P. Meikle, Liverpool | 3,562 |
| J. H. Billings & Co., Manchester | 3,534 |
| Bennie & Thompson, Warrington | 3,523 |
| P. D. Hayes & Sons, Stockport | 3,445 |
| J. McConville, Ambergate | 3,368 |
| A. Hyslop, Manchester | 3,361 |
| S. Johnson, Son & Co., Manchester | 3,287 |
| Ward & Tetley, Sandbach | 3,287 |
| E. W. Bostock, Northwich | 3,200 |
| W. Cunliffe & Sons, Limited, Birmingham | 2,960 |
| S. Hutton & Co., Northwich * | 2,873 |

PAIGNTON.—For work of making up, for the urban district council.—Mr. C. Owen Baines, engineer and surveyor:—
H. Drew, Paignton, £275.
For Steam Lorry and Watering Wagon, &c.—Fodens, Limited, Sandbach, £610.

WEST HAM.—For the erection of dinner centre and covered play-ground at Stock-street Schools, for the corporation.—Mr. W. Jacques:—

| | |
|---|---|
| H. C. Horswill, Forest-gate | £390 |
| J. L. Luton, Stratford | 374 |
| Newman, Limited, Ilford | 368 |
| W. J. Maddison, Canning-town | 357 |
| W. J. Clemens, Stratford | 356 |
| Barker & Co., Plaistow | 346 |
| A. Webb, Stratford | 355 |
| Webb & Co., Walthamstow | 334 |
| A. E. Symes, Stratford * | 327 |

WEST HAM.—For the erection of a caretaker's house and alterations at Denmark-street School.—Mr. W. Jacques, architect:—

| | |
|---|---|
| A. Webb, Stratford | £987 |
| Barker & Co., Plaistow | 946 |
| H. C. Horswill, Forest-gate | 890 |
| W. J. Maddison, Canning-town | 888 |
| Webb & Co., Walthamstow | 887 |
| W. J. Clemens, Stratford | 866 |
| Newman Limited, Ilford | 788 |
| J. T. Luton, Stratford | 764 |
| A. E. Symes, Stratford * | 687 |

## MEETINGS.

*Secretaries and others will oblige by sending early notice of date of forthcoming meetings.*

MARCH.

9.—Opening of Building Trades Exhibition, Rusholme, Manchester.
11.—Institute of Sanitary Engineers: Mr. Percival M. Frazer, A.R.I.B.A., on "The Modern Home." Caxton Hall, Westminster, 8 p.m.
12.—Institution of Civil Engineers. Messrs. A. B. McDonald and G. Midgley Taylor on "The Main Drainage of Glasgow"; paper by Mr. D. H. Morton on "Glasgow Main Drainage The Mechanical Equipment of the Western Works and of the Kinning Park Pumping Station." 8 p.m.
12.—Junior Institution of Engineers: Mr. Bertram D. Fox, A.M.INST.C.E., on "Railless Electric Traction," Institution of Electrical Engineers. 8 p.m.
15.—Institution of Civil Engineers: Student's Meeting; Mr. A. E. Gladwyn on "The Heat Value of Fuels." 8 p.m.
15.—Institution of Mechanical Engineers: Dr. Rudolf Diesel, of Munich, on "The Diesel Oil Engine, and its Industrial Importance, particularly for Great Britain." 8 p.m.
15.—Junior Institution of Engineers: Mr. A. H. Weston on "Crude Oil Engines," 39 Victoria-street, S.W. 8.15 p.m.
16.—Junior Institution of Engineers: Visit to Lots-road Generating Station. 10 a.m.
19.—Institution of Municipal Engineers: Discussion on "The Size and Design of Street Gullies, Grates and Weirs."
26.—Royal Sanitary Institute: Annual Meeting of Associates; Mr. H. Percy Boulnois, M.INST.C.E., chairman of council, on "Sanitary Legislation and Education." 7 p.m.

APRIL.

2.—Royal Sanitary Institute: Mr. F. J. Osborne Smith, F.R.I.B.A., on "Sanitary Fittings." 7 p.m.
12-13.—Royal Sanitary Institute: Meeting at Cardiff; Discussion on "The Development of Cardiff Waterworks"; visit to waterworks extension at Brecon Beacons.
23.—Surveyor's Institution: Annual Dinner, Whitehall Rooms. 7 p.m.

MAY.

4.—Lower Thames Valley District Surveyors' Association: Annual Meeting and Dinner.

## APPOINTMENTS OPEN.

### HORBURY URBAN DISTRICT COUNCIL.

The Council require the services of a competent Clerk of Works for a period of about 9 months, at a weekly salary of £3.

None but persons experienced in Sewage Disposal Works and Hennebique Ferro-Concrete Construction need apply.

Form of application may be obtained from the undersigned, to whom applications have to be sent not later than noon on Monday, March 18th next.

J. H. DREW, M.INST.M.&C.E.,
Engineer to the Council.

Town Hall,
Horbury.
March 5, 1912.

### CLEETHORPES URBAN DISTRICT COUNCIL.

APPOINTMENT OF SURVEYOR.

The Cleethorpes Urban District Council are prepared to receive applications for the appointment of a Surveyor.

Salary £200 per annum, rising to a maximum of £300.

The person appointed will be required to reside in the district, and devote the whole of his time to the duties of the office, and will not be allowed to undertake any private work whatever.

Applications to be made on forms (to be obtained from me on receipt of stamped addressed foolscap envelope), which must be returned to me filled up not later than the 16th March, 1912.

(By order)
B. GREAVES,
Clerk to the Council.

Council Offices,
Cleethorpes.
March 5, 1912.

### NEWTON-IN-MAKERFIELD URBAN DISTRICT COUNCIL.

ASSISTANT SURVEYOR.

The above-named Council invite applications for the position of Assistant Surveyor. Applicants must possess experience in Surveying and Levelling, and in the general routine work of a Surveyor's Department. The appointment will, if services are satisfactory, be for a period of two years, and the salary £70 for the first year and £75 for the second year.

Applications, with not more than three recent testimonials, should reach me not later than the 23rd March instant.

CORNELIUS COLE,
Clerk to the Council.

Town Hall,
Earlestown,
Lancashire.
March 4, 1912.

### COUNTY BOROUGH OF SOUTHPORT.

The Corporation of Southport are prepared to receive applications for the positions of an Engineering Assistant and a Surveying Assistant in the Borough Engineer and Surveyor's Office. The commencing salary will be £160 *per annum* and £120 *per annum* respectively. Applications, in candidate's own handwriting, stating age, experience and qualifications, accompanied by copies of not more than three recent testimonials, and endorsed "Engineering Assistant" or "Surveying Assistant," must be delivered at this office not later than 10 a.m. on Tuesday, March 19th, 1912. Canvassing is strictly prohibited, and will disqualify.

J. E. JARRATT,
Town Clerk

Town Clerk's Office,
Town Hall,
Southport.
March 6, 1912.

## COUNTY BOROUGH OF HUDDERSFIELD

### APPOINTMENT OF ENGINEERING AND SURVEYING ASSISTANT.

The Corporation invite applications for the appointment in the Borough Engineer's Department of an experienced Engineering and Surveying Assistant, at a salary of £140 per annum.

The person appointed must be thoroughly qualified to fulfil the duties of the office, particulars of which may be obtained on application to the Borough Engineer.

Application, in candidate's own handwriting, giving full particulars as to experience, age, present and previous appointments, accompanied by not more than four recent testimonials, to be addressed to me the undersigned not later than 10 a.m. on Wednesday, March 13th, 1912.

Canvassing will disqualify.

(By order)

K. F. CAMPBELL, M.INST.C.E., M.I.E.E.,
Borough Engineer and Surveyor.

Huddersfield.
February 28, 1912.

## WILLESDEN DISTRICT COUNCIL.

### APPOINTMENT OF JUNIOR CLERK IN ENGINEER AND SURVEYOR'S DEPARTMENT.

The Willesden District Council are prepared to receive applications for the appointment of Junior Clerk in the Engineer and Surveyor's Department, the commencing salary being 10s. per week, rising by annual increments of 2s. 6d. per week to a maximum of 20s. per week.

Candidates must be not less than 14 nor over 18 years of age.

Candidates must have received a good general education, and will be required to submit themselves for examination in certain subjects.

Further particulars may be obtained upon application to the undersigned on and after Monday, March 4th, 1912.

Applications, in Candidate's own handwriting, and accompanied by copies only of three testimonials, to be delivered to the Engineer to the Council not later than 4 p.m. on Tuesday, the 12th March, 1912.

(By order)

O. CLAUDE ROBSON,
Engineer to the Council.

Public Offices, Dyne-road,
Kilburn, N.W.
February 29, 1912.

## BOROUGH OF CAMBERWELL.

### SANITARY INSPECTOR.

The Council invite applications for the position of Sanitary Inspector. Salary £117 per annum, rising by annual increments of £10 to £175. After five years at this maximum, and upon a favourable report of the Public Health Committee, the salary may be increased to £200 by annual increments. Candidates must not exceed the age of 40 years.

The appointment will be subject to the approval of the Local Government Board, and to the provisions of the Camberwell Superannuation Act, 1908. The person appointed will be required to devote the whole of his time to the work, and must hold a certificate of a recognised body, unless he has been examined since April 24, 1899, in which event he must hold a certificate of the "Sanitary Inspectors' Examination Board," in accordance with the requirements of the Local Government Board and the provisions of the Public Health (London) Act, 1891.

Applications, which must be made on Forms to be obtained from the undersigned (if by post by forwarding a stamped addressed foolscap envelope), must be delivered at the Town Hall not later than Friday, 15th March, 1912, at 12 noon. Personal canvassing members of the Council will disqualify.

C. WILLIAM TAGG,
Town Clerk.

## EXAMINATIONS.

ADVERTISER, passed Institution Mun. and County Engineers' Exams., wishes to dispose of Preparatory Notes for same. Box 1,133, office of THE SURVEYOR, 21 Bride-lane, Fleet-street, E.C.

## TENDERS WANTED.

## BOROUGH OF REIGATE.

### TO ROAD TARRING CONTRACTORS.

The Reigate Town Council invites Tenders for Tar-washing about 186,000 yards super. of roads within the Borough, the price to include Cleaning, Tarring, and Gritting the tar surface, and all other necessary works in connection therewith.

Sealed Tenders, which are to state the price per yard super., with full description of the mode of treatment, are to be delivered at my Office at the Municipal Buildings, Reigate, on or before noon of Wednesday, the 13th day of March next.

The person whose Tender is accepted will be required to enter into a Contract in accordance with a Form to be seen at my Office aforesaid.

The Council does not bind itself to accept the lowest or any Tender.

Dated this 26th day of February, 1912.

(By order)

ALFRED SMITH,
Town Clerk.

## ERITH URBAN DISTRICT.

### ABBEY-ROAD SEWER.

The Erith Urban District Council invite Tenders for the Laying of 440 feet of 6-in. Cast-Iron Sewer in Abbey-road, Abbey Wood, and a 3-in. Cast-Iron Air Main, with Two 100-gallon Ejectors, and the necessary Cast-Iron Ejector Chamber, &c.

Plans, Sections, Specification and Bills of Quantities may be seen, and Forms of Tender obtained, at the Council Offices, Erith, on deposit of £1 1s., which will be returned on receipt of a *bonâ-fide* Tender.

Tenders, sealed and endorsed "Abbey-road Sewer," to be delivered at my office not later than 12 noon on Monday, the 18th inst.

The Council do not bind themselves to accept the lowest or any Tender.

J. KENNEDY ALLERTON,
Clerk and Solicitor.

Council Offices, Erith.
March 5, 1912.

Take your cue from the Talbot Motorist and look after your pockets.
TALBOT
LONDON
"Economy or Upkeep" marks the scoring point of the Invincible Talbot, whilst its efficiency and reliability enable it to comfortably "give one away" to its competitors. Talbot owners know, from the consistency of Talbot cars, just how to "cut their cloth." Write for catalogue to-day—don't give it a miss"—it will be your "winning hazard."
INVINCIBLE
TALBOT
CLEMENT TALBOT, LTD.
(DEPT. A 29), AUTOMOBILE ENGINEERS,
BARLBY ROAD, LADBROKE GROVE, LONDON, W.
Telegrams: Clemtal, London. Telephone: 3066 Paddington.

## ORSETT RURAL DISTRICT COUNCIL.

*PARISH OF STANFORD-LE-HOPE.*

CONTRACT No. 1. SEWAGE DISPOSAL WORKS.
CONTRACT No. 2.—MAIN SEWERAGE.
CONTRACT No. 3.—MACHINERY, EJECTORS, AIR MAINS, &c.

The above Council are prepared to receive Tenders for the following Works in connection with the Sewerage and Sewage Disposal of the Parish of Stanford-le-Hope: -

CONTRACT No. 1.

Construction of New Outfall Works, comprising 4 Humus Chambers, 3 Circular Filter-beds, 3 Continuous-flow Settlement Tanks, 2 Detritus Tanks, 2 Sludge-drying Beds, Ejector Chamber, Separating Chamber, together with the Construction of New Screening Chamber, Extension and Alteration of Existing Effluent Channel, Alterations and Additions to 3 Contact Beds, including the Removal of Existing Filtering Material and substituting new Filtering Media, the Removal, Washing, and Replacing of Material in 3 Contact Beds, Alterations and Additions of Existing Sedimentation Tanks, including all Valves, Penstocks, Piping, &c.

CONTRACT No. 2.

The Construction of about 4¾ miles of Sewers, together with Manholes and Flushing Chambers, Erection of Ventilating Columns, Additions to Engine-House, &c.

CONTRACT No. 3.

The Provision and Laying of about 635 yards of Cast-Iron Sewage Rising Mains, the Laying and Testing of about 605 yards of Cast-iron Compressed-Air Main, the Installation of Pneumatic Automatic Ejectors, Oil Engines, and Compressors, together with all necessary Valves, Connections, &c.

Persons tendering for these contracts may obtain prints of the Drawings from Messrs. R. J. Cook & Hammond, Lithographers, 47 and 49 Tothill-street, Westminster, S.W., at the price of—

Contract No. 1.—4 Drawings at 14s. per set.
Contract No. 2.—6 Drawings at 21s. per set.
Contract No. 3.—1 Drawing at 3s. 6d.

Payments to be made to the above Lithographer for the copies. Copies of Conditions and Specifications, Form of Tender, Estimate of Quantities, &c., may be obtained at the Office of the Engineer for the Works, Mr. S. A. Hill-Willis, 2 Orsett-road, Grays, on or after March 8th on the deposit of £2 2s., returnable on receipt of *bonâ-fide* Tender and return of Specifications.

Sealed Tenders, in the envelopes and on the forms supplied, are to be delivered to the undersigned not later than Tuesday, the 26th day of March, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
JAMES BECK,
Clerk to the Council.

2 Orsett-road, Grays.

## TRING URBAN DISTRICT COUNCIL.

TENDER FOR MATERIALS.

The Council invite Tenders for the Supply and Delivery of Kerb, Setts, Broken Granite and Flints as and when required for the year ending 31st March, 1913.

Full particulars and Forms of Tender may be obtained on application to the undersigned.

Sealed Tenders, accompanied by Samples, endorsed "Tender for Materials," must be delivered to me not later than noon on Thursday, the 21st March, 1912.

The lowest or any Tender will not necessarily be accepted.

S. S. GETTINGS, Assoc.M.Inst.C.E.,
Surveyor.

Surveyor's Office,
Tring.
March 5, 1912.


# SEWAGE PURIFICATION

# DIBDIN'S BIOLOGICAL SLATE BEDS

**47 VICTORIA STREET, WESTMINSTER, S.W.**

TELEPHONE—2211 VICTORIA.

DR. GILBERT FOWLER, F.I.C., F.C.S., in giving evidence upon Dibdin's slate beds, said:

"The result of examination showed that at no point did the deposit, although teeming with bacterial life, possess a really offensive smell. In general, it rather resembled seaweed. *The presence of numerous red worms showed that the conditions were mainly aerobic.* Apparently similar changes were taking place in the beds to those occurring in well-manured soil on the banks of slightly polluted rivers. . . . *I am able to state my confident opinion that the slate process is scientifically and economically sound.*"

"AFTER 7 YEARS' WORKING RESULTS ARE AS GOOD AS AT FIRST."

CONTRACTORS TO H. M. GOVERNMENT

# The Surveyor

And Municipal and County Engineer.

Vol. XLI. MARCH 15, 1912. No. 1,052.

## Minutes of Proceedings.

**Biting Gnats in England.**

While the suppression of mosquitoes, or biting gnats, is not usually regarded as a matter of importance in England, there are several considerations which tend to show that it would be to the public advantage if greater attention were paid to the means of suppressing the more troublesome of the biting gnats and midges of this country or, at any rate, considerably reducing their numbers. About a year ago Sir Ronald Ross, in the course of a lecture which he delivered at the London Institution, pointed out that the comparative immunity from malaria, or fen ague, now enjoyed by those parts of England in which the disease was once rife is, though mainly due to drainage, perhaps partly dependent also upon the fact that English gnats of the species capable of transmitting malaria have given up the habit of biting mankind. We believe that the chief natural breeding places of mosquitoes are, in almost all countries, those pools of stagnant water which do not last long enough to attract frogs, and are not in connection with waters inhabited by fish. Such pools often last long enough for the production of several generations of mosquitoes, especially if they are replenished by occasional heavy showers and are not washed out by continuous rains capable of removing the puddling material accumulated by shower water off crumbly ground. Very porous soils do not favour the formation of such pools, and very stiff soils, especially under the influence of the oceanic type of weather, favour rather the production of lasting pools which attract frogs and newts, and the formation of channels which allow of the visits of fish from the permanent waters into which they drain.

Where the soil is of a kind often found in the Eocene strata, and under the influence of the continental type of climate which sometimes prevails in East Anglia, we may perhaps expect the natural conditions specially favouring an increase in the numbers of gnats; but it is important to remember that our own works may also provide the insects with breeding places of a very favourable type. As regards the biting habit, it must not be overlooked that in the long period of English history the airtight box as a dwelling has, fortunately, only had a short vogue, and our modern habit of sleeping with open windows and on balconies may possibly lead to a revival of the biting tradition among the gnats. Even if the gnats and the midges which molest us in many parts of the country do not, as far as is known, convey any disease, it is possible that some of our minor complaints may be due to their bites, and the discomfort of being bitten is, in any case, a thing to be avoided if possible. We therefore regard the study of this subject as one of some importance, and we welcome the interesting article by Dr. E. H. T. Nash, medical officer of health for Wimbledon, which will be found elsewhere in the present issue.

Dr. Nash found that gnats were breeding in considerable numbers both in road gulleys and on sewage farms, and it is important to note that the larvæ were not removed from the gullies by a steady and copious flow of water. In other countries, where mosquitoes of various species are a serious scourge, small cisterns used for domestic purposes provide breeding places for the insects, and these places may constitute a continuous source of danger through long droughts, such as those of India and of some of the countries in the Mediterranean area. Dr. Nash's experiments were of a thoroughly practical character. He warns sewage farm managers against the use of petroleum in such a way that it checks the proper working of the beds, and he points out that the main remedy consists in drying off the plots every seven days, the principle being, of course, one that may be carried into effect in various ways. We commend a study of Dr. Nash's paper to all municipal officers who are concerned with works which may tend to the encouragement of these tiny enemies of mankind.

* * *

**Reinforced Concrete Materials.**

We have before us an excellent paper on the "Testing of Materials used in Reinforced Concrete," which was read last week by Mr. A. Alban H. Scott, M.R.SAN.I., before the Society of Architects. To quote Mr. Scott's own words, concrete and reinforced concrete are now being used so extensively and for such a variety of purposes, and their possibilities are so great, that at the present stage some further careful investigation is required by architects both as to the strength and properties of the various units as well as of the finished material. To this investigation the paper under notice forms a not unimportant contribution. Particularly valuable are the statistics of tests which are incorporated, their practical importance being considerably enhanced by the fact that the figures given are not based upon results obtained from carefully prepared laboratory specimens, made under the most favourable conditions, and without any allowance for the rougher methods which obtain in actual practice. The author of the paper lays stress upon the necessity for securing that all the component materials shall be of the very best quality. It is not enough, if the best results are to be obtained, that rigorous tests shall be applied to the cement, but attention must also be given to the concrete aggregate and to the quality of the steel used for reinforcement. For example, the coarse material should be tested for freedom from loam and other foreign matter; the proportion of the various sizes of the crushed material; the percentage of voids; and the specific gravity. Further, it is most important that all steel should be inspected at the works, and that sample rods should be tested for ultimate strength, elastic limit, elongation and contraction of area.

structure of metal at fracture, and bending. The chief matters to be examined at the works are surface defects, correctness of diameters, and whether any welds have been made.

It might be thought at first sight that some of the tests suggested by Mr. Scott are unnecessary or superfluous, but, having regard to the deleterious effect which even a slight deviation from the highest standard may have upon reinforced concrete work, no practicable precaution that is not absolutely unreasonable should be omitted. An example of this is afforded by the test of the coarse material for freedom from loam. The paper instances a sample of river aggregate recently tested which contained no less than 7 per cent of loam, and the author fairly points out that most loams have a surprising covering power, being of the very finest "flour." Consequently a thin film is formed between the cement and the actual silicious material, which seriously interferes with the proper adhesion of the particles.

It must always be borne in mind, however, that even if every care is taken to see that each ingredient of concrete is of the very best quality, the finished article will be very much influenced by the "personal equation" of those concerned in its mixing. Foremen, gangers and mixers should be selected with the greatest care, none but experienced and reliable men being employed in any capacity. We have said enough to show, if any proof were needed, that Mr. Scott's subject is of immediate and practical interest, and we hope to publish some extracts from his very valuable paper in our next issue.

* * *

**The Latest Housing Proposal.**

The question whether, even if the Housing and Town Planning Act were more imperfect than it may be, it would be advisable to amend it so soon after it came into operation is one that does not concern Sir Arthur Griffith-Boscawen, who has introduced into Parliament a Housing Bill, the aim of which is "the enforcement of the principles of existing Acts." This end is to be achieved by establishing a special department of the Local Government Board, consisting of three Housing Commissioners, to supervise the work of local authorities. Where a local authority is found to be "culpably neglectful" of its duties, the Local Government Board is to be authorised by the Bill, after application to the courts for a mandamus, to deal with slums and to provide housing accommodation itself at the cost of the local authority. The default of some local authorities being recognised as arising from financial disability, it is proposed to provide a Parliamentary grant of £500,000 a year in aid of housing operations, upon the analogy of the Road Board's fund. Moderate men will be disposed to rub their eyes upon reading such proposals as these; yet it is characteristic of our particular national genius that there are to be found people among us so eager to supplement new enactments with something still more new and, as the phrase goes, up to date that they overlook the sense of proportion and the fitness of things. The Housing and Town Planning Act cannot yet be said to have had a fair trial. It is only just beginning to become operative, and in large numbers of districts its influence and effects have not been felt at all. It embodies some principles which are, to say the least, sufficiently novel to the lethargic mind of the ordinary municipal representative, and it would be much more than a surprise to this particular individual, even to the ratepayer himself, if he found the pace set so fast as to leave him breathless and exhausted. Moreover, that proposed fund of £500,000 would be more than an innovation—it would be something quite startling. The analogy to the Road Board grant is so remote as to be, in fact, no analogy at all.

**The Quest of the Local Road.**

*Apropos* of the letter under this heading, which appeared in our issue of the 1st inst., our attention has been drawn to a note in the *Journal* of the Institution of Municipal Engineers of January, 1911, in which it is stated that Mr. Walton Maughan, surveyor of main roads to the Coventry District of the Warwickshire County Council, and a member of the institution, has been engaged now for a number of years on the preparation of road statistics and a traffic census extending over the whole of England. Mr. Maughan has issue for this purpose comprehensive forms which, when filled in, contain detailed information of the most complete nature. In carrying out his work he has "covered" every county (with three or four exceptions) in England, at a very considerable expense to himself. His returns embrace a period of five years, while on certain main routes quite a hundred returns have been taken at various periods of the years in question. The *Journal* states: "The magnitude of a self-imposed task of this nature can be appreciated without much effort of the imagination, while the value of the results admits of no dispute. Members who may be interested in the matter can obtain a copy of the forms used, together with an explanatory note, on application to the secretary of the institution, and they may, by putting themselves in communication with Mr. Maughan (whose address is Stoke, Coventry), be of very material assistance in completing the returns for the whole country. Much has been written about the necessity for the classification and standardisation of roads and road materials, and but few people seem to have been aware that here, approaching absolute completion, are statistics and other information ready to hand." It appears that we have at least a respectable basis upon which to build up the desired classification, with full statistics, and Mr. Maughan has undoubtedly rendered a very important public service by his self-imposed labours.

* * *

**A Bad Piece of Main Road: A Railway Company's Views.**

We are glad to see that the Urban District Council of Dorking are negotiating with the London, Brighton and South Coast Railway Company for the transference to the council of the maintenance of a piece of road which is a portion of a through route at a place where there is also a considerable amount of local traffic. It is to be hoped that the arrangement when made will include a dedication of the road by the company, with a suitable recognition of present obligations as regards the cost of maintenance. On another page we have printed an account which will give an idea of the nature of this piece of road, which is a nuisance to all users on account of dustiness and muddiness and occasional heavy splashing from deep puddles, while the fact that it is a part of a main road involves an element of danger, since so hard a "bunker" is quite unexpected by strangers to the locality. It has been suggested by the profane that the reason why railway companies sometimes maintain approach roads at their stations on the hummock-and-puddle or on the catch-em-alive-o principle is that it is desired to emphasise the comfort of railway travel; and while we would not suggest so sinister a motive in the case of a portion of a main road, it is certainly desirable that all such portions of road as those over railway bridges and their approaches should be maintained by the highway authority rather than by a railway company. As an engineering work, the piece of road in question compares very unfavourably with the humblest class of by-roads in the neighbourhood. We have not gone into the legal aspect of the matter, but on the face of it we do not see why the urban council should not take over the road and ask the county council to "main" it immediately afterwards.

**Design of High Dams.**

At a meeting of the Concrete Institute, held last night, a paper on "The Design of High Dams" was read by Mr. Reginald Ryves, Assoc.M.Inst.C.E. The paper, which will be reproduced in our next issue, was limited almost entirely to the consideration of dams more than 150 ft. clear of the ground in height, and of such length that the part under consideration could be regarded as receiving no support from the parts beyond it on higher ground. The author briefly considered four types of masonry dams, one of which was the mass gravity dam, and the others three dams of spans. Of these three two were gravity dams, in which the moment of the water load was balanced by the moment of the weight of the masonry. In one of these, which the author called the parallel slice dam, the theory of the mass gravity dam is strictly followed, with more or less concentrated water loads; in the other the weights of the spans are wholly or partly counted in calculating moments, and the application of the theory is perhaps affected by the form given to the piers. The third type of dams of spans was the author's thrust-buttress type, first designed for a height of 200 ft., but suitable, he submitted, for much greater heights. It differs essentially from the other types, for instead of balancing moment against moment the author balanced direct thrust in the masonry against the direct thrust of the water load. Some other matters with which the author dealt in a special study of high dams which he recently undertook were referred to in the "propositions" which he puts forward with a view to concentrating discussion.

* * * *

**Workmen's Dwellings at Guildford.**

It has been suggested to us on more than one occasion that it would be of assistance to many of our readers if we were to publish plans and particulars of various types of workmen's cottages as opportunity might occur. This we have done from time to time, and in the present issue we have pleasure in reproducing the plans of some cottages at Guildford, which have been designed by Mr. T. J. Capp, a local architect, together with descriptions. We hope to follow this next week with plans and particulars of two other types of cottages which have been designed for the corporation of the same town by Mr. C. G. Mason, Assoc.M.Inst.C.E., the borough engineer. Mr. Capp has designed two types of cottage, both of which are characterised by the comparative spaciousness of the rooms. The cost per cottage of the "A" design (two bedrooms) is only £154, while a "B" design cottage, containing three bedrooms, is estimated to cost £175. These prices represent an expenditure of only 5d. per cube foot, and the proposed weekly rents are 5s. 6d. and 6s. 3d. respectively, including rates. These results are extremely satisfactory, and Mr. Capp has done well to produce a design so efficient both as regards economy of construction and the reasonableness of the rents to be charged.

* * *

**A Unique Opportunity.**

Municipal engineers who are seeking professional advancement should not overlook the unique opportunity presented by the vacancy which exists in the office of inspector of nuisances and borough surveyor of Llanidloes. It is true that the combined salary is only £75 per annum, of which £65 is allocated to the former office, but this must not be taken as a measure of the responsibilities involved. A capable and qualified whole-time officer is required, and he must hold the certificate of the Royal Sanitary Institute, or of some other similar body. He must also be experienced both in sanitary work generally and in questions arising under the Housing and Town Planning Act. We cordially congratulate the council of the borough of Llanidloes on the modesty of their requirements, and we hope that they may obtain, at a salary of £10 per annum, a borough surveyor who will bring to the discharge of his duties a degree of skill which such remuneration fairly represents—and no more. When will some authorities learn that the employment of skilled professional advisers is a true economy, and that such officers can only be obtained by the offer of reasonable salaries.

* * *

**Town Planning and Suburban Areas.**

The practical application of the provisions of the Housing, Town Planning, &c., Act, 1909, to the redevelopment of suburban areas is not the least difficult of the problems that have to be faced as a consequence of the passing of that measure. A discussion on this subject—initiated by an able paper by Mr. F. W. Platt, the building surveyor to the Salford Corporation—took place at last Friday's meeting of the Royal Sanitary Institute at Manchester. As was pointed out by the chairman, Mr. H. Percy Boulnois, in closing the discussion, the application of town planning principles in a partially developed locality is far more difficult than their adoption in a new county or town. It is at least possible, however, for a local authority to note the trend of development, and, if necessary, to use their powers under the Act of 1909 to arrest or to mitigate any evil tendencies. Mr. Platt's paper focussed attention on one of the practical problems of town planning, and we desire to draw attention to the report of it and of the discussion which ensued upon its reading, which appear in another column.

* * *

**Water Supply and Drought.**

The exceptionally dry summer which was experienced last year brought home to the mind of even the least expert the necessity for husbanding the water supply of the nation. The first step towards achieving this desirable object is to ascertain as accurately as possible the quantity of water available—a quantity which is, of course, primarily affected by rainfall. Prof. Radcliffe, who read a paper on "Water Supply from Upland Drainage Areas" before the Royal Sanitary Institute at Manchester last Friday, has, since 1888, been conducting a series of investigations with the object of classifying watersheds, and of finding a constant (C) which would be suitable for each of the divisions under which the area might be placed, so that the mean annual rainfall in inches of any district, multiplied by C, would show the depth in inches of rain per annum which the area might be expected to yield for water supply purposes. Prof. Radcliffe's paper is of intense interest, and we cordially commend to our readers not only the account of it which appears in another column of our present issue, but the full paper itself

* * *

**A Well-Deserved Honour.**

Sir Maurice Fitzmaurice is to be cordially congratulated upon the honour conferred upon him by the King in connection with the laying of the foundation-stone of the new County Hall for London. The work which Sir Maurice has done during his tenure of the important office of chief engineer to the London County Council forms the climax of a brilliant career, and is well deserving of the recognition it has received. Municipal engineers throughout the country will rejoice in the honour done to the holder of what is probably the most important municipal engineering appointment in the kingdom, and will join in the hope that the new knight may be spared for many years to enjoy the dignity which has been conferred upon him and to continue the great work which he is doing for the metropolis which he serves so well

# Workmen's Dwellings for Guildford.

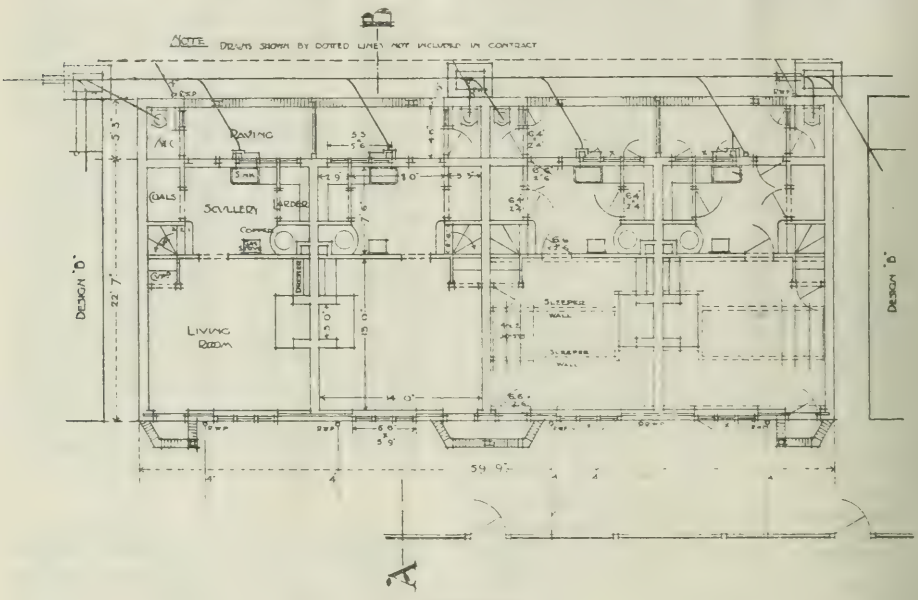
## FOUR TYPES OF COTTAGES.

By the courtesy of Mr. C. G. Mason, Assoc.M. Inst.C.E., the borough engineer, and Mr. Thos. J. Capp, a local architect, we are afforded the opportunity of giving a description and reproducing the plans of twenty dwellings for workmen which the Corporation of Guildford recently decided to erect. Of the number mentioned twelve of the houses have been designed by Mr. Capp, the plans for the remaining eight having been prepared in the office of the borough engineer.

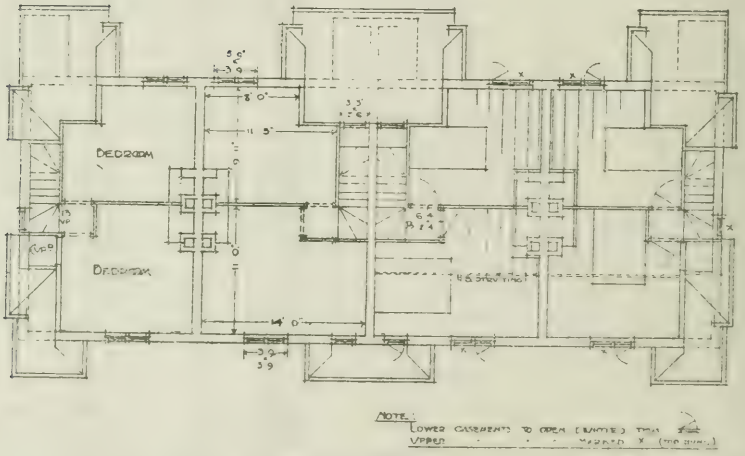
The dwellings prepared by Mr. Capp will comprise three blocks of four self-contained cottages, one block to design "A" and two blocks to design "B."

The accommodation on the ground floor of each cottage comprises living-room, scullery, larder, coal store and water-closet. There will be two bedrooms on the first floor of the "A" cottages, and three bedrooms to the "B" cottages. Each living-room will be fitted with an open fire range, dresser and cupboard. The scullery will contain a sink, wash boiler, and gas cooking range. The bedrooms are entered separately from the landing and a fireplace will be built in each, with the exception of bedroom No. 3 in design "B."

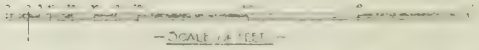
The elevations will be of local stock bricks, faced and pointed up to first-floor level, and above this




Ground Plan.




First Floor Plan.




Proposed Workmen's Dwellings, Guildford. Design "A."

(*Mr. T. J. Capp, Architect, Guildford.*)

covered with cream-coloured stucco. The roofs will be covered with plain sand-faced tiles.

The partitions will be formed with Portland cement fireproof slabs. All partitions and walls in the living-rooms and bedrooms will be finished in plaster and washable distemper, and other internal walls will be finished with struck joint and limewhited.

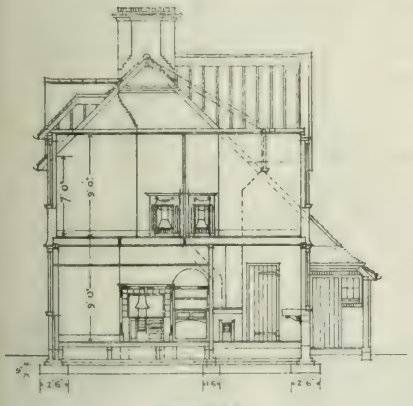
A paved space is provided at the rear of each cottage, the forecourts being enclosed with dwarf oak fencing and gates, and there will be a common right-of-way at the rear for access to the back entrance of each cottage.

The buildings are being erected at a cost of 5d. per cubic foot, and the proposed rents are 5s. 6d. for the two-bedroom cottages, and 6s. 3d. for those with three bedrooms, both amounts being inclusive of rates.

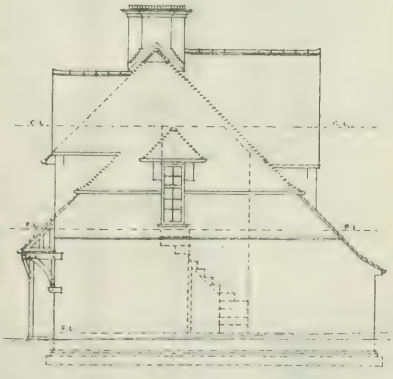
In the "A" design of building the estimated cost per cottage is £154. The income for fifty-two weeks at 5s. 6d. per week is estimated at £11 6s., and the

Elevation to Road.

Back Elevation.



Section A B.



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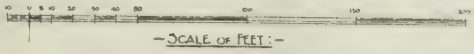
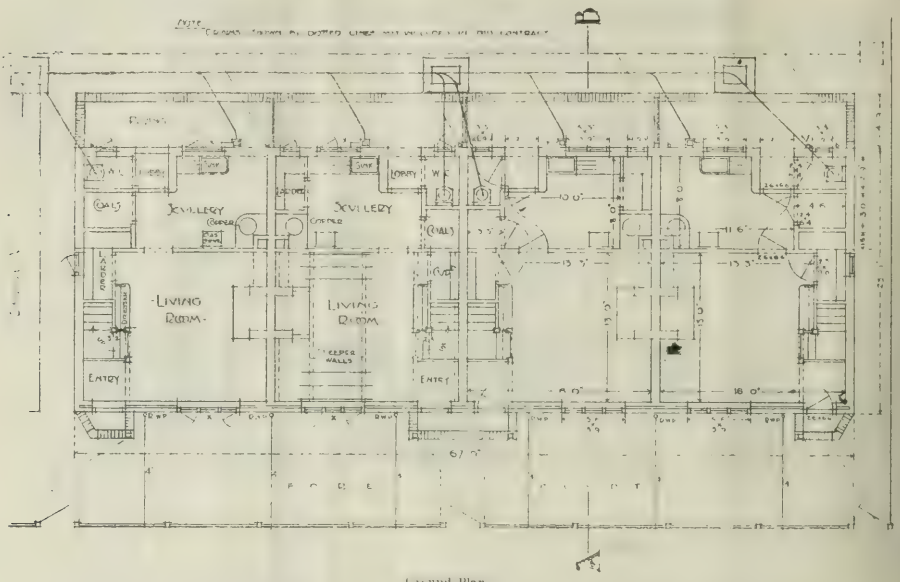
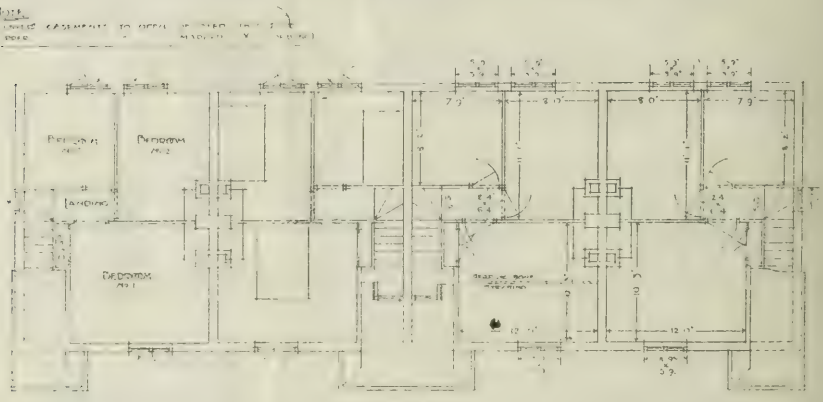


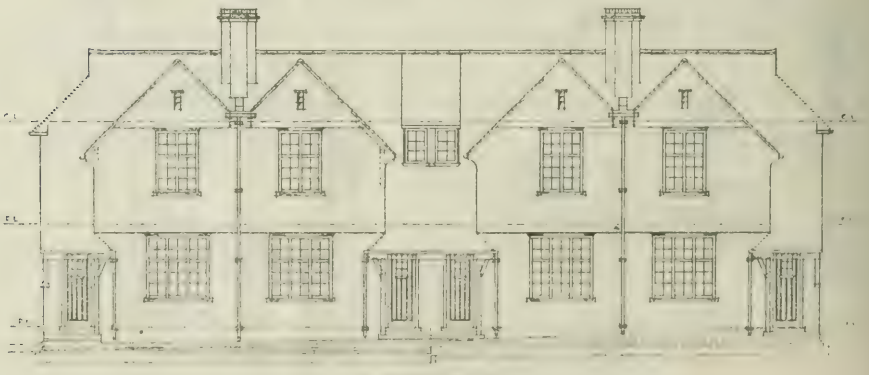

Proposed Workmen's Dwellings, Guildford. Design "A."




Ground Plan.




First Floor Plan.



Elevation to Road.

PROPOSED WORKMEN'S DWELLINGS, GUILDFORD. DESIGN "B."

(Mr. T. J. Cuff, Architect, Guildford.)

expenditure as follows: Instalment of loan on land and sewer, £1 12s. 3d.; ditto on building, £6 9s. 4d.; rates, 25 per cent of rent, £3 11s. 6d.; expenses, 2½ per cent, 7s. 2d.; repairs, 10 per cent, £1 8s. 7d.; leaving a profit of 11s. 7d.

In the case of the "B" buildings the cost of erection is put at £175. Let at 6s. per week the income for the year would be £15 12s., and the expenditure as follows: Instalment of loan on land and sewer, £1 16s. 5d.; ditto on building, £7 7s.; rates, 25 per cent of rent, £3 18s.; expenses, 2½ per cent, 7s. 10d.; repairs, 10 per cent, £1 11s. 2d.; leaving a profit of 11s. 7d.

*(To be concluded.)*

**Reinforced Concrete for Reservoirs.**—Lock-woven mesh is being used by H.M. Office of Works as reinforcement for the covering of the reservoirs in connection with the Windsor Castle water supply. Particulars of this system of reinforcement will be supplied on application to Messrs. George F. West & Co., Caxton House, Westminster, S.W.

**Safeguard against Pollution.**—Messrs. Kerner-Greenwood & Co., King's Lynn, write: "We notice in yours of March 8th that a correspondent says that a certain council's stables and manure pit are likely to pollute a well which is only 20 yds. away. There are a good many wells which are condemned on account of pollutions, but which might very easily be made watertight against all outside contagion. It is only necessary to render a 1-in. Pudloed cement floating on the inside brickwork of the well to make a perfectly safe job. The expense is very little, and we commend the idea to your readers in full knowledge that what we say is correct, and shall be glad to give further particulars to any enquirers."

## SOME RECENT PUBLICATIONS.*

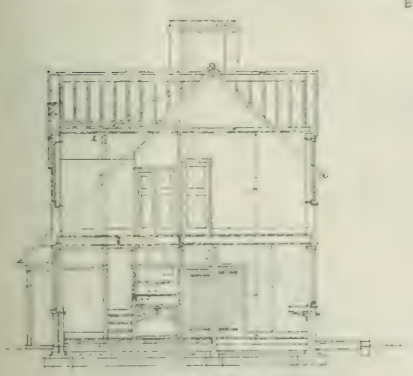
The Gambia: Its History, Ancient, Mediæval and Modern. By Henry Fenwick Reeve, C.M.G., M.Inst.C.E., F.R.G.S., F.A.S. Price 10s. 6d. nett. London: Smith, Elder & Co.

To the scanty literature of this deeply interesting colony—which, next to Newfoundland, is the oldest settlement in the world—Mr. Reeve has added a monograph of so lucid and exhaustive a character that it at once takes the field as the authority on the subject. The author writes with the object of awakening our Government and nation to the strategical value of the possession of a great harbour and waterway on the North-West African Coast, where such advantages are scarce, and to the intrinsic value of the practically unlimited deposits of iron ore in the cliffs overhanging the navigable channels. He deals—to some extent with the aid of such qualified observers as Dr. Hopkinson and Captain Stanley—with the history, geography, geology, ethnology, and natural history of the settlement, and gives translations from many ancient and mediæval authorities. The attraction and value of the work is materially enhanced by the thirty-two pages of half-tone illustrations and three maps which accompany it. Among them are a frontispiece portrait of Sir G. C. Denton, K.C.M.G., the Governor, who has just retired after years of most capable administration of the colony, and a portrait of the author himself.

**Lower Thames Valley District Surveyors' Association.**—The annual meeting and dinner of this body has been fixed to take place on Saturday, May 4th next.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

Back Elevation.



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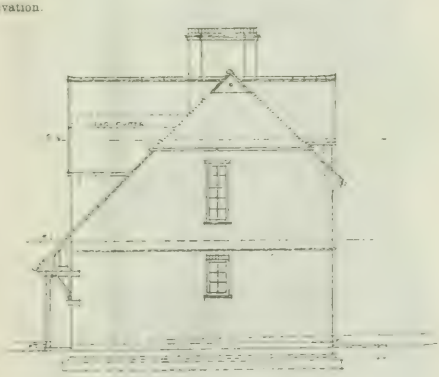

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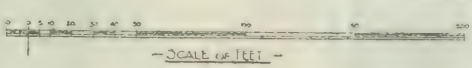


Proposed Workmen's Dwellings, Guildford: Design "B."

# Sewage Works and Street Gullies as Breeding Grounds of Mosquitoes.

By Dr. ELWIN H. T. NASH, D.P.H. (Vict.), Medical Officer of Health, Wimbledon.

The district for which I am responsible, in common with almost every district in the country, suffered during last summer from an unusual plague of "gnats." The common "gnat" is really a true mosquito of the Culex type (*Culex pipiens*), and although its bite is not known to carry any disease, it is extremely unpleasant to many people—myself among the number—raising large, hard bumps, which itch intolerably and which, in some cases, are a week or more before they disappear.

As a result of complaints which I received, I started to try and locate the breeding grounds with a view of exterminating the larvæ. The district contains a very large common, with three large ponds, two streams, and a considerable area of boggy land, but the last mentioned, except for the area immediately adjoining the streams, was quite dry on account of the prolonged drought. There is also, in another part of the district, a large lake with small streams running into it, and

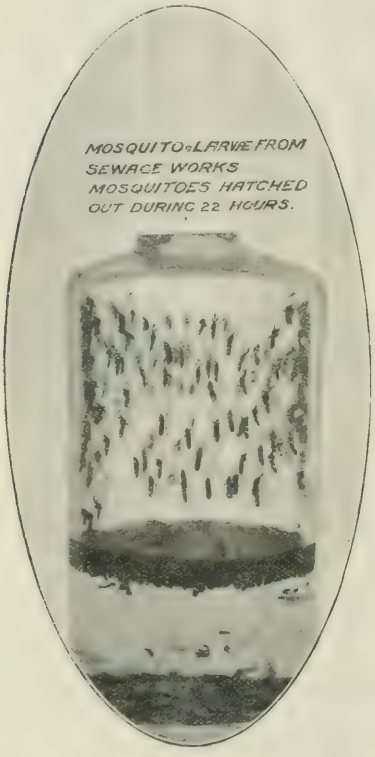


Fig. 1.

an overflow stream which runs away into the river. These ponds and the lake had been generally put down as the breeding grounds, and those who complained had generally suggested the kerosening of these waters. In order to satisfy those who complained, I made careful search in the ponds, streams, and bogs on the Common, and except for five larvæ under a low breeze over one of the brooks, I found nothing. The ponds were not the place to expect to find larvæ in, as they are large open spaces with clean banks and a constantly rippled surface. Search in the few stagnant ditches at the roadside revealed nothing.

Search on the lake revealed nothing at first, although the banks were swarming with mosquitoes and midges, especially the giant midge (*Chironomus plumosus*), which was the insect which had been the cause of some of the complaints from that district by people who thought it a malignant type of insect, whereas these Chironomidæ are quite harmless, although looking particularly formidable on the wing.

So far, the search had been most unsatisfactory, until I tackled the sewage works, where the final process is broad irrigation on four grass plots. I found that all the pools on the final plots were alive with larvæ and pupæ, and there were also a few in the

Fig. 2.

Larvæ and Pupæ of Culex Pipiens from Street Gully.

carriers. Fig. 1 shows a photograph of a dip, taken from a pool with a 4-oz. bottle, which has been decanted into a larger bottle. As will be seen, there is a solid mass of larvæ and pupæ. The photograph was taken twenty-two hours after capture, and shows very well both sexes of the *Culex pipiens*, which had hatched out in the interval.

As the sewage works are in an extreme corner of the district this did not account for the very general

Fig. 3.

distribution of the mosquitoes, and as it is generally agreed that they seldom stray far from the pool in which they were hatched, and that, generally speaking, their range of flight is limited to a quarter of a mile, it was obvious that there must be other considerable breeding grounds. Then it occurred to me

that the only constant standing water distributed through the town was to be found in the street gullies, as they would be kept filled by the constant watering necessitated by the hot weather.

I instructed a labourer to take samples from the gullies in four roads, two in the centre of the town and two near the Common. In each case one road was tar-dressed and the other was not, and the two roads in each case were next to and parallel to each other.

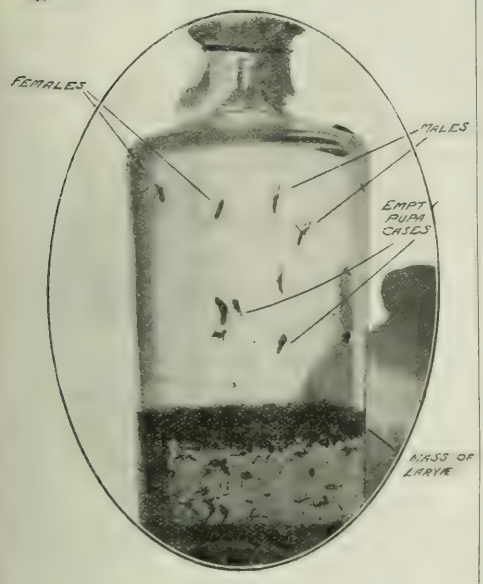


FIG. 4.

The tar-dressed road in each case was a main road, and the non-tar-dressed road was a secondary road.

Three samples of 4 oz. were taken from each road. Of the six taken in the centre of the town the results were:—

Tar-dressed Main Road:

No. 1.—Nil.

No. 2.—Nil.

No. 3.—This gully was next to a small public garden, and I subsequently found within a short distance two tubs alive with the larvæ of Culex and Chironomus.

At first nothing to be seen, but two days after there were swarms of newly hatched larvæ.

As I used the same funnel for decanting the specimens as for some of the others I cannot say whether I washed in a few of eggs that had come from another gully or not.

Non-Tar-dressed Secondary Road:

No. 1.—A large number of larvæ.

No. 2.—A large number of larvæ.

No. 3.—A very large number of small and some larger larvæ.

Of those taken near the Common the results were:—

Tar-dressed Main Road:

No. 1.—Nil.

No. 2.—Three larvæ.

No. 3.—Eight larvæ.

Non-Tar-dressed Secondary Road:

No. 1.—A considerable number of larvæ.

No. 2.—A considerable number of larvæ.

No. 3.—About fifty larvæ.

(All these specimens were taken on August 18th, previous to which there had not been rain for a long period.)

Thus, out of twelve gullies, nine, or 75 per cent. were acting as breeding grounds.

Fig. 2 is a photograph showing larvæ and pupæ taken from one of these gullies.

In order to ascertain whether a heavy fall of rain would wash the larvæ out of the gullies, I had a gully erected and surmounted by the usual grating, and two channels were constructed similar to the channels at the sides of the roads, and water was run into each of these at varying speeds after a large number of larvæ and pupæ had been placed in the previously filled gully. The gully had a 4-in. seal.

In the first test, water was run in at 18 gallons per hour for fifteen minutes. It was found that comparatively few larvæ came through, the majority of those that did being full-grown; no pupæ came through.

In the second test, water was run for twenty minutes at 24 gallons per hour, when one pupa and a few small larvæ came through together with a larger number of full-grown larvæ than in the previous test.

In the third test water was run in for twenty-five minutes at 48 gallons per hour, which was equal to half an inch of rain in twenty-four hours, and it was found that a few pupæ came through, but the larvæ came through in more equal and larger numbers.

At the conclusion of the test there were more larvæ left in the gully than came through. It was observed that the larvæ and pupæ collected in the quiet parts of the gully away from the sides where the water splashed in from the channels, as shown in the diagram.

Subsequently samples were taken from various gullies after two heavy rains. In the poorest part of the town, where there were practically no trees, no larvæ were found, but from the parts where there were plenty of trees the majority of the gullies contained a few larvæ or pupæ in the sample taken.

In one road not yet made up, with fields on either side, most of the gullies were swarming with larvæ. One open one had nothing in the specimen taken, but the grating over this gully was very hard to open, and when it was at last opened there was a cascade of stones into the water. The larvæ and pupæ are extremely active, and dive to the bottom at the least noise. Even a shadow across a pool will disturb them.

In two gullies in the road where there were frogs, no larvæ were found, nor were there any in the ones overgrown with grass. It is a well-known fact that mosquitoes will not lay in water they cannot see.

A set of gullies in which there were a very large number of larvæ were kerosened after samples had been taken, and a fresh set of samples taken next morning, but not a single live larva or pupa was found.

Several other breeding grounds were found in small private collections of water and water-butts, and an interesting experiment was furnished in our own depot, which adjoins a small public garden. Two

FIG. 5.
LARVÆ OF CHIRONOMIDÆ.

tubs were kept side by side full of water to keep them tight, and in one tar brushes had been put to keep the heads tight. Both tubs contained larvæ, but the untarred tub was swarming with larvæ and pupæ, whereas there were fewer in the tarry tub water. This quite explodes the idea which some authorities have put forward that tar is an efficient culicide. The fact being that tar *per se* is not a culicide, and the film produced on the surface of the water is not a continuous one like that of oil, but easily breaks up and allows breathing spaces for the larvæ.

I experimented with various larvicides, among others copper sulphate solution, which is so extensively used in waterworks, especially in the United States, the usual strength being one in a million; but

although this may kill the algæ, it is useless, even in fairly strong solutions, as a culicide.

I subsequently found, on investigation, that a neighbouring sewage works in which the final treatment was by grass plots and osier beds was simply alive in the quieter channels with the larvæ of *Culex pipiens*, and photograph No. 3 shows a 4-oz. dip with the number of mosquitoes which hatched out in twenty-two hours. It will be seen that the number that have hatched out is not so great as in the case of photograph No. 1, but the difference is due to the fact that whereas in photograph No. 1 the larvæ are practically all of the same age, in photograph No. 3 the lavæ will be seen to be of very different ages.

In addition to the *Culex pipiens* I discovered in one portion of the district the Norway mosquito, *Culex dorsalis*, which is particularly vicious in its biting habits, and whose breeding grounds in this country, I understand, have never yet been discovered.

The life history of the mosquito is as follows: The female lays its eggs, generally about 300 in number, in the form of a concave raft. The larvæ, as shown in the photograph, possess a large posterior horn, which is not a caudal appendage, but is their breathing apparatus, and, as will be seen in the photographs, the larvæ must come to the surface to breathe, and they lie suspended from the surface of the water with their breathing tube uppermost. The presence of larvæ can at once be seen on a pool if the light is sufficient, by the dimpling of the surface by their breathing tubes, and it is the fact that they must come to the surface to breathe which enables us to deal with them at once in collections of water which cannot be drained off, as a film of paraffin simply acts by suffocation. In the pupal state the breathing arrangements are entirely different, and breathing takes place from two lateral horns on the head. When the imago emerges from the pupal state it does so by gradually climbing out of the shell, which floats on the surface of the water, but if, before the mosquito is able to fly, this raft is capsized the mosquito is drowned, and thus it is that even if eggs are laid on a water surface exposed to the wind, so that ripples are formed, the chances of the mosquito surviving are extremely small. The two sexes are easily distinguishable, the males having well-developed plumes, and the female nothing but what appears to be a single proboscis. The two sexes are quite different in their habits, the males forming the large swarms, with which everyone is familiar, and which are seen over trees in the proximity of water. In themselves they are quite harmless. The female is a single-flying insect, and is the one which "bites." As a rule it is found that the males are produced in far larger numbers than the females, some authorities giving the proportion as about 7 to 1.

Other insects which are very often mistaken for mosquitoes are some of the smaller midges (Chironomidæ), which are also found in sewage works in enormous numbers, and their habits are very similar to those of the mosquito. The males are plumed in the same way as the mosquito, but in neither sex is there any form of proboscis as is found in the mosquito; and whereas the Culicididæ rest with their hind legs raised, the Chironomidæ rest with their fore legs raised. The life history of the Chironomidæ, however, differs considerably from that of the Culicidæ, in that the larval stage of the Chironomidæ is in the form of a thin, red worm, generally known as the blood-worm which lives in water and is generally found in the carriers where there is no stagnation. They remain, as a rule, at the bottom, living in a sort of honeycomb, which they make in the mud. They breathe in a different way, and are thus enabled to live entirely under the water. The pupal form can also be distinguished from the pupal form of the Culicidæ, in that it is narrower and longer, and possesses two white breathing tufts, one on each side of the thorax. In many cases, when the carriers have been run off, it will be found that the mud in the bottom is filled with the red larvæ of the Chironomidæ. These are also killed by drying off in the same way as the larvæ of the Culicidæ.

The method of dealing with the sewage works was by drying off the grass plots alternately every seven days, which was inside the life cycle of the mosquito. It was found that, except in a few pools which were left, all the larvæ were dead the next day, and after the pools had been attended to there were none alive twenty-eight hours after the water had been run off. The usual time taken from the hatching to the development of the imago is ten days, but in attempting to breed some mosquitoes in my office I have kept larvæ alive for twenty-eight days without any apparent growth.

As larvæ were present also in the main carriers unknown to me, although in comparatively small numbers, paraffin was run continuously from a can into the effluent as it came from the tanks. Owing to the current and the eddies this was apparently insufficient to kill the larvæ, but it was followed within a few days by the appearance of sewage fungus in the carrier of the final effluent, the presence of which had never before been known. On hearing of this I immediately had the paraffin stopped, and after the bed had been dried off and aërated, the sewage fungus was not seen again. The explanation seems to be that the paraffin formed a sufficient film over the last grass plot to interfere materially with the aëration.

Before finally deciding on the seven-day periods, careful watch was kept on a plot on which sewage was run from the first day, and it was decided to dry off directly we found any pupæ, as the pupal stage generally only lasts for two days. In this case we found pupæ on the eighth day.

The seven-day alternation is sufficient in dry weather to dry and aërate the ground.

One of the important points arising out of these observations is the nuisance sewage works may create in populous districts, and to a lesser degree, street gullies, rain-water tubs, and small private ponds. As far as sewage works are concerned the remedy, as shown, is absolutely simple, it being only necessary to dry off the plots every seven days, or to see that no pools are allowed to remain undried for more than a week. In the matter of private ponds the difficulty can be got over by keeping fish, more particularly goldfish, and in the case of the street gullies the addition of a little paraffin is all that is required. These facts also bring up another question, and that is the power to deal with ponds, water-butts, and so forth, which contain larvæ, or, in fact, any accumulation of water which may be a breeding ground, and I contend that they can be dealt with under the Public Health Act as a "nuisance," and that anyone who refuses to deal with their private collections of water by not stocking them with fish and keeping the banks free from weeds can be compelled either to paraffin them or dry them off if it can be proved that they are acting as breeding grounds for mosquitoes.

## THE PIKETTY REINFORCED CONCRETE SYSTEM.

Offices have been opened at 14-18 Bloomsbury-street, London, W.C., by Messrs. Paul Piketty & Co., for the exploitation of that firm's system of reinforced concrete. They are equipped to render expert services to architects, engineers and surveyors upon all matters appertaining to reinforced concrete. Tenders for the construction of "Piketty" reinforced concrete structures are submitted by their British licensed contractors.

The "Piketty" system is somewhat similar to the Hennebique system, differing only in the disposition and form of the members that resist shearing stresses. Messrs. Piketty & Co. use round steel for stirrups, which are locked to the upper horizontal reinforcement. The system was introduced some twelve years ago by Mr. Paul Piketty, civil engineer and public works contractor, of Paris, in quite a modest way; to-day it is one of the largest reinforced concrete systems used in Europe.

Great care is exercised in the calculation and preparation of designs and working drawings. The extensive technical staff is cleverly departmentalised, so as to produce its work efficiently and with dispatch. Messrs. Piketty make a point of only acting through architects, engineers and surveyors, and do not undertake commissions direct with building owners or local authorities. Thus, as a private firm they become responsible for their work to their licensed contractors, who in turn are responsible to the building owner and his technical adviser.

The firm have in the press a large hand-book, fully describing and illustrating the Piketty system, together with photographs of various types of works carried out, and copies may be had on application.

Mr. R. H. Neal, Assoc.M.Inst.C.E., M.I.M.E., who has had considerable practical experience of reinforced concrete in the United Kingdom, is associated with Mr. Piketty, and has taken over the general management of the British business, which is quite distinct from the Parisian house.

## WATER SUPPLY FROM UPLAND DRAINAGE AREAS.

### PROF. RADCLIFFE'S INVESTIGATIONS.

A valuable paper, dealing with the subject of water supply from upland drainage areas, was presented to the Provincial Sessional Meeting of the Royal Sanitary Institute, held at Manchester on Friday last, by Prof. J. Radcliffe, of the Manchester School of Technology. Last year's drought, which will be in the recollection of everyone, will bring clearly to the minds of those responsible for the nation's supply the necessity for the acquisition of accurate knowledge of the quantity of water available. Existing statistics may answer their purpose in ordinary seasons, owing to the margin of safety allowed; but exceptional stress calls for exceptional methods, and rules of thumb (even quasi-scientific rules of thumb) must go by the board.

The exact quantity of water available in the various districts of the country must be ascertained; and we agree with Prof. Radcliffe that "in the past too much reliance has been placed upon unsupported rainfall records, which have been frequently taken as the only data upon which to estimate the volume of water available for general purposes, and for compensation to owners of land and buildings on the banks of streams from which the water was to be extracted."

"All who have been interested in rainfall measurements," he continues, "know the difficulties attending the work to secure accuracy. The difference in the reading of gauges within a short distance (horizontally and vertically) is sufficient to indicate possible errors in the final calculations relating to the available quantity. Many large and small watersheds are entirely without gauges, in others a small number have been installed; but in almost all cases the gauges are entrusted to men without interest in the work of observation. The value of water from the sources referred to is increasing; it is therefore desirable that an improved method of recording the quantity available should be generally adopted, and that the statutory obligations regarding the flow of compensation water to the streams should be such as will be more equitable to all concerned than is the case at present. The difficulties arise in connection with the efforts to obtain accurate information regarding the rainfall, and in fixing the exact amount of loss that occurs on all watersheds. Interested parties look at the matter from their own standpoint, and the information obtained is not available for general use. If the observations were conducted by the Ordnance Survey, or other department of the State, a valuable improvement on the present system would be effected, a considerable amount of litigation would be prevented, and a uniform procedure could be employed for comparison throughout the country."

Since 1888 the author has conducted a series of investigations with the object of classifying watersheds, and of finding a constant (C), which would be suitable for each of the divisions under which the areas might be placed, so that the mean annual rainfall in inches of any district, multiplied by C, would show the depth in inches of rain per annum, which the areas might be expected to yield for water supply purposes. Briefly, the following classification has been used: (1) Watersheds with hilly and broken surfaces of exposed and almost impervious rock faces, or with a very small thickness of soil and vegetation. (2) Watersheds of a less hilly nature, though very uneven in character, the surfaces covered with a considerable thickness of decomposed rock and decayed vegetable matter. (3) Watersheds with more regular surfaces, but with a large part of the area covered by thick beds of peat. (4) Watersheds of slight inclination covered by a fair thickness of soil on which rough grass grows. (5) Watersheds situate on practically impervious beds. (6) Watersheds situate on porous or very broken materials. (7) Combinations of the foregoing. That the work has presented "many difficulties of an interesting and practical character" one can well understand.

#### COMPUTATION OF AVAILABLE SUPPLY.

Prof. Radcliffe then proceeds to deal with the many causes which either singly or in combination tend towards the production of error in the computation of available supply. These we must summarise in brief manner, with the earnest recommendation to all interested to obtain a copy of the full paper. The air over a gathering ground is never evenly charged with moisture; hence there is much variation in fall, and a large number of gauges is required if error is to be avoided. Again, owing to the discharge of spring water into streams, it cannot be accepted that all the water of such streams flowing from the surface has fallen upon the contributing watershed. He instanced the case of a spring, with an almost regular flow, discharging some 3,000 gallons per hour near the high part of a watershed, and another case where there were no less than twenty-nine known springs, the waters from which, by their varying amount of temporary and permanent hardness, were evidently from different sources, some of them having possibly travelled long distances. Necessarily, "if there is an increase on one watershed from an underground supply, there must be a corresponding decrease on another collecting area." Coming now to the important question of the loss by percolation, the professor proceeds as follows:—

"The loss by percolation is of a varying character; but few watersheds are free from faults, even if they rest upon a so-called impervious stratum. If the drainage area contains the outcrop of previous beds, the loss of water may be considerable. The amount of percolation may be increased when water is raised by pumping at a low level from the rocks into which it has passed by percolation. In many cases the fissures of the rocks in a valley are charged with water under pressure, which cannot escape because of the impervious beds with which they are covered. The fissure may be quite full of water, and therefore make no demand upon the watersheds from which they are supplied, but immediately pumping takes place at a lower level, or the fissures are tapped in some other way, the loss on the watersheds by percolation is increased, and the value of the streams on the surface of the ground is often seriously reduced. Water may in the same way pass freely from one watershed to another, but no rule can be laid down for the purpose of ascertaining the quantity, as the local conditions vary enormously."

The loss due to absorption by vegetable matter next engages his attention, and this, although appreciable, is of a fairly regular character. That from evaporation is a much more difficult thing to determine. Experiments in this direction have so far given us little information of a reliable character, so many causes operating in various ways. The point of saturation of the air, the dryness or otherwise of prevailing winds, the velocity of these winds, sunshine figures and temperature variations—these, and many others, are factors in determining the allowance to be made for evaporation; while it is of the utmost importance to remember that if the character of the surface of the ground is such as to hold water in a way that will expose it to the evaporative power of the air, then the loss from the watershed is greater than in districts where the rain flows quickly from the ground to the stream. As regards evaporation from the surface of reservoirs, which varies as local conditions vary, we cannot do better than quote direct from the paper.

"There is a great difference in the annual records where observations have been made, and though an average rate of evaporation per annum may be obtained from long observation in any position, it can only be used to give the approximate amount of loss for the particular district to which the records apply. The position of the reservoir, the extent of exposure to the prevailing winds (especially the dry winds), the depth of the water, the tendency to form waves on the surface, and their sizes, the amount of sunshine, the variations of temperature, and the degree of saturation and movements of the air in contact with the water, are all irregular influences that cannot be disregarded when dealing with this matter. The practice of deducting the area of the reservoir from the area of the watershed is a rule-of-thumb method, but it is the best thing to do in the absence of accurate information. It implies that the rate of evaporation from water surfaces is equal to the rainfall of any particular district."

It is regrettable to have to note here that, owing to the constant alterations of the conditions existing on watersheds, and the important bearing which those conditions have in regard to the determination of the quantity of water available, the author has so far found it impossible to fix the value of C (as mentioned in the early part of the paper). He therefore recommends water-supplying authorities to adopt a method which would give definite results, pointing out what is patent—*viz.*, that the value of a watershed is its yielding capacity, and not the fall of rain upon

the area, though that is, of course, an important factor in the first instance.

SOME RECOMMENDATIONS.

As some assistance towards uniformity in the adoption of a method, he sets forth briefly what should be done:—

"Provision should be made carefully to measure all water drawn from the reservoirs for water supply purposes, either by accurately formed gauges or meters, each fitted with automatic recording appliances. The information obtained might be used for several purposes, including the indication of the night flow, which in many cases would show the approximate amount of waste in the area of supply; but the principal point would be to indicate the quantity of water taken from the stream. The diagrams would be valuable evidence during the consideration of questions relating to the water supply of a district. A gauge should be placed upon the stream immediately below the lowest point of the impounding works, so that all water flowing from the drainage area (including the reservoir) to the stream may pass through the gauge, and be recorded by automatic appliances, so that a permanent register may be kept of that part of the water which is not used by the water-supplying authority for ordinary purposes. The gauge should be of a character which will accurately measure the volume of compensation water, and also that which flows down the stream during times of flood when the reservoirs are full. By the combined arrangements the actual volume of water available may be determined, and the percentage of rainfall lost from various causes on the watershed would be clearly shown from year to year."

Additional gauges might, too, be required above the impounding reservoir to measure the dry-weather flow from the catchment area; but all gauges should, he holds, be fitted with automatic recording appliances, so that the uneven character of the flow of the stream may be taken into account. Many water-supplying authorities and riparian owners are suffering under the injustice of the present method for fixing by Act of Parliament the volume of compensation water to streams upon which impounding reservoirs have been constructed. A more equitable system could, he says, be based upon direct observations of the kind he suggests. Provision could be made in the Acts of Parliament for fixing the proportion of the available quantity of water from a watershed for compensation purposes—the volume to be ascertained by stream and other gaugings of a reliable character; while an approximate estimate could be formed in the first instance, and at the end of each ten years (or other period) a readjustment based upon the result of the observations should take place. The result would, he contends, be fair to all concerned and correct many of the errors now existing.

DISCUSSION OF PROF. RADCLIFFE'S PAPER.

Dr. Meredith Young, county medical officer of Cheshire, moved a vote of thanks to Prof. Radcliffe for his paper.

Mr. T. de Courcy Meade (city engineer, Manchester) said that he had been much struck by the results Prof. Radcliffe gave of the observations made over many years, and particularly with those relating to evaporation. As regards the case of water in an impounded lake or reservoir, he had found from his own observations that the action of the wind would materially alter its level, and observations confined to one spot would be found considerably to vary. He had much pleasure in supporting the vote of thanks.

Mr. James Watson (waterworks engineer, Bradford) announced his intention to refrain from quoting other men, and what he said would be based on his own observations. He agreed with many of the points in the paper, but he would have liked the author to carry his demonstrations a little further and to tell them how to obtain greater accuracy. He did not agree that the rainfall of England and Scotland had not been very fairly ascertained. There were many thousand gauges in use, and measurements were not made by incompetent men, but by those who knew what they were about. The author's methods would be most interesting were they financially possible. Reasonable accuracy was now obtained over large areas, and although there was much food for reflection in the paper, he would like to know what better methods could be adopted than those that had been in use for so long.

Mr. C. G. Henzell (waterworks engineer, Leeds) said that economy was a prime factor in water supply, as in other matters. It was not necessarily what a town wanted, but what it could get. In the construction of large reservoirs there was always an outcry against the expense, and the amount of storage capacity had to be cut down if schemes were to go ahead. Most towns now sought to obtain possession of drainage areas, and that meant a great expenditure. Where areas were not held, sporting tenants, owners and farmers were prone to cut open drains on the moors, and this was a serious matter, as the rainfall was not absorbed for dry seasons, but ran straight off, and it was found that the water going through the overflow was much increased. Afforestation did not increase the rainfall, but it equalised the flow over the drainage area, which was most important when one came to deal with large areas. As regards the height of rain gauges above ground, he had found that those placed 1 ft. above gave the truest mean of all.

Mr. Joseph Corbett (Salford) gave out as his chief suggestion that a methodical survey should be made of the water supply of the country. Other speakers appeared to have overlooked this, but there was a serious time coming, and it was necessary to know how the country could be kept going in the future. This was to be done only by proper recording—by the Ordnance Survey or other department. He noticed that in America Governments did much good work in this way, and he instanced that done in Massachusetts. They would have to go to America to learn how to look after their water supplies.

The Chairman (Mr. H. Percy Boulnois), in closing the discussion, said that engineers always welcomed a paper from a scientist, and endeavoured to carry out the suggestions made. With regard to Prof. Radcliffe's "C," he was afraid it would never be achieved. One had to take evaporation and percolation, and as regards neither of these was the professor on certain ground. Then there were vegetation, degree of rainfall, and springs—the last-named hidden everywhere. The matter bristled with difficulties. They were, however, exceedingly indebted to the author, for the paper was one that set them thinking.

## CORRESPONDENCE.

*"All truth is precious, if not all divine."*—Cowper.

### CHEMISTRY AND ROAD ENGINEERING.

*To the Editor of* The Surveyor.

Sir,—I have read with much interest, in your issue of the 8th inst., Prévost Hubbard's address to the American Association for the Advancement of Science, and although I agree that chemistry is of much assistance to engineers, I do not see that the successful construction of a bitumen road rests solely with either chemists or engineers, or both. What of the manufacturer who is considered of so little importance that he is not mentioned in the address? Is the experience and knowledge of one who has probably carried out a great amount of experimental and laboratory work to be treated as of no consequence?

I contend that to be an authority on bitumen it is necessary to have considerable experience in the manufacture or handling of it, and I fail to see why anyone who puts the results of his labours on the market should be so entirely ignored; and it cannot be denied that if a manufacturer is handling various bitumens day after day he must necessarily get more valuable knowledge as to their behaviour and so forth than can be obtained in any other way.

At the same time, the manufacture of bitumen for road or any other purposes cannot be carried on without chemistry; but the suitability of any certain bitumen can never be decided by analysis alone. Some materials contain a much higher percentage of bitumen than others, but that is no proof that they are more satisfactory; in fact, it is the mineral matter that is the most important part of certain bitumens. Further, a mixture of, say, two classes of bitumen can be made so as to imitate the analysis of a third; and I venture to say that a chemist who has not made a study of the subject—and this cannot be done in a year or two—will be entirely deceived and cannot ascertain by analysis what bitumens are contained in some compositions. I know of many instances of this kind, and also, on the other hand, where a thoroughly practical man who, knowing the characteristics of different kinds of bitumen, has been able at once to distinguish the component parts of a composition. Yours, &c.,

"Manufacturer."

March 12, 1912.

# Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

*All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

## THE MONTHLY PREMIUM.

Mr. S. J. HARPUR, to whom the premium for February was awarded, has selected the following books, which have been duly forwarded to him: –

"Practical Road Engineering," by H. P. Boulnois.
"Town Scavenging," by Watson.
"Notes on the Law of Private Street Works," by J. B. R. Conder.
"Municipal Engineering," edited by S. G. Turner.
"Drainage Work," by Maxwell.
"Sewer and Drain Cases," by Conder.
"Computation of Area," by Gray.

The above are all published by the St. Bride's Press, Limited; and Mr. Harpur's selection affords an example of the excellent way in which the premium may be applied in the purchase of several small volumes, rather than one or two more expensive ones, as is usually done.

## QUESTIONS.

This week answers are invited to the following questions:—

**227. Refuse Disposal.**—Describe, with illustrations, the most efficient and economical form of refuse destructor for a village of 500 inhabitants. (M.Inst.Mun. and C.E., *Seconder.*)

**230. Refuse Sorting.**—Describe, with sketches, a device for the mechanical sorting of house refuse.

**232. Books for Examination.**—What are the *best* and *cheapest* books to get for studying for the A.M.I.C.E. examination in the following subjects: Geography, history, literature, mechanics, strength and elasticity of materials, theory of structures, hydraulics, geology and mineralogy? ("Institute.")

**233. Tramways.**—Sketch a "turn out" or "passing place" on a single line of tramway; figure the leading dimensions, the angle of the crossings, and describe the length, position, and character of the "points" required for diverting the traffic. (M. and C.E.)

**234. Pumping Station.**—Sketch and describe a small pumping station capable of lifting 100,000 gallons of water from a bore-hole in the rock and delivering through a rising main 500 yds. long into a reservoir, the total vertical lift being 100 ft. After working out the theoretical horse power required, state the brake horse power and type of engine you recommend, and give your reasons. (M. and C.E.)

### NOTES.

*Apropos* of Question 232, a correspondent writes testifying to the great assistance he has received in his examination studies from Prof. Jamieson's well-known work on "Applied Mechanics and Mechanical Engineering." He points especially to the value of the worked examples, and instances the following illustrations which are given in Lecture XI. of vol. I. on Newton's laws of motion:—

*Example I.* (p. 258).—Of two steam hammers, one weighs 5 tons and the other 10 tons. The former has a drop of 10 ft. and the latter 6 ft. Compare their momenta at the end of their respective strokes.

*Answer.*—In order to find their velocities at the moment of impact, we may employ the formula –

$$v^2 = 2gs$$

$\therefore$ for the first hammer

$$v_1 = \sqrt{2 \times 32 \times 10} = 8\sqrt{10} \text{ ft. per second,}$$

and for the second hammer

$$v_2 = \sqrt{2 \cdot 32 \times 6} = 8\sqrt{6} \text{ ft. per second.}$$

$$\therefore \frac{\text{momentum of first hammer}}{\text{momentum of second hammer}} = \frac{m_1 v_1}{m_2 v_2} = \frac{5 \times 8\sqrt{10}}{10 \times 8\sqrt{6}} = \frac{\sqrt{5}}{2\sqrt{3}} = \frac{1}{1\cdot549} \text{ Answer.}$$

*Example II.* (p. 261).—A 40-lb. shot is fired from a 5-ton gun with an initial velocity of 1,500 ft. per second. Find the velocity of the gun's recoil, and the mean force of the explosion, supposing the gun to be 10 ft. long.

*Answer*—

Let W, $w$ = weight of gun and shot respectively
" V, $v$ = velocity " " "

(1) By the third law of motion

momentum of gun = momentum of shot

$$\therefore W V = w v$$

$$\therefore 5 \cdot 2{,}240 \cdot V = 40 \times 1{,}500$$

$$\therefore V = \frac{40 \times 1{,}500}{5 \times 2{,}240}$$

$$= 5\cdot36 \text{ ft. per second} - \text{Answer.}$$

(2) In order to find the mean effort exerted during the explosion of the powder, we must first determine the acceleration of the shot along the muzzle of the gun. Since the gun is 10 ft. long, and the velocity of the shot as it leaves the gun is 1,500 ft. per second, we get from the formula –

$$v^2 = 2as$$

$$\therefore (1{,}500)^2 = 2 \cdot a \cdot 10$$

$$\therefore a = \frac{(1{,}500)^2}{20}$$

$$= 112{,}500 \text{ ft. per second per second.}$$

But, $P = \frac{w}{g} \cdot a$

$$\therefore P = \frac{40}{32} \times 112{,}500$$

$$= 140{,}625 \text{ lb.} - \text{Answer.}$$

*Example III.* (p. 262).—A railway train, exclusive of engine, weighs 200 tons, and moves on a level line. In ten minutes its speed is increased from 10 miles per hour to 40 miles per hour. Determine the mean pull between the engine and train, the frictional resistances being taken at 10 lb. per ton.

*Answer.*—The pull between the engine and train consists of two parts: (1) the force required to accelerate the train, and (2) the force required to overcome the frictional resistances.

(1) Let $P_1$ = force required to accelerate the train.

Then $P_1 = \frac{wa}{g}$

$$= \frac{w(v_2 - v_1)}{gt}$$

But $v_1$ = 10 miles per hour = $\frac{44}{3}$ ft. per second,

and $v_2$ = 40 " " = $\frac{176}{3}$ " "

and $t$ = 10 minutes = 600 seconds.

$$\therefore P_1 = \frac{200 \times 2{,}240 \times \left(\frac{176}{3} - \frac{44}{3}\right)}{32 \cdot 600}$$

$$= 1026\cdot6 \text{ lb.}$$

(2) The resistance of friction being 10 lb. per ton, the total frictional resistance =

$$P_2 = 200 \times 10$$

$$= 2{,}000 \text{ lb.}$$

mean pull between engine and train

$$= P_1 + P_2$$

$$= 1026\cdot6 + 2000$$

$$= 3026\cdot6 \text{ lb.} - \text{Answer.}$$

**Illegally Repairing a Drain.**—At the Highgate Petty Sessions recently an owner was summoned for repairing, without giving notice to the Finchley Urban District Council, a drain communicating with the council's sewer. It was stated for the prosecution that sec. 43 of the Finchley Council's Act of 1908 provided that twelve hours' notice should be given by the owner to the council before opening a drain leading to the main sewer, and the penalty was a sum not exceeding £5. Defendant was fined 10s. and costs.

## TOWN PLANNING AND THE REDEVELOPMENT OF SUBURBAN AREAS.

### SALFORD BUILDING SURVEYOR'S INTERESTING PAPER.

Many papers have been written of late upon the Housing and Town Planning Act. Most of them have dealt with the Act in a general way, criticising its various provisions, and setting forth in more or less condensed form the procedure it is necessary to follow in its application. These papers—and we would particularise those presented by Mr. Louis Carr to a meeting of the Institution of Municipal and County Engineers, and by Mr. F. W. Platt to a meeting of the Institution of Municipal Engineers—have been eminently helpful; and they have served their purpose, too, in proving to the faint-hearted that the most intricate Act becomes relatively simple in its application if only its provisions are subjected to capable investigation. The particular application of the Act is, however, another matter, and we welcome the paper read by Mr. F. W. Platt, building surveyor to the Salford Corporation, at a Provincial Sessional meeting of the Royal Sanitary Institute, held at Manchester on Friday last, as the forerunner of many of its kind.

Mr. Platt's paper concerned itself with the application of the Act to "the redevelopment of suburban areas now in process of transition," and it will readily be recognised that there is all the difference between the application of the Act to such areas and to areas of a comparatively virgin nature. As Mr. Platt points out, the growth of towns in England and South Wales since the passing of the Act of 1875—we scarcely see the reason for the limitations—has been sporadic rather than predetermined. That certain landowners have "attempted to create and maintain desirable areas" does not alter the fact, for, to quote from the paper:

"These efforts of the landowners were only temporarily successful, for other owners, whose main desire was to benefit by the increment earned by others, had land adjoining these 'oases.' These latter men observed and noted the desirability and distinctive features possessed by these well-planned areas, and, without any regard for increasing or even for maintaining the amenities thereof, developed their lands so as to obtain all the advantages furnished by or inherent to such oases. They built houses of an inferior quality and size, which subsequently were rapidly graded down to the poorest type of dwelling, all as closely packed together as the law permitted. For a time the effect of such development was not felt, but as 'tenant owners' died or found their arboreal efforts fruitless, the houses became empty and the district assumed a derelict, faded appearance. To such an area at the final stage of its decay the town planning sections do not afford much relief. But there are many areas on the outer fringes of our large and even small towns that have not reached this stage, but are only in the initial stage of transition. To them the town planning clauses are most useful."

#### AVAILABLE POWERS.

Out of this sporadic growth, says Mr. Platt, a state of quasi-unity has been evolved—a unity heterogeneous rather than homogeneous, but still sufficiently a unity to allow of a town having its distinctive business, social, manufacturing, and residential centres. Can these heterogeneous units then be so co-ordinated by means of the Act as to redevelop the town and make of it "a corporate entity in which the arts, manufactures, religious life, science and amenities of modern civic life can be enjoyed"? Mr. Platt is of the opinion that they can, and he sets forth the various powers which the Act gives to that end, quoting sec. 54, sub-sections 1, 3 and 7; sec. 55, sub-section 2; and sec. 56, 5th schedule (5). The purpose of his paper is then definitely announced in the following words:

"The purpose of this paper is to discuss how far these provisions can be applied to suburban areas now partly built upon with the roads formed, the character of the buildings upon such roads, and the general laying out of such areas as are now changing by reason of external influences. The subject might be discussed under two heads: (1) That of the general lay out, which might come under the definition of convenience, (2) the maintaining of a standard of superior building, or a grading from that to a type which would be more synthetical to than antithetical of the superior dwelling, and the limiting of the number of buildings to the acre, as well as the regulating of the height and character of such buildings, would come under the heading of amenity. These two being secured, and the fact that the main roads would be already formed, paved and sewered, the definition 'sanitary conditions' would be a complement to them. How, then, can convenience be secured in the redevelopment of an area?"

Until quite recent years, business men, according to Mr. Platt, did not live more than 3 miles from the centre of a town. Various causes have operated to increase this distance, and areas within this 3-mile limit, which were covered with fine houses, having large, well-timbered gardens, have been thrown into the hands of speculative builders, whose only desire has been to put as many houses upon the ground as the building by-laws will allow. The emigration of the better classes has kept pace with this extension of "undesirable" areas, and until the passing of the Act of 1909 local authorities were powerless to cope with the situation.

"The difficulty is now removed. A local authority can note these changes—which are always gradual, but sometimes possible to arrest or at least to mitigate. They may then cause to be prepared for their use provisional maps to enable them to study how best to link together these suburban areas, which sometimes can readily be done by the planning of connecting roads, which could be formed as the areas are redeveloped on the removal of the largest houses. When the moment is opportune for preparing a scheme, an application could be made to the Local Government Board for permission to include these lands, for which plans have been prepared, in the scheme. The provisional map could have indicated upon it the suggested alterations to each area. . . . New roads of the residential rather than traffic type could be designed, whose purpose would be to form communicating links between the respective residential portions of the area and to other similar areas; and they could be so planned and formed as to preserve any natural features of beauty in the land through which they are intended to pass. If this were done, the emigration would be retarded, if not prevented, and a generation, lower in the social scale, but none the less good citizens, would be encouraged to inhabit these districts. The organised planning and co-ordination of interests would preserve all that was desirable and produce a coherent scheme."

#### POINTS FOR LOCAL AUTHORITIES.

In preparing a scheme of this kind, the following are, according to Mr. Platt, the main objects that the local authority should keep in mind: (1) The economic readjustment of the town; (2) the social effect of the proposals; and (3) the supplementing of the existing scheme of traffic facilities in the adjoining areas; and with all these he deals at more or less length. As regards the social side of the question, we are not quite in agreement with him, for we cannot concede either that "in the districts where the modern town planning system has been followed in the laying out thereof the intellectual life is highest, notwithstanding that the area is not exclusively occupied by the leisured classes, but is graded from the artisan to the professional type, [or that] this improvement is felt in its radiating influences on the surrounding districts and emulation fostered thereby." We should require a new definition of the word "intellectual" first. As regards the details of redevelopment, Mr. Platt wisely attempts to lay down no rules. Each scheme must, he holds, have special consideration, and his paper is modestly presented merely as affording "some guidance in determining what should form the subject of consideration." It is not, he adds, "the work of a single mind to carry out any scheme; expert assistance is needed from men and women in every walk of life"; and Mr. Platt himself has been happily one of the first to come forward and contribute his quota to the requisite stock of this expert assistance.

### DISCUSSION OF MR. PLATT'S PAPER.

Dr. Meredith Young (county medical officer of Cheshire), in moving a vote of thanks to Mr. Platt, said he had much fault to find with town planning enthusiasts, and more especially with those of the type of Prof. Patrick Geddes. These enthusiasts went back into history in order to dig out schemes which were never town planning schemes at all. The circumstances surrounding the growth of many of the cities they referred to were largely fortuitous. With the speculative builders, too, who laid out so-called garden cities he had a quarrel. They simply acquired a site, ran up a few showy villas, arrogated to themselves the use of the term "garden city," and

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then waited for custom to come along. He would advise those present to inspect the whole area of the proposed city, and carefully to study the conditions before considering a tenancy. There were in his county several schemes being promoted by county boroughs and urban districts. He had attended many conferences in regard to these schemes, and had noticed that the surrounding rural councils always feared that the inclusion of their area was designed. Rural bodies could counter any such proposals by insisting on a joint committee being formed under the Act. Then if, in time to come, the borough or urban district claimed the rural district, the latter could say "No. You have not done all this. It has been the work of the Joint Committee," and the independence of the rural district would be preserved. As regards the preparation of schemes, the architect must not be allowed to have too much of his own way. Economy was necessary in every scheme, and architects were not economical. The surveyor should lay out and plan sites, and the architect stick to his last and plan buildings only.

Mr. J. T. Alexander (city building surveyor, Liverpool) welcomed the coming into being of the Act. It was a live measure, and they must do their best to keep it so. It was most essential that the inhabitants of every town should form a society of public-spirited persons to keep an eye upon the development of the town and its suburbs. Edinburgh was a case in point, for in this beautiful city such a society had been in existence for upwards of eighty years. Under sec. 55 of the Act power was given for the suspension of by-laws for the proper carrying out of the scheme, and he was a strong advocate for this in the case of garden cities and suburbs where the houses were restricted to a reasonable number to the acre. He would refer also to the dreadful state of chaos and ugliness which prevailed, often for years, during transition periods in the development of estates, and he asked whether this should be permitted to continue.

Mr. Joseph Corbett (Salford) said that they were on the eve of a great improvement in the growth of towns, so far as the action of the public went. An opportunity had now been offered, for the first time, for hitherto all had been left to individual effort. In sanitation and allied matters, too, the public were taking great interest, and he hoped that they would keep their grasp upon these essentials of a healthy life. Future legislation would undoubtedly supplement this grand Act.

The Chairman, Mr. H. Percy Boulnois (Westminster), in closing the discussion, expressed his fear that town planning legislation, although it had a future, had come rather late in the day for this country. For a new country it could be of the greatest importance, as, for example, in the reconstruction of Delhi. The large landowners of this country and he would instance the Duke of Devonshire at Eastbourne—had done well in laying out their estates. The small landowners, on the contrary, had only too often ruined a town, and Yarmouth was a case in point.

## THE ROAD BOARD PERSONNEL.

### 4.—LORD PIRRIE.

Several pages of this journal would be required to do anything approaching justice to the remarkable career of Lord Pirrie, P.C., K.P., LL.D., D.SC., who is one of the members of the Road Board, and the brief sketch which follows indicates only very feebly the nature and extent of his achievements since the time when he entered the celebrated Queen's Island establishment of Messrs. Harland & Wolff at Belfast, with the history of which his name has now become inseparably associated. In 1874 Mr. W. J. Pirrie was admitted as a partner in the great shipbuilding firm of which he is now chairman. He was then only twenty-seven years of age, but the thoroughness of his work, and the very evident natural talent of which he was the possessor, had marked him out for special recognition, and Sir Edward Harland himself stated that it was owing to Mr. Pirrie's "character, perseverance, and ability" that he was taken into partnership. It has been remarked with truth that one phase

Lord Pirrie.

of his career as a shipbuilder is unique—namely, the method adopted by him of studying naval construction and the equipment of vessels for various trades, not merely in the office or at the building berth, but upon the ocean itself. He has made voyages for the purpose of this sort of technical education and experience on all the great seas of the world since 1872, and the results of his careful observations have been seen from time to time in important improvements, which have amounted to nothing less than epoch-making departures in the plan and fittings of modern passenger steamships.

When consideration is given to all that he has done at Queen's Island, it is surprising that Lord Pirrie should have been able to find any time at all for other activities; yet he has done so, and the record of his public services is not less a record of brilliant and purposeful work than that of his professional labours. He entered the Belfast Corporation in 1893, and in the same year was elected to the Harbour Board, being raised to the Aldermanic Bench only a few months afterwards. He became Mayor of Belfast in 1895, and in 1898 was presented with the Freedom of the City—the first occasion of the bestowal of such an honour in the history of the municipality—as a mark of appreciation of his services as chief magistrate.

Lord Pirrie, who was born at Quebec in 1847, is a member of the Viceregal Commission on Irish Railways, and of Lloyds' Register of Shipping; also of the Institute of Naval Architects and the Institutions of Civil and Mechanical Engineers.

A rumour of the impending retirement of Lord Pirrie from the chairmanship of the firm of Harland & Wolff was current during the week, but inquiries have elicited no confirmation of the report.

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Birkenhead T.C.** (March 6th. Mr. P. M. Crosthwaite). £32,253 for the purposes of extending the town's gas undertaking. The corporation propose to erect gasholders for storage purposes and two cottages on land in the north end of the borough. A Provisional Order to borrow £114,000 for the extension has already been granted, and of this sum £30,000 has been applied, a further sum of £32,253 now being required. Alderman J. H. M'Gaul, chairman of the Gas Committee, said it was absolutely necessary that the holders should be erected, as many houses had been built in the neighbourhood, while others were contemplated.

**Birmingham T.C.** (March 7th. Mr. R. H. Bicknell). £450 for the diversion of a sewer at Hay Mill. The town clerk (Mr. E. V. Hiley) explained that the application was made by the Yardley Council in October last year. In November the district was taken over by Birmingham, and the city council had since passed a resolution renewing the application. There was no outstanding debt in regard to the sewer. Mr. C. E. Lawton, formerly surveyor to the Yardley Council, produced plans of the proposed works.

**Burnley T.C.** (March 5th. Mr. Edgar Dudley).—£3,800 for the purchase of property for the widening of St. James-street and Accrington-road, Burnley.—The town clerk, Mr. P. Thomas, stated that the property to be purchased in St. James-street would cost £3,300. It was the main thoroughfare in the town, running through it from Blackburn and Accrington to Nelson and Colne. In the street was a main line of tramway, and at the particular point opposite the property in question it was reduced from a double line to a single one. The width of the street at the point referred to varied from 42½ ft. to 35 ft. 7 in., and it was proposed to increase it to a width of 60 ft. With regard to the Accrington-road improvement, that thoroughfare was also a main one. The improvement to be effected by taking down the property was the widening of the road and the obtaining of a better entrance to the Barracks-road, which was used a great deal for vehicular traffic. The cost of the property was £500. The width of the road at present was from 33 ft. 4 in. to 38 ft. 10 in., and it was intended to widen it to 42½ ft.

**Cainsborough U.D.C.** (March 8th. Major J. Stewart). —£1,200 for enlarging the present baths.—After the matter had been closed, the inspector said he was instructed by the Local Government Board to inquire as to the progress Gainsborough was making in the matter of sewage disposal. Two years ago, Mr. North, an inspector of the board, had been told that the council did not want to consider a scheme until complete sectional plans had been prepared, showing the existing sewers, and so forth, and he was told that the work would be completed in a year's time. Major Stewart was informed that since that time only three other sections had been finished, and that no guarantee could be given as to when the other would be done. The Local Government Board was concerning itself over the matter of Gainsborough bringing its sewerage system up to date.

**Ilkeston T.C.** (March 8th. Mr. F. O. Stanford).—£30,000 for sewerage purposes.—The town clerk (Mr. S. F. James) explained that sewage disposal works were in course of construction, and would be completed about June next, at a cost of £32,400. The loan of £30,000 applied for was for the purpose of providing new intercepting and contributory sewers to convey the sewage to the disposal works now nearing completion.

**Ilkley U.D.C.** (February 22nd. Major J. Stewart).—£3,000 for the provision of an annexe to the King's Hall and public conveniences adjoining. The sum of £2,000 will be spent on the annexe, the front of which will be of stone and of a style of architecture in keeping with the rest of the town hall building, of which it will form a part. The building will be 92 ft. long and average about 42 ft. wide, and it will be provided with a spring floor for dancing purposes, and a glass roof. A kitchen and refreshment serving room will be added. There was no opposition to the proposal.

**Launceston T.C.** (February 20th. Mr. Edward Leonard). £1,250 for the purchase and improvement of certain property situate in Kingdon-court, Tower-street, and Ram-alley, and for the erection of new dwellings for the working-classes.—The town clerk (Mr. C. H. Peter) gave statistics concerning the population, acreage, and debt of the borough, and evidence was tendered by Mr. V. B. Peter (architect), Dr. Budd (medical officer of health), and others as to the need for improving the area in question.

**Newcastle-under-Lyme T.C.** (March 8th. Mr. Edgar Dudley). £2,200 for the purposes of street improvement at the Higherland and Pool Dam.—The town clerk stated that the road through the Higherland and Pool Dam was the main entrance to Newcastle and the Potteries from Keele, Nantwich, Chester, Whitmore, Market Drayton, and Shrewsbury, and that the traffic was heavy. The road was dangerous, and three main roads converging at angles made it impossible for approaching traffic to be seen. Provisional contracts had been signed for the purchase of land for £2,175. It was estimated that the work altogether would cost £2,950, and deducting from this £750 promised by the Road Board, £2,200 had to be found by the corporation.

**Newport (Mon.) T.C.** (February 27th. Mr. H. R. Hooper).—£5,000 for purposes of the electricity undertaking.—Mr. A. A. Newman, the town clerk, in support of the application, said the board in 1907 had sanctioned a loan of £10,000 for the hire-purchase of stock and the hire of motors. This had been expended, in addition to a sum of £1,530 for the same purposes.

**St. Annes-on-Sea (Lancs) U.D.C.** (March 5th. Mr. P. M. Crosthwaite).—£14,019 for sewerage purposes. —Mr. C. J. Lomax, Assoc.M.Inst.C.E., the engineer, explained the details of the scheme. He said that in preparing it he had kept in mind first and foremost the idea of freeing the foreshore of contamination, a matter which was very essential to St. Annes as a health resort. The general effect of the scheme would be that there would not be any outflow either of sewage or storm water on the foreshore until the Ormerod Homes were reached. In connection with the scheme he was bound to take up the existing sewers, and he considered that there would be no engineering difficulty in doing so. All possible advantage would also be taken of the gravitation system. The full scheme would serve an ultimate population thirty years hence of 39,500 residents and a prospective visiting population of 59,000—a total summer population of 98,000.

**Shifnal R.D.C.** (February 29th. Mr. A. G. Drury).—£4,300 for a sewerage scheme for Albrighton.—At a previous hearing the council asked for a Provisional Order for the purchase of land known as the Clockmill Meadow, containing in all about 3 acres of land, all of which may or may not be necessary for the purpose of carrying out the scheme. An alternative scheme was now proposed by the opponents, but to this the owner of Albrighton Hall objected strongly.

**Yeovil T.C.** (February 19th. Mr. Edward Leonard).—£24,220 for housing purposes.—It was explained that the Local Government Board had sanctioned the loan of £4,350 for the land, and that since that the council had prepared a scheme. The borough surveyor, Mr. A. Oddy, stated that the streets would be 30 ft. wide, the carriageways would be constructed of macadam, and the kerbs and channels of Keinton stone. The sewers would be constructed of stoneware pipes, the greater part of which would be 6 in. in diameter and the rest 9 in. A separate system had been provided for. Mr. Warren, the architect, said that land had been purchased for 450 building sites, upon which it was proposed to erect 132 type A cottages (five rooms), ten type B cottages (four rooms), and four blocks of tenements, each block containing four suites of apartments. The type A cottages would each have a frontage of 16 ft. and a depth of 25 ft., and would contain on the ground floor: Living-room, 15 ft. 3 in. by 12 ft.; scullery, 11 ft. 9 in. by 7 ft. 6 in.; larder, fuel store, and water-closet. On the first floor: Bedroom, 11 ft. 3 in. by 11 ft. 3 in.; bedroom, 11 ft. 6 in. by 7 ft. 6 in.; bedroom, 8 ft. 3 in. by 7 ft. 6 in. The four-room cottages (type B) each would have a frontage of 15 ft. 4 in. and a depth of 20 ft. 9 in., and contain on the ground floor: Living-room, 14 ft. by 10 ft. 2 in.; scullery, 8 ft. 6 in. by 8 ft. 3 in.; larder, fuel store, and water-closet. On the first floor: Bedroom, 14 ft. by 10 ft. 3 in.; bedroom, 8 ft. 6 in. by 8 ft. 3 in. Each of the flats would contain: Living-room, 13 ft. 6 in. by 11 ft. 9 in.; bedroom, 10 ft. 6 in. by 9 ft. 6 in.; larder, fuel store, and water-closet. In the type A cottage a bath would be provided, with hot water conveyed from the copper. The council were not providing bath-room in the type B cottages.

### APPLICATIONS FOR LOANS.

**Bexhill T.C.**—£1,100 for the provision of a recreation ground.

**Clones U.D.C.**—£1,500 for the erection of ten working-class dwellings.

**Friern Barnet U.D.C.**—£1,398 for the Friern-lane improvement.

**Gower R.D.C.**—£5,500 for the Penmaen water supply.

**Hackney B.C.**—£1,430 for road improvement purposes.

**Harrogate T.C.**—£250 for the improvement to the entrance to the Valley Gardens, and £2,700 for the provision of a glass and iron structure at the Pump Room.

**Hendon U.D.C.**—£692 for street improvement works.

**Hull T.C.**—£50,000 for street improvement purposes.

**Ilkeston T.C.**—£3,168 for street works and the purchase of a depot.

**Shoreham U.D.C.**—£2,200 for the purchase of the town hall.

**Southport T.C.**—£500 for the provision of a bowls-house.

**Stepney B.C.**—£5,000 for additional machinery and plant at the electricity works.

**Wednesbury T.C.**—£1,800 for the purposes of a recreation ground.

**West Bromwich T.C.**—£2,000 for a school site.

**Westhoughton U.D.C.**—£2,140 for the construction of a water tower.

**Woolwich B.C.**—£36,570 for generating plant and electricity mains.

### LOANS SANCTIONED.

**Aldershot U.D.C.**—£1,000 for surface-water drainage.

**Dewsbury T.C.**—£831 for street improvement purposes.

**Evesham R.D.C.**—£650 for the purchase of land for the provision of cottages.

**Hazel Grove U.D.C.**—£1,800 for private street improvement purposes.

**Hendon U.D.C.** £208 for private street works.

**Hinckley R.D.C.**—£150 for the extension of the water main.

**Hove T.C.** £755 for relaying part of Church-road with wood blocks.

**Kingstown U.D.C.**—£7,025 for the erection of workmen's dwellings.

**Malvern U.D.C.**—£6,700 for works of sewerage.

**Middlesbrough T.C.**—£2,851 for wood-paving works.

**Plymouth T.C.**—£26,155 for repaving works and reconstruction of sewers, and £440 for private street works.

**Shoreham U.D.C.** –£500 for sewerage works, and £200 for private street works.

**Southport T.C.** £500 for the balustrade extension at the Gardens.

**Spennymoor U.D.C.** –£3,900 for the purchase of the market buildings.

**Teignmouth U.D.C.** –£1,010 for the purchase of Gales Hill-yard and Luve-lane stables, and alterations to the latter.

**Winchcombe R.D.C.**—£1,500 for sewerage and sewage disposal works.

### LOAN REFUSED.

**Barking U.D.C.**—£11,000 for electricity works extensions.

### FORTHCOMING INQUIRIES.

MARCH.

| | | £ |
|---|---|---|
| 19. | **Castleford.** For street widening purposes (Mr. Edgar Dudley) ... ... ... ... | 4,386 |
| 19. | **Great Yarmouth.** For works of paving (Mr. F. H. Tulloch) ... ... ... ... | 3,260 |
| 19. | **Hoylake.** For road improvement purposes (Major J. Stewart) ... ... ... ... | 670 |
| 19. | **Nelson.** For the provision of a public slaughter-house (Mr. R. H. Bicknell) ... | 1,500 |
| 19. | **Norwich.** For allotment purposes (Mr. F. H. Tulloch) ... ... ... ... ... | 1,510 |
| 19. | **Wilton.** For sewerage purposes (Mr. F. O. Stanford) ... ... ... ... ... | 1,500 |
| 20. | **Ashton-in-Makerfield.** For gas, fire station and street lighting purposes (Mr. R. H. Bicknell) ... ... ... ... ... | 6,300 |
| 20. | **Farnworth.** For electricity, refuse destructor and public office purposes (Major C. E. Norton) ... ... ... ... ... | 4,705 |
| 20. | **Northallerton.** For sewage disposal purposes (Mr. A. A. G. Malet) ... ... ... | 1,500 |
| 20. | **Selby.** For the purposes of small dwellings (Mr. Edward Leonard) ... ... | 2,000 |
| 20. | **Wakefield.** For street widening purposes (Mr. Edgar Dudley) ... ... ... ... | 5,950 |
| 21. | **Alderley Edge.** For sewerage, street and depot purposes (Mr. R. H. Bicknell) ... | 1,150 |
| 21. | **Chester-le-Street.** For the provision of a new road (Mr. A. A. G. Malet) ... ... | 10,000 |
| 21. | **Leicester.** For the extension of the town hall (Mr. Edward Leonard)... ... ... | 3,580 |
| 21. | **Milton.** For sewerage purposes (Mr. F. O. Stanford) ... ... ... ... ... | 1,100 |
| 21. | **Northampton.** For the provision of a recreation ground (Mr. Edgar Dudley) ... | 3,500 |
| 21. | **Prescot.** For the provision of a public convenience (Major J. Stewart) ... ... | 150 |
| 21 | **Wallasey.** For the provision of a recreation ground (Major C. E. Norton) ... ... | 6,120 |
| 22. | **Alnwick.** For works of water supply (Mr. A. A. G. Malet) ... ... ... ... | 4,000 |
| 22. | **Failsworth.** For private street works (Major J. Stewart) ... ... ... ... | 5,239 |
| 22. | **Peterborough.** For the provision of a recreation ground (Mr. Edgar Dudley) ... | 1,800 |
| 22. | **Thames Ditton.** For works of sewage disposal (Mr. F. O. Stanford) ... ... ... | 6,094 |

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**A New Form of River Pollution.**—Seeing over 15 miles of obscene cinematograph films being thrown into the Seine last week, a zealous member of the river police attempted to summon an inspector for polluting the stream.

**Tar-treated Roads: Bristol City Engineer's Report.**—In the extract in our last issue from the report of Mr. Lessel S. McKenzie, city engineer of Bristol, on the practical and economic aspects of the tar-treatment of the roads under his charge, line 26 should have read "less than 15,852 fewer loads of slop and sweepings," and not, as printed, "fewer than 15,852 loads of slop and sweepings." We regret the mistake.

**Post Office Operations in Margate.**—It is interesting to note that, since the transfer of the National Telephone Company's undertaking to the Government, Margate will be the first town to have a complete system of underground cables, in place of the existing aërial distribution. There will also be installed at the new post office recently erected in Cecil-square an up-to-date common battery telephone exchange, which will be on the same principle as that of the largest London exchanges. The Post Office will commence the laying of underground cables in Margate almost immediately.

**Wood-Block Pavement with Clay Expansion Joint.** The city of Wellington, New Zealand, according to a recent consular report, constructs its wood-block pavements in the following manner: The roadway is excavated to a depth of 11¾ in. below the finished-surface level of pavement. Six inches of concrete (composed of 6 parts of ballast to 1 part of Portland cement) are laid over the whole width of the roadway and floated to a smooth surface. Jarrah blocks, 5 in. deep, cut from planks measuring 6 in. by 3in., 7 in. by 3 in., or 8 in. by 3 in., are dipped in hot tar and then laid in courses 3 in. wide across the street, the blocks in each course and the several courses being placed as close together as possible. Expansion joints 1 in. wide of well-worked clay are laid alongside each kerb. The whole surface is coated with boiled tar, well brushed in, and then sprinkled with coarse sand. This tarring and sanding are repeated as found necessary. The sand used is taken from the sea beach, the particles being about the size of rice. The above report states that the city has 4 miles of wood-block pavement constructed in the above way eight years ago which show no signs of wear, this being attributed largely to the coating of tar and sand which is spread over the surface every year or two. The wood-block pavement in Wellington cost about 18s. 3d. per square yard.—From *Engineering and Contracting* (Chicago).

# Municipal Work in Progress and Projected.

*The Editor invites the co-operation of* Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Coventry £20,000, Todmorden, Witham (Essex); parks and open spaces—Bexhill £1,100; roads and materials—Friern Barnet £1,398, Hove, Sunderland £4,500; sewerage and sewage disposal—Aylesbury £2,475, Chester-le-Street £6,000, Croston £2,000, Petersfield; water, gas and electricity—Bootle £43,755, Chelmsford £6,350, Torquay £50,000.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

## ADMINISTRATION.

**Bury T.C.**—The council have agreed to recognise the principle of paying a minimum rate of wages of 25s. per week of fifty-four hours to all able-bodied men of full age, and that the head of each department should determine as to the fitness or otherwise of the employees.

**Salford T.C.**—A minimum wage of 26s. has been fixed for the council's workmen.

## BUILDINGS.

**Barrow-in-Furness T.C.**—A sum of £3,000 is to be spent in the purchase of land for public baths, and the borough surveyor, Mr. Arthur Race, has been asked to prepare plans and estimates of the cost of the scheme.

**Bilston (Staffs) U.D.C.**—The tender of Messrs. H. Gough & Son, of Wolverhampton, to build a sanitary depot at the Lunt for £1,025, has been accepted, and one from Messrs. J. Hickin & Sons, Willenhall, for the erection of a fire station for £538, has also been approved.

**Coventry T.C.**—A proposal is being considered for the provision of a public abattoir, at an estimated cost of £29,000.

**Essex C.C.**—Sketch plans are being prepared of the proposed new county buildings at Chelmsford, and the front of the Shire Hall is to be repaired at a cost of £500.

**Hitchin U.D.C.**—It is proposed to carry out improvements at the town hall, at a cost of £700.

**Hornsea U.D.C.**—A letter has been received from the Local Government Board stating that the board had decided to extend the period for the repayment of the sea-defence loan—(*a*) the outstanding balance of so much of the loan of £8,000 as was raised for the construction of the sea-wall; and (*b*) the outstanding balance of the loan of £3,000 raised for the construction of groynes; (*a*) to be repayable in twenty-six years from May 1, 1911, and (*b*) in ten years from October 1, 1911.

**Pontardawe R.D.C.**—It has been decided to subscribe £300 towards the erection of a bridge over the river Amman at Pantyffynon, the cost of which is estimated to be £3,500.

**Shrewsbury T.C.**—The Road Board have offered to lend the council £500, free of interest, for five years towards the cost of widening the Factory and Comet bridges. An engineer has been instructed to report on the best means of widening the English Bridge, which stretches over the Severn, and carries a portion of the London and Holyhead road.

**Stonehaven T.C.**—A new mortuary is to be built, at a cost of £700.

**Sunbury U.D.C.**—Tenders are being invited for the erection of a shed at Sunbury Common for the housing of the fire brigade hose cart, plans for which have been prepared by Mr. H. F. Coales, the surveyor.

**Todmorden T.C.**—The borough surveyor, Mr. J. A. Heap, has been directed to report on the advisability of converting the mansion on the Centre Vale into municipal offices.

**Witham (Essex) U.D.C.** Plans prepared by the surveyor, Mr. W. P. Perkins, for a new fire station, have been referred to the Building Committee.

## HOUSING AND TOWN PLANNING.

**Billericay R.D.C.**—The tender of Messrs. Harris Bros., Billericay, at £1,150, has been accepted for the erection of seven cottages in Church-lane, Great Burstead.

**Drogheda U.D.C.**—It has been decided to build forty three-roomed dwellings, and ten dwellings to contain a parlour, two bedrooms and living-room. The former are estimated to cost £130 each, and will let at 2s. 4d. per week, and the latter will cost more and let at 3s. 4d. per week.

**Dunfermline T.C.**—Application is to be made to the Local Government Board for permission to prepare a town planning scheme within the extended boundaries of the city, including Rosyth.

## PARKS AND OPEN SPACES.

**Bexhill T.C.**—It has been agreed to lay out the waste land between Brockley-road and the park, just acquired by the council as an extension of the park, the laying out to include the construction of four hard tennis courts, at a total cost of £1,100.

**Heckmondwike (Yorks) U.D.C.**—Plans have been approved of the Green improvement scheme, and these show that the total area of 4,733 yds. is to be utilised as follows: Asphalted paths, 799; lawn, 1,675; shrubberies, 2,259. The contracts for the whole of the work have been let. The total estimated cost is £750.

**Portsmouth T.C.**—The Parks and Open Spaces Committee are now engaged in improving Southsea Common, in view of the approaching season. Upwards of 200 additional trees are being planted in the neighbourhood of the Ladies' Mile.

## REFUSE COLLECTION AND DISPOSAL.

**Dungannon (Co. Tyrone) U.D.C.**—The Dam Meadows are to be purchased from Lord Ranfurly for £275 for refuse disposal purposes.

**Loughborough T.C.**—The charges for the removal of trade refuse have been fixed at 5s. to £3 per annum, according to the quantity removed.

## ROADS AND MATERIALS.

**Banff T.C.**—The report of a special committee has been adopted dealing with the question of regulations with respect to the making of openings in the roads and streets of the burgh. The report recommended that persons opening the streets and roads should be charged 5s. for any length opened not exceeding 5 yds., and 1s. per yard for every yard or part of a yard in excess of that, and that the regulations obtaining as to getting the burgh surveyor's consent before opening any part of the road should continue to be enforced. The committee recommended that no charge should be made for openings made for the first time in connection with new buildings.

**Chelmsford T.C.**—It has been decided to widen the whole of Rectory-lane and New-street, and to purchase for street improvement purposes the Olde White Hart property at the corner of the Baddow-road.

**Coseley (Staffs) U.D.C.**—The county council have recommended the Road Board to make a grant of £224 to the urban council for the purpose of tar-spraying.

**Downham U.D.C.**—It has been decided to replace the existing stone pavement on the north side of Bridge-street, for a distance of 105 yds., with concrete slabs, and to accept the tender of the Atlas Stone Company, Limited, to do the work for £56. It has also been decided to purchase a tar boiler for the sum of £7 15s.

**Friern Barnet U.D.C.**—The surveyor, Mr. E. J. Reynolds, has prepared plans and sections of the proposed improvement to Friern-lane, and subject to official sanction for a loan the work will be carried out, at an estimated cost of £1,398.—The tender of Messrs. Grounds & Newton, at £3,223, has been accepted for making up Torrington Park.

**Hove T.C.**—The borough surveyor, Mr. H. H. Scott, has been instructed to draw up a specification of the probable cost of making up the portion of Wilbury-avenue, between the Drive and Wilbury-villas, and an estimate for making up Holland-road. The Works and Improvements Committee recommend the expenditure of £998 upon street improvements in Glebe-villas, and £1,057 on street improvements in Langdale-gardens and Wish-road.

**Lancashire C.C.**—Arrangements have been made by the Main Roads and Bridges Committee for the carrying out of the work of tar-spraying on the main roads in the administrative county during the ensuing year. The terms arranged show an advance on last year's prices of a farthing per yard, this being due to the increase in the price of tar products.

**Marylebone B.C.**—The assistant surveyor has reported that during the recent snowfall snow fell to an approximate depth varying from ½ in. to 2 in. Over 1,000 casual workmen were employed in dealing with the snow, and their wages amounted to about £182. Some 47 tons of salt were used, at an approximate cost of £90, and the number of loads of snow shot down the sewers was 690. The approximate total cost in respect of this snowfall was £500.

**Oulton Broad (Suffolk) U.D.C.**—Victoria-road has been treated with Roadoleum, at a cost of £83.

**Romford R.D.C.**—It has been decided to purchase a water sprinkler from Messrs. Rowe & Sons, at £42, and from Messrs. Chalmers & Co. a dust van, at £48.

**Sunbury U.D.C.**—The surveyor, Mr. H. F. Coales, has reported that the average cost for the past seven years of the maintenance of Staines-road, exclusive of footpaths, has been £187 9s. 10d. per mile, a reduction, as compared with the previous seven years, of £28 0s. 4d., or 13 per cent. The average cost of other roads—including Staines-road footpaths, kerbing, tar-paving, and all improvements—for the last seven years has been £81 3s. 1d., a reduction of £34 11s. 7d., or 30 per cent. The reduction equalled a 3d. rate. Mr. Coales was unanimously thanked for his report, the chairman, Mr. H. H. Allen, stating that the state of the roads left little to be desired, and compared most favourably with other districts.

**Sunderland T.C.**—The Highways Committee recommend that Stockton-road should be paved with wood and the roadway widened in front of Grange House and abutting on the Esplanade, at an estimated cost of £4,500.

## SEWERAGE AND SEWAGE DISPOSAL.

**Aylesbury U.D.C.**—Surface-water drainage works, estimated by the surveyor, Mr. W. H. Taylor, to cost £2,475, are to be carried out.

**Bath T.C.**—The Sewage Disposal Committee have accepted the tender of Messrs. Firth & Co. for laying about 5 miles of 30-in. cast-iron pipe sewage pumping main between Bath and Saltford, together with other pipe sewers, manholes, and appurtenant works. The work will occupy something like eighteen months.

**Carlisle R.D.C.**—Pursuant to a report submitted by the engineer, the council have determined to complete the Stanwix sewerage scheme at a cost of £1,250.

**Chester-le-Street U.D.C.**—A sewage disposal scheme is to be carried out at Pelton Fell, at an estimated cost of £6,000.

**Croston U.D.C.**—Alterations are to be carried out at the sewage disposal works, at an estimated cost of £2,000.

**Itchen U.D.C.**—The council in committee have adopted Messrs. Weston & Burnett's scheme for the drainage of Shirley, at an estimated cost of £13,000.

**Newcastle-upon-Tyne T.C.**—The following figures show the quantity of water used in flushing the sewers of the city, and the cost of the flushing: 1906, 40,000,000 gallons, £2,035; 1907, 63,250,000 gallons, £2,767; 1908, 16,000,000 gallons, £1,016; 1909, 17,250,000 gallons, £1,442; 1910, 16,500,000 gallons, £1,717; 1911, 15,250,000 gallons, £1,383.

**Petersfield U.D.C.**—The council have instructed Mr. Harry W. Taylor, Assoc.M.Inst.C.E. (Messrs. Taylor & Wallis), Newcastle-upon-Tyne and Birmingham, to report upon improvements of the existing main sewerage of the town.

**St. Helens T.C.**—It is intended to proceed with the culverting of the brook from Kirkland-street to Westfield-street, at a cost of £7,000.

## WATER, GAS, AND ELECTRICITY.

**Alsager U.D.C.**—The council have accepted the tender of the New England Boring Company, Limited, of Peterborough, for the experimental boring at the Oak Farm, at the sum of £295, and the work is to be pushed forward as rapidly as possible.

**Bootle T.C.**—A scheme has been approved for the extension of the electricity works, at an estimated cost of £13,755.

**Brighton T.C.**—For the third time within two years the council last week discussed a scheme for the wiring of houses for electric lighting under an agreement by which the tenant was to pay 1d. extra per unit until the cost was defrayed. By a majority of 25 to 19 the proposal was again rejected.

**Chelmsford R.D.C.**—A water supply for the parish of Broomfield, to cost £6,350, is under consideration.

**Llanfairfechan U.D.C.**—The council have adopted a recommendation from the Highways Committee to engage an expert to report upon the feasibility of lighting the district by electricity.

**Runcorn U.D.C.**—It has been agreed to substitute electric pumping for the present steam plant at the waterworks. The cost of pumping by electricity will be 1·26d. per 1,000 gallons, as against 2d. on the present system, and the price likely to be realised on the sale of the existing plant will nearly balance the cost of the installation. It has also been decided to proceed with the work of laying new and enlarged mains at a cost of £2,000.

**Torquay T.C.**—The waterworks engineer, Mr. S. C. Chapman, has recommended the council to adopt the scheme for the proposed new main from Tottiford to Torquay, *viâ* Great Hill, estimated to cost £50,000. He recommends that the work should be done in sections, and that the first section—from Tottiford to Hennock—should be constructed forthwith, at an estimated cost of £5,000.

**Wath (Yorks) R.D.C.**—It is intended to spend a sum of £3,000 upon duplicating almost every part of the pumping plant and strengthening the weak spots in the water supply system.

## MISCELLANEOUS.

**Waterford C.C.**—The council have adopted a county improvement scheme, in aid of which they have been promised by the Treasury authorities the £30,000 unallocated railway balance in their possession. The scheme embraces the following—*viz.*: Proposed Cunnigar Bridge and roadway at Dungarvan, estimate £16,909; dredging and improvement of the river Suir, £7,955; dredging and improvement of the river Blackwater, £6,380; dredging and improvement of the river Bride, £1,400; building storm-wall site at Tramore, £3,998.

## PERSONAL.

Mr. Herbert J. Paul, of Hull, has been appointed assistant engineer to the Preston Town Council at a salary of £200 per annum.

Mr. G. W. Lacey, borough surveyor of Oswestry, has been voted 100 guineas for his services in connection with the construction of the sewage disposal works.

Mr. J. A. Reddie, chemist in the sewage department of the Bradford Corporation, has been appointed manager of the Salterhebble sewage works, at a salary of £200 per annum.

Mr. J. W. Neave, ex-assistant county surveyor of Essex, has died, we regret to state, at his residence, Weston, London-road, Chelmsford, in his sixty-fourth year. He had been ill for some time, and about six months ago he found it necessary to retire owing to the state of his health.

Mr. A. Burton, borough surveyor of Stoke-on-Trent, has had his salary increased by £50 per annum; Mr. J. R. Heath, deputy borough surveyor, by £20; Mr. F. P. Sissons, northern district surveyor, by £10; Mr. J. H. Hele, southern district surveyor, by £15; and Mr. W. Percival, building surveyor, by £15.

Sir William Lindley has signed a contract with the Water Supply and Sewage Committee of the St. Petersburg Town Council by which he becomes engineer-in-chief for the designing of the new waterworks and the drainage of St. Petersburg, and for the eventual direction and executing of the schemes. The cost of the projected works is £10,000,000.

Colonel E. J. Heward, V.D., the borough engineer and surveyor of Greenwich, presided at the ninth annual dinner of the council's foremen and outdoor staff, held at the Trafalgar Hotel, East Greenwich. He was supported by the mayor (Councillor Charles Stone, J.P.), the town clerk (Mr. Francis Robinson), the assistant borough surveyor (Mr. C. Percy Smith), and many other councillors, officials, and representatives of the council's contractors.

Sir Maurice Fitzmaurice, C.M.G., M.A., eldest son of Mr. R. Fitzmaurice, M.D., of co. Kerry, Ireland, upon

whom the King conferred the honour of knighthood on Saturday last on the occasion of the stone-laying ceremony of the new County Hall for London, was born at Tralee, co. Kerry, in 1861, educated at Trinity College, Dublin, and obtained degrees of M.A. and M.A.I., Dublin University. He was pupil to the late Sir Benjamin Baker, K.C.B., K.C.M.G.; worked in the office of Sir Jno. Fowler and Sir Benjamin Baker during 1883, and in 1884 was appointed assistant at the Forth Bridge under the same engineers, and remained there until the completion of the work in 1888. In the latter year he went to Canada in charge of the construction of railways and docks, and continued on this work for three years. He was then engaged for a short time on Irish railways, but returned to Sir Benjamin Baker's office in 1891, and was for a year engaged on the reconstruction of the bridges on the London and Brighton railway. In 1892 he was appointed resident engineer by the London County Council on the construction of the Blackwall Tunnel under the Thames. On the completion of this work he was appointed by the Egyptian Government to take charge of all the works in connection with the Nile reservoir at Assouan. On the completion of the Assouan Dam, at the end of 1901, he was appointed chief engineer to the London County Council. Since 1901 he has constructed the electric tramways in London, new Vauxhall Bridge, Rotherhithe Tunnel, Kingsway, and tramway subway underneath. He was for some years engaged on the duplication of the London main drainage system, at a cost of about £4,000,000. He is a member of the council of the Institution of Civil Engineers, and member of the Institution of Mechanical Engineers, and obtained the C.M.G. for work in Egypt, and the Order of the Medjidie.

At the A.M.I.C.E. examination held last month all the students prepared by Messrs. Turner and Davis were successful in passing the whole examination.

## FOR OTHER ADVERTISEMENTS

See End of Paper.

## COUNTY BOROUGH OF SOUTHPORT.

Tenders are invited by the above Corporation for the Supply and Delivery of Materials, &c., from the 1st April, 1912.

SCHEDULE No. 1. Stoneware Pipes, Gullies, &c.
" 2. Bricks, Footway Tiles, &c.
" 3. Ironmongery, Plumbers' Sundries and Glass.
" 4 Oils, Colours, Greases, Disinfectants and Packings.
" 5 Portland and Roman Cements.
" 6. Road Materials (Granite Spalls, Setts, Chippings, Kerb and Channel, Flags, Lump and Broken Stone, Gravel, Artificial Stone Slabs, &c.).
" 7. Iron Castings (Manhole Covers, &c.).
" 8. Creosote Oil and Pitch.
" 9. Repairing and Supplying Harness, Sundries, &c.
" 10. Brooms and Brushes.
" 11. Rain-Water Goods, Smith Iron, &c.
" 12. Plasterers' and Slaters' Materials.
" 13. Enamel Name-Plates.
" 14 Dust and Spelk Baskets (for the collection of house refuse).
" 15. Paving Works and Street Repairs (Piecework).
" 16. Forage and Provender.
" 17. Team Labour Hire.

Specifications, Forms of Tender, and other particulars may be obtained at the office of Mr. A. E. Jackson, A.M.I.C.E., Borough Engineer and Surveyor, Town Hall, Southport.

Each Tender must be placed in a separate envelope, and endorsed "Tender for No. ," and must be delivered at the Borough Engineer's office not later than 12 noon on Saturday, the 6th day of April, 1912.

The Corporation do not bind themselves to accept the lowest or any Tender.

J. ERNEST JARRATT,
Town Clerk.

Town Hall, Southport.
March 13, 1912.

## BOROUGH OF RICHMOND (SURREY).

*TO CONTRACTORS.*

EXTENSION OF CEMETERY.

The Council are prepared to receive Tenders for Works required in Laying Out and Draining a portion of the Cemetery Extension Land in Grove-road, Richmond.

Drawings and Conditions of Contract may be seen, and all particulars obtained, on application to Mr. J. H. Brierley, Borough Surveyor, Town Hall, Richmond, Surrey, where a Form of Tender, together with a copy of Specification and Bill of Quantities, may be obtained on payment of a deposit of One Guinea, which will be returned on receipt of a *bonâ-fide* Tender.

Sealed Tenders, properly endorsed, must be sent in not later than noon on Thursday, 28th March, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

HENRY SAGAR,
Town Clerk.

Town Hall,
Richmond, Surrey.
March 13, 1912.

## WOODFORD URBAN DISTRICT COUNCIL

TARRING ROADS.

The Council are prepared to receive Tenders for Road Tarring.

Particulars may be obtained upon application to the undersigned.

Sealed Tenders, endorsed "Tender for Tarring," to be sent in not later than noon on Tuesday, 26th March.

The Council do not bind themselves to accept the lowest or any Tender.

WILLIAM FARRINGTON,
Surveyor to the Council.

Council Offices,
Woodford Green.
March 12, 1912.

## MATLOCK URBAN DISTRICT COUNCIL.

*SEWERAGE AND SEWAGE DISPOSAL WORKS.*

TO CONTRACTORS.

The above Council invite Tenders for the Construction of Main Outfall and Subsidiary Sewers of Earthenware, Steel and Cast-iron Pipes, together with Manholes, Ventilators, Flushing Tanks, &c., and for Sewage Disposal Works, including Detritus Tanks, Sedimentation Tanks, Percolating Filters, Effluent Drains, Land Irrigation and Storm-water Areas.

Plans and Specifications may be seen, and Bill of Quantities, Schedule of Prices, and Form of Tender may be obtained at the Offices of the Engineer, Messrs. James Deegle & Son, 14 Victoria-street, Westminster, S.W., and Hind Hill-street, Heywood, on and after Monday, the 25th day of March 1912, on payment of a deposit of £2, which will be returned on receipt of a *bonâ-fide* Tender.

Sealed Tenders endorsed "Matlock Sewerage," addressed to the Clerk, Town Hall, Matlock, are to be delivered not later than Monday, the 15th day of April, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

R. TAYLOR,
Clerk to the Council.

Town Hall,
Matlock.
March 13, 1912.

PAVIORS wanted at once for granite sett paving on Tramway Work, for a period of two or three months. Apply, by letter only, to

E. GEORGE MAWBEY, M.INST.C.E.,
Borough Engineer.

Town Hall, Leicester.

SURVEYOR, important Rural District West Lancashire, has vacancy for Pupil. Splendid opportunity for sewerage, water, and all-round experience; premium required.—Further particulars address A., Box 1,113, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

## RAILWAY COMPANIES' ROADS.

### A DANGEROUS HIGHWAY AT DORKING.

On an important main road from London to the South Coast, through Epsom, Dorking, and Horsham, there is a portion, about 2 furlongs in length, which has for some time past been in such a condition that it is not only a source of serious discomfort to users of the road, but is decidedly dangerous. The stretch of road in question, including a railway bridge and its approaches, as well as portions which are not parts of the approaches in the engineer's sense of the word, is at present the property of the London, Brighton and South Coast Railway Company, skirting their yard at the Dorking Railway Station. The Dorking Urban District Council is, it is understood, negotiating with the company for the transfer of the road in order that it may be properly maintained, after being put into such condition that it may be a satisfactory portion of a highway on which there is a considerable through traffic as well as a large amount of local traffic. It is to be hoped that the council will not be satisfied with an arrangement for maintenance only. Like other roads over railway bridges and their approaches, this stretch of road is, presumably, one which the railway company is legally bound to maintain in a condition suitable for the traffic of the neighbourhood at the time that the bridge was built. It is difficult to believe that a main road in Surrey could have been, at the date of the construction of the railway, maintained in a condition no better than than that in which this road would probably be, even with the smaller and less severe traffic of those days. It may be conceded, however, that the amount of relatively hard stuff, such as gravel or flints, added from time to time to the crust, or rather "crumb," of this road, might in those days have given passable results, as compared with neighbouring roads. The road has, however, been so badly managed, or so neglected, that dangerously deep holes have been formed in it, and the mud, or rather the "crumb" itself, has attained to such a consistency and such a thickness of rutted material as constitute a danger to cyclists, while large quantities of water have been allowed to run on to the road or to remain there in pools.

Local motorists drive through very slowly indeed in soft weather, and local cyclists take to the footpath, but not every person riding or driving through from other places can be expected to be aware of the state of affairs in time to avoid severe jolting or sideslip. Like earth roads generally, and similar roads containing some proportion of gravel or flints, this piece of highway wears down, and is rolled down by the traffic into fair condition in favourable weather, and its dustiness in dry weather is, perhaps, a matter which is not to the point as regards the company's obligations. The fact that the local authority, after taking over the road, would have to make a new crust of hard stone, to a certain extent covers up present deficiencies; but in addition to this the council will have to do a considerable amount of work in reforming the road-bed, making proper margins and ditches on the side away from the footpath, and dealing with the various parts of the present "crust" in such a manner that a firm foundation may be prepared for the new crust. In one place where the road is in side cutting, the provision of a suitable ditch within the limits of the present highway will be a somewhat troublesome matter, though the total width available is probably sufficient for this and other works which will be necessary. As regards seepage and surface flow from the land above, the company can, of course, point to numerous instances of neglect to cope with this matter on roads in the county.

At a recent meeting of the urban district council the clerk pointed out that the engineer of the railway company did not admit that the road had been in a bad and dangerous condition for a long time past. To this the clerk had replied that his council were still of opinion that the road was in a dangerous state, and complaints were made about it almost every day. The company had increased to £25 their previous offer of £20 for the maintenance by the council of the road, and the matter was referred to the Roads Committee, and has since been refused. The urban council regard the matter as one which should be taken in hand by the county council as a main road improvement, and in this connection it may be pointed out that the sum of £100, mentioned by a local member of the county council as that probably needed to put the road into proper order, is only about a quarter of the sum necessary for the purpose.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President*—Mr. Albert D. Greatorex, M.Inst.C.E., Borough Engineer and Surveyor of West Bromwich.

### FORTHCOMING MEETINGS.

The following meetings are reported as fixtures: June 7th and 8th, Scottish meeting at Stirling; Eastern District, June 15th, at East Ham; Eastern District meeting on June 22nd, at Lowestoft.

A West Midland District meeting will be held at Stourbridge, April 13th, the Paris meeting at Whitsun, and the annual meeting will probably be held July 11th, 12th and 13th.

Provincial members who propose to take part in the visit to Paris will, in cases where the journey exceeds a distance of 30 miles, be able to obtain return tickets to London at a single fare and a quarter.

Members desirous of submitting a paper at the forthcoming annual meeting are requested to give early information of their desire.

Premiums not exceeding 30 guineas are awarded by the council for the best papers read by members and associate members during the year.

Thomas Cole,
11 Victoria-street, S.W. *Secretary.*

## INSTITUTION OF MUNICIPAL ENGINEERS.

*President*—Mr. E. A. Stickland, Assoc.M.Inst C.E., Borough Surveyor, Windsor.

### SOUTH-EASTERN DISTRICT.

A meeting will be held in the council room of the institution, 39 Victoria-street, S.W., on Tuesday, March 26th, at 7 p.m., when there will be an open discussion on "The Size and Design of Street Gullies and Weirs." Members are invited to bring to the meeting drawings and, if possible, models of any street gullies or weirs which have come under their notice.

Bernard Partridge,
Town Hall, *Hon. District Secretary.*
Walthamstow.
March 11, 1912.

### VISITS.

A visit will be paid to the Building Trades Exhibition at Rusholme, Manchester, to-morrow (Saturday) at 2 o'clock.

Programme.

2 p.m.—Meet at the Exhibition entrance, Old Hall-lane.
2.15 p.m.—Informal meeting within the Exhibition.
3 p.m.—Proceed to inspect the various exhibits.
5 p.m.—Tea, at the kind invitation of Mr. H. Greville Montgomery, director of the Exhibition.

A visit will be paid to the showrooms and works of Messrs. Doulton & Co., Limited, Albert Embankment, London, on Wednesday, March 27, at 2.30 p.m.

Members will assemble in the showrooms at 2.30, and the processes to be seen during the round of visits will include the manufacture of drain pipes and other sanitary stoneware, fireclay stoves, architectural terra-cotta, and Doulton and other art ware.

### EXAMINATIONS.

The next examination will be held in May next, at centres to be arranged. The papers set at the November examinations may be obtained in book form, price 1s., post free.

B. Wyand,
39 Victoria-street, S.W. *Secretary.*

**Drainage Works and Sanitary Fittings.** A third edition, revised and brought up to date, particularly as regards the questions of concrete sewers, sewer ventilation and flushing, and the Public Health Acts Amendment Act of 1907, still further evidences the success of this little manual,* which manifestly deserves the attention and confidence of all concerned in the important subject with which it deals.—*The Bookseller.*

* "Drainage Work and Sanitary Fittings." By Wm. H. Maxwell. Price 2s. nett. London: St. Bride's Press, Limited, 24 Bride-lane, Fleet street, E.C.

## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned* (*No.* 1359 *Holborn*), *subject to later confirmation by letter.*

Inspectors of Nuisances.—March 16th.—Smethwick Town Council. £100 per annum.—Mr. W. Shakespeare, town clerk.

Clerk of Works.—March 18th.—Horbury Urban District Council. £3 per week.—Mr. J. H. Drew, engineer.

Clerk of Works.—March 18th.—West Riding County Council. £2 5s. per week.—Mr. F. A. Darwin, clerk, County Hall, Wakefield.

Engineering Assistant.—March 19th.—Southport Corporation. £160.—Mr. J. E. Jarratt, town clerk.

Inspector of Nuisances.—March 19th.—Woodstock Rural District Council. £150 per annum.—Mr. A. G. Higgs, clerk, Woodstock.

Surveying Assistant.—March 19th.—Southport Corporation. £120.—Mr. J. E. Jarratt, town clerk.

Road Foreman and Building Inspector.—March 20th.—Buxton Urban District Council. £1 17s. 6d.—£2 5s. per week.—Mr. F. Langley, engineer and surveyor.

Assistant Surveyor.—March 21st.—Ripley Urban District Council. £70 per annum.—Mr. G. Whitcombe, clerk.

Sub-Inspectors (2).—March 21st.—Corporation of Burnley. £2 10s. per week.—Mr. Peregrine Thomas, town clerk.

Surveying Assistants.—March 22nd.—Corporation of Poole. £1 15s. and £1 5s. per week.—Mr. Samuel J. Newman, borough surveyor.

Assistant Surveyor.—March 23rd.—Newton-in-Makerfield Urban District Council. £70—£75.—Mr. Cornelius Cole, clerk.

Tracing Clerk.—March 25th.—Bethnal Green Borough Council. £60 per annum.—Mr. C. G. E. Fletcher, town clerk.

County Surveyor's Assistant.—March 28th.—Salop County Council. £2 per week.—Mr. F. Crowte, clerk, Shrewsbury.

Engineering Assistant.—April 2nd.—Paignton Urban District Council. £4 4s. per week.—Mr. James R. Mill, clerk.

Chief Engineer.—April 15th.—Board of Trustees for the Improvement of Calcutta. 2,000 rupees per mensem, rising to 2,500 rupees.—Mr. C. H. Bompas, chairman, 5 Clive-street, Calcutta.

Land Valuer.—April 15th.—Board of Trustees for the Improvement of Calcutta. 1,250 rupees per mensem, rising to 1,500 rupees.—Mr. C. H. Bompas, chairman, 5 Clive-street, Calcutta.

Assistant Engineers.—May 1st.—Indian Public Works and State Railway Departments.—Secretary, Judicial and Public Department, India Office, London, S.W.

Clerk of Works.—Cleckheaton Urban District Council. £3 per week.—The Clerk.

## MUNICIPAL COMPETITIONS OPEN.

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Portland.—April 4th. Designs and plans for council offices, for the urban district council. Premiums of £50 and £10 are offered.—Mr. R. A. Colenutt, clerk.

Wombwell.—May 1st. Designs for public swimming bath, for the urban district council.—Prizes of £40, £30 and £20 are offered.—Mr. W. Quest, surveyor.

Hale.—June 28th.—Designs for a town planning scheme for the urban district council. Premiums of £50 and £25 are offered.—The Clerk.

Düsseldorf.—July 1st.—Plan for the extension of the city. Premiums of £1,000 and £375 are offered.—The Chief Burgomaster.

## MUNICIPAL CONTRACTS OPEN.

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### Buildings.

Gloucestershire.—March 16th.—For walling and other work, for the Education Committee.—Mr. R. S. Phillips, architect, Shire Hall, Gloucester.

Harwich.—March 16th.—For the construction of bathing huts, for the corporation.—Mr. A. J. H. Ward, town clerk.

Macclesfield.—March 17th.—For additions to public baths, for the corporation.—Chairman of the Baths Committee.

Leicester.—March 18th.—For work of walling, for the corporation.—Mr. T. C. Hughes, town clerk.

Harrogate.—March 18th.—For alterations to old town hall, for the corporation.—Mr. C. E. Rivers, borough engineer and surveyor.

Southampton.—March 18th.—For the reconstruction of superstructure of Brockenhurst Bridge, for the county council.—Mr. H. Barber, clerk, The Castle, Winchester.

Glamorgan.—March 18th.—For the erection of a new school at Glyn Neath, domestic science centre at Oystermouth school, domestic science centre at Skewen school, and new girls' school at Aber, Ogmore Vale, for the county council.—Mr. W. E. R. Allen, deputy clerk, County Council Offices, Westgate-street, Cardiff.

Grimsby.—March 18th.—For building latrines, for the Education Authority.—Mr. D. Chandler, Education Offices, Grimsby.

Huddersfield.—March 18th.—For the erection of a shelter, for the corporation.—Town Clerk.

East Sussex.—March 18th.—For the erection of a school, for the Education Committee.—Mr. F. J. Wood, county surveyor, County Hall, Lewes.

Warwick.—March 19th.—For alterations to Heathcote Hospital, for the Joint Board.—Mr. J. Tibbits, clerk, Warwick.

Durham.—March 19th.—For the erection of three schools, for the county council.—Mr. J. A. L. Robson, county secretary for higher education, Shire Hall, Durham.

Monmouthshire.—March 19th.—For alterations to a school, for the Education Committee.—Mr. C. Dauncey, secretary, County Council Offices, Newport (Mon.).

Leeds.—March 20th.—For the extension of a school building, for the Education Committee.—Mr. J. Graham, secretary.

Keighley.—March 20th.—For the erection of a toolhouse, for the rural district council.—Mr. J. W. Clarkson, clerk.

Portsmouth.—March 20th.—For the erection of two shelters, for the corporation.—Mr. G. H. Etherton, town clerk.

Finchley.—March 23rd.—For the erection of an elementary school, for the urban district council.—Mr. E. H. Lister, clerk.

Bristol.—March 25th.—For the erection of a dockmaster's house, for the Docks Committee.—Secretary, Docks Committee.

Hanwell.—March 25th.—For alterations to free library, for the urban district council.—Mr. P. Scott, clerk.

Braintree.—March 25th.—For the construction of an open-air swimming bath, for the urban district council.—Mr. H. J. Cunnington, clerk.

Salop.—March 25th.—For the erection of a school at Oswestry, for the Education Committee.—Mr. W. H. Pendlebury, M.A., secretary, Shire Hall, Shrewsbury.

Ely.—March 25th.—For the erection of a house, offices, and cottages, for the county council.—Mr. R. S. W. Perkins, county surveyor.

Oldham.—March 26th.—For the extension of town hall and municipal buildings, for the corporation.—Mr. J. H. Hollsworth, town clerk.

Croydon.—March 26th.—For the erection of boiler-house and chimney, for the corporation.—Town Clerk.

West Sussex.—March 26th.—For the erection of a school, for the Joint Education Committee.—Mr. L. Thompson, secretary, Thurloe House, High-street, Worthing.

East Riding.—March 27th.—For the erection of two schools, and work of alterations and additions, for the county council.—Mr. J. Bickersteth, clerk, Education Committee, County Hall, Beverley.

Norfolk.—March 27th—April 17th.—For the enlargement of two schools, for the Education Committee.—Mr. T. A. Cox, secretary, Education Office, Shire Hall, Norwich.

Glasgow.—March 27th.—For the construction of swing bridges over Forth and Clyde Canal, for the corporation.—Mr. John Bowers, town clerk.

Belfast.—March 27th.—For alterations at public baths, for the corporation.—Mr. R. Meyer, town clerk.

Chelmsford.—March 27th.—For the erection of thirty-eight working-class dwellings in five blocks, for the corporation.—Mr. W. Smith, town clerk.

Salisbury.—April 3rd.—For the erection of a new roof to engine-room, for the corporation.—Mr. W. J. Goodwin, city engineer and surveyor.

## Iron and Steel.

Watford.—March 19th.—For the supply of paper-insulated cables, for the urban district council.—Mr. W. Hudson, clerk.

Hindley.—March 25th.—For the supply of vertical spindle centrifugal pump and electric motor, for the urban district council.—Mr. T. Robey, clerk.

Hemsworth.—March 26th.—For the supply of water-main pipes, valves, and hydrants, for the rural district council.—Mr. J. Scholefield, clerk.

## Roads.

Halifax.—March 16th.—For private improvement works, for the Highways Committee.—Mr. P. Saunders, town clerk.

Bridge.—March 18th.—For the supply of flints and gravel, for the rural district council.—Mr. T. L. Collard, clerk, The Workhouse, Bridge, near Canterbury.

Newark.—March 18th.—For the supply of road materials, for the corporation.—Mr. G. Tallents, town clerk.

Thurnscoe.—March 18th.—For the supply of broken granite, granite chippings, broken slag, slag screenings, flags, kerbs, setts, channelling, asphalte, and pipes, for the urban district council.—Mr. J. Ledger Hawksworth, clerk, Bolton-upon-Dearne.

Blackburn.—March 18th.—For making up certain streets, for the corporation.—Mr. W. Stubbs, borough engineer.

Easington.—March 18th.—For paving certain streets, for the rural district council.—Mr. J. M. Longden, clerk.

Plymouth.—March 18th.—For making up a street, for the corporation.—Mr. J. Paton, borough engineer.

Llanfrechfa Upper.—March 18th.—For road metalling, hauling, &c., for the urban district council.—Mr. W. Clark, clerk, Coronation-road, Cwmbran, Mon.

Lower Bebington.—March 18th.—For the supply of macadam, setts, kerbs, channels and flags, for the urban district council.—Mr. H. W. Corrie, surveyor.

Altrincham.—March 18th.—For the supply of road materials, for the urban district council.—Mr. H. E. Brown, surveyor.

Antrim.—March 18th.—For hire of steam rollers, for the county council.—County Surveyor, Court House, Belfast.

Hornsey.—March 18th.—For making up work, for the corporation.—Mr. F. D. Askey, town clerk.

King's Lynn.—March 18th.—For the supply of road materials, for the corporation.—Mr. Alfred J. Smith, borough surveyor.

Kidderminster.—March 19th.—For the supply of road materials, for the rural district council.—Mr. G. J. Shepherd, surveyor.

Bilston.—March 19th.—For the supply of broken Rowley rag or granite, for the urban district council.—Mr. John D. Wassell, clerk.

Chester-le-Street.—March 19th.—For the supply of road materials, for the rural district council.—Mr. G. W. Ayton, highway surveyor.

Shardlow.—March 19th.—For the supply of Leicestershire granite, ironstone slag, granite kerbing and sanitary pipes, for the rural district council.—Mr. J. S. Wooddisse, surveyor, Aston-on-Trent, Derby.

Ware.—March 19th.—For the supply of broken blue Guernsey granite, for the urban district council.—Mr. G. H. Gisby, clerk.

Abergavenny.—March 19th.—For the supply of broken and unbroken stone, for the rural district council.—Mr. A. J. Willcox, district surveyor.

Carlton.—March 19th.—For the supply of granite, slag and tar-macadam, for the urban district council.—Mr. J. C. Hallar, engineer and surveyor.

Lexton and Winstree.—March 19th.—For the supply of materials, team labour and road-roller, for the rural district council.—Mr. G. E. Thompson, clerk, Victoria Chambers, Colchester.

Tutbury.—March 20th.—For the supply of broken granite and limestone, for the rural district council.—Mr. H. S. Tebbitt, surveyor, Tatenhill, Burton-on-Trent.

Stockbridge.—March 20th.—For the supply of road material, for the urban district council.—Mr. J. Marsden, clerk.

Hallaton.—March 20th.—For the supply of broken granite, for the rural district council.—Mr. J. L. Douglass, clerk, Market Harborough.

Hampstead.—March 21st.—For laying wood blocks, for the borough council.—Mr. O. E. Winter, borough surveyor.

Devizes.—March 21st.—For the supply of material, team haulage and manual labour, for the rural district council.—The surveyor.

Horbury.—March 21st.—For the supply of macadam, tar-macadam, flags, kerbs and setts, for the urban district council.—Mr. J. H. Drew, engineer and surveyor.

Tring.—March 21st.—For the supply of kerb, setts, broken granite and flints, for the urban district council.—Mr. S. S. Gettings, surveyor.

Dewsbury.—March 21st.—For the supply of granite setts, for the corporation.—Mr. H. Ellis, town clerk.

Ormskirk—March 21st.—For the supply of road materials, for the urban district council.—Mr. H. W. Chadwick, surveyor.

Croft.—March 21st.—For the supply of whinstone and slag, for the rural district council.—Mr. J. Hodgson, surveyor, North Cowton, Darlington.

Chester-le-Street.—March 21st.—For the supply of Northumberland whinstone, broken slag, tarred slag, limestone, &c., for the urban district council.—Mr. F. J. Gray, clerk.

Newmarket.—March 22nd.—For the supply of broken granite and tar-binder, for the urban district council.—Mr. S. J. Ennion, clerk.

Pontefract.—March 22nd.—For making up a street, for the rural district council.—Mr. J. D. Smith, clerk.

Whitby.—March 22nd.—For the supply of broken whinstone and mixed screenings, for the rural district council.—Mr. J. Lyth, surveyor.

Merton.—March 22nd.—For making up two roads, for the urban district council.—Mr. G. Jerram, surveyor.

Wood Green.—March 22nd.—For street improvement work, for the urban district council.—Mr. W. P. Harding, clerk.

Cambridgeshire.—March 22nd.—For the hire of steam rollers, for the county council.—Mr. J. E. Blackwall, county surveyor.

Guiseley.—March 23rd.—For the supply of granite, limestone, whinstone and tar-macadam, for the urban district council.—Mr. J. Battye, surveyor.

Gateshead.—March 23rd.—For the supply of whinstone, macadam, granite macadam, whin setts, whin kerb, flags, and gullies, for the corporation.—Mr. W. Swinburne, town clerk.

Sudbury.—March 23rd.—For the supply of road materials, disinfectants, and stoneware pipes, for the corporation.—Mr. W. J. Tait, borough surveyor.

Pocklington.—March 23rd. For the supply of blue stone and slag, for the rural district council. Mr. Thomas Robson, clerk.

Norden.—March 23rd.—For the supply of granite setts, flags, kerbs, and macadam, for the urban district council.—The Surveyor.

Rowley Regis.—March 25th.—For the supply of road stone, for the urban district council.—Mr. D. Wright, clerk, Old Hill.

Itchen.—March 25th.—For work in thirteen streets, for the urban district council.—Mr. T. A. Collingwood, surveyor, Council Offices, Woolston.

Stamford.—March 25th.—For the supply of broken granite, for the corporation. — Mr. F. R. Ryman, borough surveyor and engineer.

Melton Mowbray.—March 25th.—For works of asphalting and repairs, for the rural district council. —Mr. E. C. Moorhouse, surveyor.

Ticehurst.—March 25th.—For the supply of broken granite, unbroken Kentish ragstone, and broken Sevenoaks stone, for the rural district council.—Mr. W. N. Wood, surveyor, Etchingham, Sussex.

Steyning West.—March 25th.—For the supply of flints and granite, for the rural district council.—Mr. F. Slaughter, engineer and surveyor.

Thame.—March 25th.—For the supply of road materials, for the urban district council.—Mr. J. T. Robinson, surveyor.

Tenterden.—March 25th.—For the supply of road materials, for the rural district council.—Mr. W. L. C. Turner, district surveyor.

Claypole.—March 25th.—For the supply of granite and slag, for the rural district council.—Mr. F. C. Meyrick, district surveyor, Beckingham, Newark.

Clayton-le-Moors.—March 25th.—For the supply of road materials, for the urban district council.—Mr. A. Dodgeon, surveyor.

Malling.—March 26th.—For the supply of quartzite, basalt or granite, for the rural district council.—Mr. F. J. Allison, clerk.

Gateshead.—March 26th.—For the execution of cement path work, for the corporation.—Mr. N. P. Pattinson, borough surveyor.

Croydon.—March 26th.—For work of street repair, for the corporation.—Mr. F. C. Lloyd, town clerk.

Worsley.—March 27th.—For the supply of macadam, granite setts, lonkey setts, grit setts, granite chippings, &c., and making up certain streets, for the urban district council.—Mr. J. P. Monks, clerk.

Halifax.—March 27th.—For work of steam rolling, for the rural district council.—Mr. F. Gordon, surveyor.

Barnet.—March 27th.—For making up a private street, for the urban district council.—Mr. Hy. W. Poole, clerk.

Chippenham.—March 28th.—For the supply of granite, basalt, and limestone, for the rural district council.—Mr. A. H. Lapham, surveyor, Corsham, Chippenham, Wilts.

Market Harborough.—March 28th.—For the supply of granite, for the rural district council.—Mr. W. H. Blount, surveyor, Loughton, Rugby.

Croydon.—March 28th.—For treating road surfaces with Tarvia, for the rural district council.—Mr. J. S. Killick, highways surveyor.

Peterborough.—March 28th.—For the supply of jarrah wood-paving blocks, Portland cement, and stone, for the corporation. Mr. J. W. Walshaw, city surveyor.

Magor.—March 30th.—For the supply of broken stone and gravel, for the rural district council.—Mr. A. H. Rees, clerk.

Goole.—March 30th.—For the supply of stone tar macadam, asphalt and ashes, for the rural district council.—Mr. G. England, clerk.

Bilkington.—April 1st.—For the supply of stone, for the urban district council.—Mr. E. Cuthbert, surveyor.

Bridgwater.—April 1st.—For the supply of broken granite, for the rural district council.—Mr. T. M. Reed, clerk.

Maldon.—April 2nd.—For the supply of broken granite, basalt, slag, Kentish rag, flints, gravel, picked stone, carting, and steam rolling, for the rural district council.—Mr. Edgar J. Ennals, surveyor.

Mothram.—April 11th.—For the supply of rock setts, for the urban district council.—Mr. F. Thompson, clerk, 123 Stamford-street, Stalybridge.

Berwick.—For leading and breaking 2,000 yds. of road metal, for the sanitary authority.—Mr. W. Weatherhead, clerk.

## Sanitary.

Wirral.—March 16th. For emptying ashpits and cesspools, for the rural district council.—Mr. J. E. S. Ollive, clerk.

Raunds.—March 18th.—For the construction of sewage disposal works, for the urban district council. —Mr. W. F. Corby, clerk.

Weymouth.—March 18th.—For laying glazed stoneware drains, for the rural district council.—Mr. H. A. Huxtable, clerk.

Mirfield.—March 18th.—For laying pipe sewer and manholes, for the urban district council.—Mr. E. B. Wilson, clerk.

Erith.—March 18th.—For laying cast-iron sewer, air main, &c., for the urban district council.—Mr. J. Kennedy Allerton, clerk.

South Mimms.—March 18th.—For the construction of stoneware pipe surface-water sewer, gullies, &c., for the rural district council.—The Clerk, High-street, Barnet.

Higher Bebington.—March 18th.—For the removal of refuse, for the urban district council.—Mr. G. M. Lloyd, surveyor, King-street, Rock Ferry.

Stirlingshire.—March 18th.—For laying sewers at Rumford, for the Eastern District Committee.—Mr. J. H. Burns, district clerk, Falkirk.

Plymouth.—March 18th.—For the removal of refuse, for the corporation.—Mr. J. Paton, borough surveyor.

Mitcham.—March 19th.—For scavenging work, for the rural district council.—Mr. E. John Gowen, clerk.

Shrewsbury.—March 19th.—For laying pipe sewer and manholes, for the corporation.—Mr. W. C. Eddowes, borough surveyor.

Rhondda.—March 19th.—For laying cast-iron pipe sewer, for the urban district council.—Engineer and Surveyor.

Llantarnam.—March 19th.—For work of scavenging, for the urban district council.—Mr. A. Gordon Jones, surveyor, Cwmbran.

Keighley.—March 20th.—For work of scavenging, for the rural district council.—Mr. T. Burton, inspector of nuisances, 80 Cark-road.

Wendover.—March 20th.—For the construction of sewage disposal works, for the rural district council. —The Clerk.

Tutbury.—March 20th.—For the removal of refuse, for the rural district council.—Mr. H. S. Tebbitt, sanitary surveyor, Tatenhill.

York.—March 21st.—For the construction of sewage disposal works at Naburn, for the corporation.—Mr. F. W. Spurr, city engineer.

Wenlock.—March 21st.—For the construction of sewers and sewage disposal works, for the corporation. —Mr. F. H. Potts, town clerk.

Milan.—March 22nd. For laying sewer, for the municipality.—Assessore, Palazzo Communale, Milan.

Huntingdon.—March 22nd.—For scavenging work, for the rural district council.—Inspector of Nuisances.

Wolverhampton.—March 23rd.—For the supply of galvanised sanitary pans and dustbins, for the corporation.—Team Committee, Town Hall.

Hindley.—March 23rd.—For the construction of cast-iron main sewer, for the urban district council.— Mr. Thomas Robey, clerk.

Itchen.—March 25th.—For laying surface-water drainage, for the urban district council.—Mr. T. A. Collingwood, surveyor, Woolstan.

Dover.—March 25th.—For work of scavenging and street watering, for the corporation.—Mr. W. C. Hawke, borough engineer.

Orsett.—March 26th.—For the construction of sewage disposal works, main sewerage, machinery, ejectors, air mains, &c., for the rural district council. —Mr. James Beck, clerk.

Swansea.—March 28th.—For laying pipe sewer, for the corporation.—Borough Engineer.

Hampton Wick.—March 29th. For horsing and driving water vans and scavenging, for the urban district council.—Mr. L. Fawssett, clerk.

York.—March 30th.—For the construction of works of sewage disposal, for the corporation.—Mr. F. W. Spurr, city engineer.

Stanley.—March 30th.—For the removal of house refuse, for the urban district council.—Mr. J. Harris, sanitary inspector.

Oswestry.—April 1st.—For the construction of stoneware pipe sewers, manholes, &c., for the rural district council.—Mr. C. H. Bull, clerk.

## Stores.

Leek.—March 18th.—For the supply of flags, kerbs, grit setts, Portland cement, bass brooms, macadam stone, cast manhole covers, grids, &c., for the urban district council.—Mr. W. E. Beacham, surveyor and water engineer.

Pembroke.—March 19th.—For the supply of road materials, ironmongery, harness, sewer pipes, Portland cement, and carting, for the urban district council.—Mr. J. C. Manley, clerk.

Sutton Coldfield.—March 19th.—For the supply of granite macadam and kerb, limestone macadam and setts, gravel, Yorkshire or Pennant kerb, Rowley setts, earthenware pipes, cement, lime, castings, iron, steel, &c., for the corporation.—Mr. W. A. H. Clarry, borough surveyor.

Ogmore and Garw.—March 25th.—For the supply of ironmongery, petroleum, disinfectants, Portland cement, paving, kerb, channel stone, manhole covers, stoneware pipe sewers, and bricks, for the urban district council.—Mr. W. T. Olivant-Jones, engineer and surveyor.

Irlam.—March 25th.—For the supply of road materials, Portland cement, stoneware pipes, hire of steam road-roller, oil and brooms, for the urban district council.—Mr. Joseph Cooke, clerk.

Colwyn Bay.—March 30th.—For the supply of drain pipes, ironmongery, disinfectants, pitch, tar and road materials, for the urban district council.—Mr. J. Amphlett, clerk.

## Miscellaneous.

Ipswich.—March 20th.—For the supply of ironwork, paints, cement, tar, and the execution of jobbing work, for the corporation.—Borough Surveyor.

Kent.—March 23rd.—For the supply of shovels, forks, scavenging brooms, scoops, scrapers, cart grease, tallow and oil, for the county council.—Mr. W. B. Prosser, clerk.

Larne.—March 23rd.—For scavenging, supplying horses and men, brushes, road materials, and gully traps, for the urban district council.—Mr. W. G. Younge, clerk.

Penarth.—March 30th.—For the supply of a steam or petrol motor wagon, trailer, and water van, for the urban district council.—Mr. George Wainwright, clerk.

# TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

ARDSLEY.—Accepted for scavenging work, for the urban district council.—Mr. J. Morley, surveyor:—
E. Parkin & Sons, Barnsley, £300.

AUCKLAND.—For the construction of sewage disposal works at Witton Park, for the rural district council:—

| | |
|---|---|
| G. E. Simpson, Newcastle-on-Tyne | £2,695 |
| T. Pearson, Stockton-on-Tees | 2,040 |
| R. Naylor & Son, Bradford | 2,029 |
| J. Carrick, Durham | 2,000 |
| J. & R. Wood, Brandon | 1,970 |
| R. Hudson & Son, Sunderland | 1,888 |
| J. W. Henderson, Newcastle-on-Tyne | 1,854 |
| R. Wilson, Barnard Castle | 1,820 |
| F. Sawerby, Caundon | 1,813 |
| Walton Brothers, Crook | 1,800 |
| A. Hyslop, Manchester | 1,710 |
| G. W. Hetherington, Caundon | 1,611 |
| M. France, Limited, Redcar | 1,500 |
| J. Robson, Newcastle* | 1,311 |

AUCKLAND.—For the construction of sewage disposal works at Eyewood, for the rural district council:—

| | |
|---|---|
| T. Pearson, Stockton-on-Tees | £2,540 |
| J. Carrick, Durham | 2,348 |
| A. Hyslop, Manchester | 2,256 |
| Naylor & Son, Bradford | 2,245 |
| G. E. Simpson, Newcastle-on-Tyne | 2,243 |
| R. Hudson & Son, Sunderland | 2,186 |
| F. Sawerby, Caundon | 2,087 |
| J. & R. Wood, Brandon | 2,011 |
| Walton Brothers, Crook | 2,010 |
| R. Wilson, Barnard Castle | 1,978 |
| J. W. Henderson, Newcastle-on-Tyne | 1,978 |
| G. W. Hetherington, Caundon | 1,900 |
| M. France, Limited, Redcar | 1,820 |
| J. Robson, Newcastle* | 1,791 |

BERMONDSEY.—For the enlargement of the Riley-street School for mentally defective children by 50 places, for the London County Council:—

| | |
|---|---|
| F. Smith & Co., Abchurch-lane | £2,088 |
| W. Smith & Son, Harleyford-road | 2,016 |
| Rice & Son, Stockwell-road | 2,015 |
| H. Groves, Greenwich | 1,897 |
| Galbraith Brothers, Limited, Camberwell-green | 1,889 |
| G. Parker & Sons, Peckham | 1,860 |
| T. D. Lenz, Deptford | 1,795 |
| J. Marsland & Sons, Walworth | 1,788 |
| J. Appleby & Sons, Southwark-park | 1,766 |
| W. King & Son, Vauxhall-bridge-road | 1,745 |
| E. A. Roome & Co., Basinghall-street | 1,716 |

Architect's estimate, £1,728.

An error in lithography has been discovered in the quantities, the word "feet" appearing in the place of "yards" in one item, and the first and second tenders are based on the price per foot for the item in question. Messrs. Appleby & Sons, who submit the next tender, noticed the error and priced their quantity at "yards" accordingly. The tenders of E. A. Roome & Co. and W. King & Son would be increased to £1,785 and £1,808 respectively by the rectification of the error referred to, and the tender of Appleby & Sons thereupon becomes the lowest. The Education Committee propose, therefore, that this tender shall be accepted.

BEVERLEY. For the supply of stone for macadamising, for the rural district council.—Mr. E. Picker, surveyor:—
R. Summerson & Co., Cockfield.
Ord & Maddison, Darlington.
W. Winn, Great Ayton.
J. F. Shackleton & Son, Goole.
Monkhouse & Peart, Wearhead.
Craddock, Allison & Co., Eaglescliffe.
Summerfield & Mead, Hull.
Kaltenbach & Schmitz, Hull.
Shap Company, Shap.
P. W. Spencer, Skipton.
J. Green & Son, Silsden.
Ribblesdale Lime Company, Burley Grange.
Lunedale Company, York.
A. Gladstone, Grosmont.
Middlesbrough Slag Company, Middlesbrough.
W. L. Shooter, Hornsea.
Leeds Sand and Granite Company, Leeds.

BOOTLE.—Accepted for the supply of stores and repairs, for the corporation.—Mr. B. J. Wolfenden, borough engineer and surveyor:—
Scavenging Brooms and Horse Brush and Motor Brush Stocks.—W. Marshall, Liverpool.
Soft Sweeping Brushes.—W. Morgan, Liverpool.
Cement, Lime, Mortar, Bricks.—J. Parr, Limited, Bootle.
Speik Baskets.—T. Porter & Sons, Liverpool.
Creosote Oil and Tar.—G. Atkin, Liverpool.
Cane Baskets.—W. Baldwin, Bootle.
Castings.—E. Wilson & Co., Liverpool.
Vans and Wagons.—E. Mills, Bootle.
Smithwork.—T. Gascoigne, H. Ormandy, and R. D. Milles, all of Bootle.
Chandlery.—J. J. Harley, Limited, Liverpool. Matchless Metal Polish Company, Limited, Liverpool. W. T. Wright, Siddall & Co., of Bootle.
Timber.—F. & G. Smith and R. D. Milles.
Oil Paints, Lubricating Oils, Glass and Glazing, and certain Chandlery items.—W. Ellis, Bootle.
Paraffin Oil and Boiled and Raw Linseed Oils.—W. Curtis, Bootle.
Heavy Engine and Solidified Oils.—J. Light & Son, Limited, Liverpool.
New Public Convenience, Cyprus-road.—Woods, Benson & Co., Bootle.
Private Improvement Works in Back Streets between Oxford-road, Hadfield-road Fernhill-road, and for Passage at the rear of Nos. 175 to 191 Marsh-lane.—T. Harris, Bootle.

BOURNEMOUTH.—The Finance Committee recommend the acceptance of tenders as follows:—
Brooms and Brushes.—A. E. Kitcher at 17½ per cent. below schedule price.
Horse Hire.—W. Mitchell, for the Boscombe, Pokesdown, and Southbourne district at 8s. 6d. per day, and G. Troke, for the remainder of the borough at 8s. 9d. per day.
Tools, &c.—W. Haydon, at 12½ per cent. below schedule A and 15 per cent. below schedule B.
Cherbourg Quartzite.—Road Maintenance and Stone Supply Company, Limited, for the supply of Cherbourg quartzite at 12s. 10d. per ton Central Station, 12s. 7d. West Station, 13s. per ton Boscombe Station, and 13s. 6d. to any of the wharves or roads in the borough.
Coarse Gravel.—G. Troke, for coarse gravel at the following prices: delivered to Central District at per cube yard, 4s.; East District, 3s. 7d.; West District, 4s. 6d.; North District, 3s. 6d. H. Hooper, for coarse binding gravel at the following prices: delivered to Central District at per cube yard, 5s. 6d.; East District, 6s. 6d.; West District, 5s. 3d.; North District, 5s.
Fine Gravel.—H. Hooper, at the following prices: delivered to Central District, fine gravel at per cube yard, 4s. 8d.; East District, 5s. 3d.; West District, 4s.; North District, 3s. 8d. Not Gravel delivered at Central District at per cube yard, 6s. 3d.; East District, 6s. 9d.; West District, 6s.; North District, 6s.

CARDIFF.—For public street works, supply of stone, cement, harness, paints, ironmongery, &c., for the corporation.—Mr. W. Harpur, city engineer:—
Limestone and Gravel.—Osmond & Sons, Ely; Lewis Brothers, Burns Powis.
Hard Stone and Gravel.—Hillhouse Quarry Company, Troon.
Cement.—J. C. Johnson & Co., Cardiff.

| Sections— | | |
|---|---|---|
| 1 | W. Davis & Son, Cardiff | £ 50 |
| 2 | Blacklock & McArthur, Cardiff | 120 |
| 3 | Cross Brothers, Limited, Cardiff | 331 |
| 5 | J. Williams & Sons (Cardiff), Limited, Cardiff | 159 |
| 6 | Cross Brothers, Limited, Cardiff | 118 |
| 7 | ,, ,, ,, | 56 |
| 8 | ,, ,, ,, | 216 |
| 10 | ,, ,, ,, | 73 |
| 11 | J. Williams & Sons (Cardiff), Limited, Cardiff | 57 |
| 12 | A. E. Smithson & Co., Cardiff | 43 |
| 13 | Bonnyman Brothers & Co., Cardiff | 14 |
| 13a | Goodall & Simpson, Cardiff | 15 |
| 14b | Bonnyman Brothers & Co., Cardiff | 24 |
| 15 | J. Williams & Sons (Cardiff), Limited, Cardiff | 140 |
| 16 | ,, ,, ,, | 11 |
| 17 | Cross Brothers, Limited, Cardiff, 75% off Trade List Average. | |
| 18 | ,, ,, ,, 65% ,, ,, | |
| 19 | ,, ,, ,, 71½% ,, ,, | |

DISS.—For the supply of granite, for the urban district council.—Mr. A. Cooper, Surveyor:—

| | 2 in.-2½ in. | 1 in. | ¾ in. to dust. | 1 in. clean chips. |
|---|---|---|---|---|
| | s. d. | s. d. | s. d. | s. d. |
| Croft Granite Brick & Concrete Company ... | 12 0 | 9 1 | 9 4 | 10 4 |
| Johnston Brothers (Columnar Basalt) ... | 12 2 | 11 2 | 10 2 | 10 2 |
| Jees Hartshill Granite & Brick Company ... | 12 3 | 10 3 | 9 9 | 10 6 |
| C. Abell, Limited ... ... ... ... | 12 3 | 10 3 | 9 9 | — |
| Ellis & Everard (Charnwood) ... ... | 12 3 | 10 6 | 10 0 | 10 3 |
| Groby Granite Company ... ... ... | *12 3 | 9 6 | 9 0 | 10 0 |
| E. Howes (Norwich), (Quenast.—Full and complete cargoes) ... ... ... ... | 12 4 | 9 6 | 9 0 | 9 0 |
| Johnston Brothers (Northumberland Whinstone) ... ... ... | 12 4 | 10 4 | 10 4 | 10 4 |
| J. R. White & Co. Queensferry) ... ... | 12 5 | 10 11 | 10 11 | 11 2 |
| Cliffe Hill Granite Company ... ... ... | 12 9 | 10 3 | 9 9 | 10 0 |
| Lavender & Bateman (Mountsorrel) ... | 12 9 | 10 6 | 10 0 | 12 0 |
| Whitwick Granite Company (Mount St. Bernard) ... ... ... ... | — | — | *8 9 | — |
| Whitwick Granite Company ... ... | 12 9 | 10 6 | 9 3 | 10 9 |
| Tilbury Contractors & Dredging Company (parcels of about 120 tons) ... ... | 12 9 | 11 6 | 11 0 | 11 9 |
| Enderby & Stoney Stanton Granite Company | 12 10 | 12 10 | 9 10 | 11 1 |
| Felixstowe Docks and Railway Company (Guernsey) ... ... ... | 12 11 | 11 11 | 9 8 | 10 5 |
| Ellis & Everard (Bardon Hill) ... ... | 13 0 | *11 3 | 10 0 | *10 3 |
| British Macadams Limited (Guernsey) .. | 13 2 | 12 9 | 11 2 | 10 4 |
| British Macadams Limited (Budle Crag) .. | 13 2 | 12 9 | 11 2 | 10 4 |
| British Macadams Limited (Penmaenmawr) | 14 0 | 12 7 | 12 0 | 12 2 |
| Road Maintenance & Stone Supply Company (Cheddar Quartzite) ... ... | 13 2 | 12 9 | 11 2 | 10 4 |
| A. & F. Manuelle (Guernsey.—In one or two consignments) ... ... ... ... | 13 4 | 13 6 | 10 6 | 11 5 |
| London Granite Company ... ... ... | 13 6 | 13 6 | 12 6 | 13 0 |
| United Stone Firms Limited (Porthgain.—300 ton lots) ... ... ... ... | 13 8 | 10 11 | 10 11 | 12 8 |
| Ible Basalt Company ... ... ... ... | 14 6 | 13 4 | — | 13 10 |

EAST WESTMORLAND.—For constructing sewer, tank and manhole, for the rural district council.—Mr. J. Ellwood, surveyor:—

| | |
|---|---|
| Lindsay & Robinson, Appleby ... ... ... ... ... ... ... | £48 |
| J. G. Reynoldson, Brough* ... ... ... ... ... ... ... | 45 |

EVESHAM.—For contract No. 1 of the sewage works extensions.—Messrs. Berrington Son & Watney, engineers:—

| | |
|---|---|
| Sangwin & Co., Hull ... ... ... ... ... ... ... | £11,006 |
| Cors, Withers, Worcester ... ... ... ... ... ... | 10,762 |
| C. J. Nevitt, Limited, Stafford ... ... ... ... ... | 10,739 |
| J. Ford, Willesden Junction ... ... ... ... ... ... | 10,282 |
| Hobrough & Co., Gloucester ... ... ... ... ... ... | 10,174 |
| T. Smart, Nottingham ... ... ... ... ... ... ... | 9,700 |
| G. Bell & Sons, Tottenham ... ... ... ... ... ... | 9,687 |
| W. Griffiths & Co., Limited, London .. ... ... ... ... ... | 9,667 |
| T. J. Mason, Stourbridge ... ... ... ... ... ... | 9,374 |
| Johnson Brothers, Gloucester... ... ... ... ... ... | 9,515 |
| P. Wilson & Co., Dunstable ... ... ... ... ... ... | 9,297 |
| Tilt Brothers, Bromsgrove ... ... ... ... ... ... | 9,279 |
| G. Holloway, Wolverhampton ... ... ... ... ... ... | 9,150 |
| A. Braithwaite & Co., Leeds ... ... ... ... ... ... | 9,146 |
| J. Owens, Wolverhampton ... ... ... ... ... ... | 9,078 |
| G. P. Trentham, Handsworth .. ... ... ... ... ... | 9,015 |
| H. Holloway, Wolverhampton ... ... ... ... ... ... | 8,883 |
| A. Hill & Co., Kidderminster ... ... ... ... ... ... | 8,800 |
| M. A. Boswell, Wolverhampton ... ... ... ... ... ... | 8,778 |
| Martin & Element, Smethwick ... ... ... ... ... ... | 8,710 |
| J. Riley, Cheltenham ... ... ... ... ... ... ... | 8,707 |
| W. Thompson & Co., Tipton ... ... ... ... ... ... | 8,692 |
| Espley & Co., Limited, Evesham* ... ... ... ... ... ... | 8,658 |

HUNSLET.—For making up part of a street, for the rural district council.—

| | |
|---|---|
| Boyes & Leach, Leeds ... ... ... ... ... ... ... ... | £558 |
| J. Robinson, Wakefield ... ... ... ... ... ... ... ... | 547 |
| J. Speight, Leeds ... ... ... ... ... ... ... ... | 528 |
| M. Arundel, Wakefield ... ... ... ... ... ... ... ... | 510 |
| G. L. Briggs & Son, Leeds* ... ... ... ... ... ... ... ... | 496 |

ISLINGTON.—For cleaning, painting, and repairing Highbury Industrial School, for the London County Council:—

| | |
|---|---|
| J. Grover & Son, Islington ... ... ... ... ... ... | £1,100 |
| McCormick & Sons, Limited, Essex road ... ... ... ... ... | 1,029 |
| A. E. Symes, Stratford ... ... ... ... ... ... ... | 1,015 |
| W. Silk & Son, Homerton ... ... ... ... ... ... ... | 989 |
| E. Lawrance & Sons, Limited, City-road ... ... ... ... ... | 949 |
| Vigor & Co., Poplar* ... ... ... ... ... ... ... | 810 |

Architect's estimate, £845.

KENNINGTON.—For rebuilding Vauxhall-street School, for the London County Council:—

| | |
|---|---|
| J. Appleby & Sons, Southwark-park ... ... ... ... ... | £23,334 |
| J. Marsland & Son, Wandsworth ... ... ... ... ... ... | 25,541 |
| W. King & Son, Vauxhall-bridge-road ... ... ... ... ... | 25,390 |
| W. Downes, Walworth ... ... ... ... ... ... ... | 25,190 |
| W. Johnson & Co., Limited, Wandsworth-common ... ... ... | 24,350 |
| C. Wall, Limited, Fenchurch-street ... ... ... ... ... | 24,166 |
| G. Godson & Sons, Kirkman-lane ... ... ... ... ... | 23,457 |
| Rowley Brothers, Wood green ... ... ... ... ... | 23,457 |
| J. & C. Bowyer, Limited, Upper Norwood † ... ... ... ... | 22,759 |

Architect's estimate, £23,500

LEWISHAM.—For making-up Collingtree road, for the borough council.—Mr. E. van Putten, borough surveyor.—

| | |
|---|---|
| T. Woods & Sons, Limited ... ... ... ... ... ... ... | £671 |
| J. Mowlem & Co., Limited ... ... ... ... ... ... ... | 604 |
| Fay Brothers ... ... ... ... ... ... ... ... | 543 |
| H. Wareham & Sons ... ... ... ... ... ... ... ... | 541 |
| W. Pearce ... ... ... ... ... ... ... ... | 530 |
| J. T. Glong* ... ... ... ... ... ... ... ... | 489 |

Footways at rear yard entrances.—W. Pearce, £8; Atlas Stone Company, Limited, 3s. 9d.; J. Wainwright & Co., Limited, 4s.; Gibson & Co., 4s. 1d.; Thames Stone Company, Limited, 4s. 2d.

LOSTWITHIEL.—For the construction of a new reservoir, for the corporation:—

| | |
|---|---|
| R. J. Mac. London ... ... ... ... ... ... ... | £1,323 |
| T. Deane, Plymouth ... ... ... ... ... ... ... | 1,052 |
| C. L. Dyke, Plymouth ... ... ... ... ... ... ... | 972 |
| W. T. Bassett, Launceston ... ... ... ... ... ... | 929 |
| J. Oliver, St. Blazey ... ... ... ... ... ... ... | 905 |
| W. F. Bennett, Bodmin* ... ... ... ... ... ... ... | 801 |

Engineer's estimate, £1,064.

RICCALL.—For the supply of road materials, for the rural district council.—Mr. A. Douglas, surveyor:—
Whinstone and Granite.—J. M. Smith & Co., Leeds; Brooks, Limited, Halifax; William Winn, Great Ayton; Ord & Maddison, Darlington; Monkhouse & Peart, Durham.
Limestone (plain and tarred).—J. Green & Son, Silsden; Skipton Rock Company, Skipton; Brough ton Quarries Company, Gargrave.
Slag.—Middlesbrough Slag Company, Middlesbrough. William Schofield & Son, Grosmont.
Sand and Gravel.—Leeds Sand and Gravel Company, Leeds.

STOCKPORT. Accepted for the supply of fencing and gates, for the corporat on.—Mr. J. Atkinson, borough surveyor:—
J. Daniel, Chorley.

STOCKPORT.—For the supply of manual and team labour, paving, &c., for the corporation.—Mr. J. Atkinson, borough surveyor:—
Earthenware and Stoneware Pipes.—Baxendale & Co., Limited, Manchester.
Lancashire Flags and Kerbs.—H. Heys & Co., Limited, Stacksteads; Exors. of R. Siddall, Stacksteads; Brooks and Brooks, Cloughfold; H. K. Taylor, Whitworth; W. Jackson, Bacup.
Lancashire Setts.—W. Chatterton, Upperniill; W. Jackson, Bacup; H. Heys & Co., Limited, Stacksteads; Exors. of R. Siddall, Stacksteads; Brooks and Brooks, Cloughfold.
Derbyshire Grit Setts.—J. Wetton & Sons, Bollington.
Welsh Granite Setts.—Enderby & Stoney Stanton Granite Co., Limited.
Welsh Granite Setts and Macadam.—Penmaenmawr and Welsh Granite Co., Limited; Pwllheli Granite Company.
Scotch Granite Setts, Kerbs, &c.—Newry Granite Company, Manchester; D. Newall, Dalbeattie.
Granite Concrete Flags.—Premier Stone Company, Saltney; Threlkeld Granite Company, Keswick.
Granite Croft Flags.—Sowerbutts, Limited, Stockport.
Granite Concrete Flags.—Threlkeld Granite Company, Keswick.
Portland Cement.—Saxon Portland Cement Company, Cambridge.
Limestone Chippings, Lime.—F. R. Morley & Co., Stockport.
Pitch and Oil.—T. Horrocks & Son, Manchester.
Iron Castings.—P. B. Wolfe, Stockport.
Coal.—Sowerbutts, Limited, Stockport.

WANDSWORTH.—For the erection of public conveniences, for the borough council.—Mr. P. Dodd, borough engineer and surveyor:—
Erection of sanitary convenience for women in High-street, Putney, adjoining London & South-Western Railway.—W. Johnson & Co., Limited,† £696.
Construction of underground sanitary conveniences in Blackshaw-road, near its junction with Tooting High-street—Dowsett & Jenkins,† £1,096.
Erection of sanitary convenience for women on Clapham-common, near Clapham-cross—Dowsett & Jenkins,† £575.

## MEETINGS.

*Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.*

MARCH.

15.—Institution of Civil Engineers: Students' Meeting; Mr. A. E. Gladwyn on "The Heat Value of Fuels." 8 p.m.
15.—Institution of Mechanical Engineers: Dr. Rudolf Diesel, of Munich, on "The Diesel Oil Engine, and its Industrial Importance, particularly for Great Britain." 8 p.m.
15.—Junior Institution of Engineers: Mr. A. H. Weston on "Crude Oil Engines." 39 Victoria-street, S.W. 8.15 p.m.
16.—Institution of Municipal Engineers: Visit to Building Trades Exhibition, Rusholme, Manchester. 2 p.m.
16.—Junior Institution of Engineers: Visit to Lots-road Generating Station. 10 a.m.
19.—Institution of Civil Engineers: Discussion of papers by Messrs. A. B. McDonald and G. Midgley Taylor on "The Main Drainage of Glasgow," and D. H. Morton on "Glasgow Main Drainage: The Mechanical Equipment of the Western Works and of the Kinning Park Pumping Station." 8 p.m.
20.—Institution of Civil Engineers: Students' Visit to the Barking Sewage Outfall Works of the London Main Drainage.
21.—Association of Engineers-in-Charge Annual Dinner, Holborn Restaurant. 6.30 p.m.
26.—Institution of Municipal Engineers: South Eastern District Meeting: Discussion on "The Size and Design of Street Gullies and Weirs." Institution Offices, 7 p.m.
26.—Royal Sanitary Institute: Annual Meeting of Associates; Mr. H. Percy Boulnois, M.Inst.C.E., chairman of council, on "Sanitary Legislation and Education." 7 p.m.
27.—Institution of Municipal Engineers: Visit to Messrs. Doulton & Co.'s Works, Lambeth. 2.30 p.m.

APRIL.

2.—Royal Sanitary Institute: Mr. F. J. Osborne Smith, F.R.I.B.A., on "Sanitary Fittings." 7 p.m.
12-13.—Royal Sanitary Institute: Meeting at Cardiff; Discussion on "The Development of Cardiff Waterworks": visit to waterworks extension at Brecon Beacons.
23.—Surveyors' Institution: Annual Dinner, Whitehall Rooms. 7 p.m.

MAY.

4.—Lower Thames Valley District Surveyors' Association: Annual Meeting and Dinner.

## APPOINTMENTS OPEN.

### COUNTY BOROUGH OF BURNLEY.

APPOINTMENT OF TWO SUB-INSPECTORS.

Applications are invited for the above positions in connection with the construction of Hurstwood Reservoir. Wages £2 10s. per week each. Experience in the construction of impounding reservoirs with high earth embankments and deep trenches is necessary.

Applications, on forms to be obtained at my office, endorsed "Sub-Inspector," must reach me on or before Thursday, the 21st instant.

PEREGRINE THOMAS,
Town Clerk.

Town Hall, Burnley.
March 8, 1912.

## BUXTON URBAN DISTRICT COUNCIL.

### ROAD FOREMAN AND BUILDING INSPECTOR.

The above Council invite applications for the combined appointment of Road Foreman and Building Inspector.

Applicants must be between 30 and 45 years of age, thoroughly experienced in the construction of macadam and paved roads, sewers, and general highway administration, and accustomed to the control and supervision of men and team labour.

Preference will be given to applicants with municipal experience in similar capacity.

Remuneration will be at the rate of 37s. 6d. per week, rising by instalments to £2 5s. on recommendation of the Surveyor.

Forms of application and particulars of duties may be obtained from the undersigned, to whom applications, endorsed "Road Foreman," are to be forwarded not later than Wednesday noon, the 20th March next.

F. LANGLEY,
Engineer and Surveyor.

Town Hall,
Buxton.
March 9, 1912.

## BOROUGH OF POOLE.

A properly qualified Surveying Assistant is required in the Borough Surveyor's Office, at a salary of £1 15s. per week.

Also one at a salary of £1 5s. per week.

Applications to be in candidate's own handwriting, stating age and giving full particulars as to present and previous appointments (with dates), also as to any professional examinations passed, and to be accompanied by copies of not more than three testimonials.

Applications to reach the Borough Surveyor's Office not later than 9 a.m., Friday, March 22nd, 1912.

Canvassing members of the Council will be a disqualification.

SAMUEL J. NEWMAN, F.R.I.B.A.,
Borough Surveyor.

Municipal Offices,
Market-street,
Poole.

REQUIRED, immediately, a Temporary Assistant in the County Surveyor's Department. Salary £2 per week. Preference given to Candidates with experience in Municipal Office. Applications on prescribed form (to be obtained from the undersigned) to be sent in by the 28th March.

F. CROWTE,
Clerk.

Salop County Council, Shrewsbury.

## METROPOLITAN BOROUGH OF BETHNAL GREEN.

### APPOINTMENT OF TRACING CLERK IN THE BOROUGH ENGINEER AND SURVEYOR'S DEPARTMENT.

The Bethnal Green Borough Council invite applications for the appointment of Tracing Clerk in the Borough Engineer and Surveyor's Department. Salary £60 per annum, and the appointment will be subject to the provisions of the Bethnal Green Borough Council Superannuation Act, 1906, and to the candidate appointed passing a medical examination.

Candidates must not be more than 20 years of age, and preference will be given to those who have had some experience in the Tracing and Clerical Work of a Surveyor's Office.

The person appointed must devote his whole time to the services of the Council, and not engage directly or otherwise in any other occupation.

Applications, on forms to be obtained from the Borough Engineer and Surveyor, must be filled in and returned to the undersigned, together with copies of not more than three recent testimonials, on or before 12 noon on Monday, the 25th March, 1912, endorsed "Tracing Clerk."

Canvassing, directly or indirectly, any Member or Officer of the Council will be a disqualification.

C. G. E. FLETCHER,
Town Clerk.

Town Hall,
Cambridge-road, Bethnal Green, E.
March, 1912.

## URBAN DISTRICT COUNCIL OF PAIGNTON.

### ENGINEERING ASSISTANT.

The Council invite applications for the post of a Temporary Engineering Assistant for the purpose of making a survey and preparing and taking levels of the district, showing the present system of drainage, sewerage and water mains.

The salary (which is inclusive of travelling expenses) will be at the rate of £4 4s. per week, and an allowance of £1 1s. per week will be made for the provision of office accommodation, together with engineering and surveying instruments.

Applications, endorsed "Engineering Assistant," to be sent to the undersigned on or before the 2nd April.

Canvassing in any form will be a disqualification.

List of duties can be obtained from the undersigned.

(By order of the Council)

JAMES R. MILL,
Clerk to the Council.

Town Hall, Paignton.
March 12, 1912.

PUPIL required by Urban District Surveyor in the Midlands; water and sewage schemes about to commence; premium required.—Box 1,142, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

## EX-PUPILS AND ASSISTANTS.

ASSISTANT (21), Stud.Inst.M. & Cy.E., desires appointment; four years' experience, including three years' articles with Borough Surveyor; good surveyor (chain and theodolite), leveller and draughtsman; all-round experience (sewerage, roads, water supply, quantities); certificated building construction; office work, stores, &c.; good testimonials. Accept small salary.—"Theta" office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

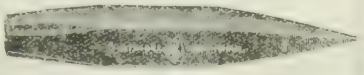
*(Continued on p. xxii.)*

WRITE: ASTON MANOR, BIRMINGHAM.
WIRE: "YATONIAN, BIRMINGHAM."
'PHONE: EAST 400, 401 and 402
(Private Branch Exchange).

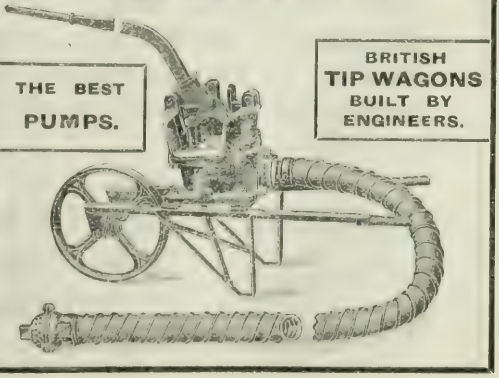
JOHN YATES
& CO., LTD.

ALL KINDS OF
CORPORATION
TOOL MAKERS
SINCE 1804.

HAMMERS, SHOVELS, PICKS and BARROWS.



WEDGES—All Shapes and Sizes.



THE BEST PUMPS.

BRITISH TIP WAGONS BUILT BY ENGINEERS.

## TENDERS WANTED.

CAMBRIDGESHIRE COUNTY COUNCIL.

The above Council invite Tenders for the Hire of Steam Rollers.

Particulars and Forms of Tender may be obtained from this Office, where Tenders are to be delivered on or before Friday, the 22nd March, 1912.

J. E. BLACKWALL,
County Surveyor

County Council Offices,
54 Hills-road,
Cambridge.

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MALDON RURAL DISTRICT COUNCIL.
SUPPLY OF MATERIALS.

Tenders are invited by the above Council for the Supply and Delivery of Materials for the year ending March 31st, 1913—*viz.*: Broken Granite, Basalt, Slag, Kentish Rag, Flints, Gravel and Picked Stone.

Forms of Tender and all particulars may be obtained from the undersigned.

Tenders to be sealed and delivered at my office, 6 Market-Hill, Maldon, not later than Tuesday, 2nd day of April, 1912.

Tenders to be endorsed "Tender for ——."

The Council do not bind themselves to accept the lowest or any Tender.

EDGAR J. ENNALS,
Surveyor.

6 Market-hill,
Maldon.

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MALDON RURAL DISTRICT COUNCIL.
STEAM ROLLING.

The above Council invite Tenders for the Hire of Steam Rollers for the year ending March 31st, 1913.

All particulars and Form of Tender may be obtained of the Highway Surveyor.

Tenders to be sent to me, the undersigned, securely sealed and marked "Tender for Steam Rolling," by Tuesday, April 2nd, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

EDGAR J. ENNALS,
Surveyor.

6 Market-hill,
Maldon.

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MALDON RURAL DISTRICT COUNCIL.
TO CONTRACTORS AND OTHERS.

The above Council invite Tenders for Carting Material from the various Wharves and Railway Stations in the district.

Forms of Tender and full particulars may be obtained from the undersigned.

Tenders, sealed and endorsed "Tender for Carting," must be delivered at my office, 6 Market-hill, Maldon, not later than Tuesday, April 2nd, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

EDGAR J. ENNALS.
Surveyor.

6 Market-hill,
Maldon, Essex.

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ALTON RURAL DISTRICT COUNCIL.
MATERIALS AND STEAM ROLLING.

The Council invite Tenders for Steam Rolling and the Supply of Broken Granite, as may be required during the year ending 31st March, 1913.

Forms of Tender and other information may be obtained from Mr. C. W. Maudsley, Surveyor, Park Close, Alton, Hants.

The Council do not bind themselves to accept the lowest or any Tender. Tenders to be sent in not later than March 30th, 1912.

A. F. M. DOWNIE.
Clerk.

Alton, Hants.
1912.

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AT THE

**Building Trades Exhibition, Rusholme, Manchester,**

MARCH 9th to 23rd, 1912,

THE **RANSOME** NUMBER **IS** ROW **A** STAND NO. **1**

*The exhibit will be of particular interest to Architects, Surveyors, Engineers and Contractors, as it will include*

**TAR-MACADAM MIXER** as supplied to the Southport Corporation,
**CONCRETE MIXER** as used on the new C.P.A. building, Manchester,
**STEEL PILING** as supplied to the Rosyth Naval Base, and
**SELF-DISCHARGING SKIPS** of particular economic interest.

*For all information with regard to the above, write to—*

**RANSOME-verMEHR MACHINERY COMPANY,**
**509 Caxton House,**
**LONDON, S.W.**

TELEPHONE:
2188 VICTORIA.

TELEGRAMS:
"VERMEHRICO, LONDON."

# Building Trades Exhibition, Rusholme, Manchester.

## SPECIAL DESCRIPTION.

The exhibition which was opened on Saturday last at Rusholme, Manchester, is the first of its kind which has been organised by Mr. H. Greville Montgomery in the provinces. He has hitherto confined his activities in this direction to the Metropolis, where he has held International Building Trade Exhibitions biennially since 1895. In that year, the first was held in the Agricultural Hall, but later it became necessary to obtain more extensive accommodation, and in 1907 the exhibition was removed to Olympia, where it may be said to rank as one of the largest and most successful trade exhibitions of its kind. The Manchester show bids fair in time, judging by the support already accorded to it, to run its progenitor pretty closely for a place.

Rusholme is situated within a short car ride of Central Manchester, and the cars practically "pass the door." The building in which the exhibition is held has been specially erected for exhibition purposes. It is a huge rectangular structure, measuring some 560 ft. by 240 ft., and its total floor space is therefore about 135,000 ft. super., and this is completely occupied by the various exhibits. The hall has been tastefully planned, and too much praise cannot be bestowed upon the pleasure grounds—with their lawns (of green felt), their gravel walks (of fibre matting)—which have been laid out by Messrs. John P. White & Sons, of the Pyghtle Works, Bedford. These grounds are open to the public at all hours, and are provided with garden seats and real live boscage. A summer-house pleasantly rounds off the whole, from which the modern bungalow on exhibit may with advantage be excluded. Bars—those essentials to business—and tea and dining accommodation are all to be found, while a feature of great attraction—the bandstand—occupies the exact centre of the hall. Opinions vary as to the advantage to be obtained from a band at a business exhibition. It is held by some that it distracts the attention of possible customers, and that, after all, it appeals almost solely to the members of that portion of the public which comes rather for pleasure than for business. Our experience of shows at which no music was provided has not been a happy one, however, and we are in full agreement with the management, especially having regard to the fact that the band engaged is that of the Grenadier Guards, and that a most attractive and varied programme has been arranged. It would certainly be better if the bandstand had been placed in a gallery, away from actual contact with a number of the exhibits; but as the hall at Rusholme does not contain a gallery, this has not been possible. The exhibitors grouped around the stand may find it a little difficult to sustain a conversation while such an item as the overture to "Tannhauser," or Godfrey's humoreske "A Musical Muddle," is being played.

While nothing upon the gigantic scale of the Olympia Exhibition can yet be expected, its Manchester brother is more comprehensive than is usual in a first enterprise, and is very fairly representative of the trade for which it caters. No attempt has been made on the present occasion to provide a municipal engineering section, but still there is much to attract the engineer, and we have no doubt that as the years go on a special section will be devoted to his interests. Anyway, construction is one of the "side-lines" of the profession of municipal engineering, and the knowledge of building practice and of building materials must enter into that vast assemblage of knowledge which the technical official of a local authority is presumed to have mastered.

It may seem a small matter to mention, but it is one which has an important bearing upon the comfort of those attending an exhibition. It has become a custom of late years to let spaces to anyone applying for them; but the promoters of the Manchester Exhibition have been wise, and have confined their lettings to *bond-fide* building trade exhibitors. Here one is not met by a gentleman who persists in declaring that one's eyes are all wrong and spectacles have become a necessity. The individual with the rubber stamps, too, is absent, and samples of dog food and egg-forces are not thrust upon the unwary visitor. This is as it should be, and every exhibit, without exception, appeals directly to the man interested in building and allied work.

It will be interesting, perhaps, before treating of the more important of the exhibits, to take a general view of the exhibits under their respective classes. Construction should first claim attention, and representing this side of engineering activity we have the exhibit of the Moseley Construction Company, including specimens of their system in concrete, reinforced concrete and terracrete, the last-named a combination of terra-cotta and concrete; and of the Leeds Sand and Gravel Company, with examples of beams and columns in Swain's patent cross-braced system, and of floors in Swain's patent reinforced concrete blocks. Floor construction is represented also by the "Permalithic" flooring of Messrs. G. M. Callender & Co., the Kleine patent fire-resisting floor of reinforced hollow bricks, and the "Terramant" jointless flooring of Messrs. Yates, Holdin & Co. In fire-resisting partitions the more notable exhibit is that of Messrs. F. Jones & Co., manufacturers of the "Hercules" fireproof partition blocks.

Bricks, tiles, terra-cotta, sanitary pipes, and similar ware are all represented by a number of firms, among whom may be mentioned the Bispham Hall Colliery Company, Messrs. S. E. Collier & Co., the Greengate Brick and Tile Co. (represented by Messrs. Hulme & Quick), Messrs. W. Higgins & Sons, the Manchester Stone Company, the Ravenhead Sanitary Pipe and Brick Company, and the Sussex Brick and Estates Company. Concrete is shown in a variety of ways, and to those engaged in the use of this material the exhibit of the Ransome-verMehr Machinery Company, with its hand and power mixers, cement testers, and so forth (of which more later), must strongly appeal. Cement, plaster, gypsum, and similar materials, with their applications, may be seen at the stands occupied by the Carlisle Plaster and Cement Company, Gypsum Mines, Limited, Messrs. G. Jackson & Sons, F. Jones & Co., and others. Among marbles and mosaics, attention may be called to "Marosa," the wall lining of Messrs. D. Anderson & Son, and to the beautiful specimens of work to be

found on the stand of Messrs. J. & H. Patteson. Roofing materials are represented by Messrs. G. M. Callender & Co., Hayward Brothers & Eckstein, Machin & Koenig, Speaker & Co., the Velinheli or Dinorwic Slate Quarries, the Manchester Stone Company, and the "Shark" Grip Tiling Company.

Coming now to the materials and appurtenances belonging rather to the interior of buildings, we have, representing doors (fireproof and otherwise), Messrs. C. Jennings & Co., Machin & Koenig, H. H. Martyn & Co., J. P. White & Sons, and Chubb & Sons. Messrs. H. Howlett & Sons and the Austral Window Balance Company show balanced and reversible window sashes, and Messrs. Hayward Bros. and Eckstein and the Crittall Manufacturing Company metal casements and fastenings. For carving, joinery, panelling, and mouldings the same firms (excluding Messrs. Chubb and Messrs. Hayward Bros. & Eckstein) may be mentioned, with the important addition of the name of Elliott's Moulding and Joinery Company. Ranges, stoves, grates, kitcheners and radiators may be seen at the exhibits of Messrs. Baxendale & Co., Goodall, Lamb & Heighway (agents for the "Devon" fire), Hayward Bros. & Eckstein, C. A. Peters, Limited, and the Hurry Water Heater Company, and the stand of the Patent Tip-up Bath Company is worth the attention of those who have not already seen this firm's speciality.

In no section has greater activity been shown than in that devoted to paints, varnishes, enamels, distempers, and "coverers" generally. The list of firms is a large one, and includes Messrs. Callender & Co., Hilton & Co., Major & Co., C. H. Musselwhite & Son, Thos. Parsons & Sons, C. A. Peters, Limited, Pinchin, Johnson & Co., Sissons Bros. & Co., Ragosine & Co., Ripolin, Limited, the Moseley Construction Company, Bell's United Asbestos Company, "Ronuk," Limited, and the Emdeca Metal Decoration Company. Some of these firms are more particularly noticed below.

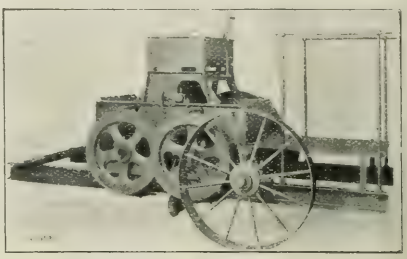
The few remaining exhibits to which brief reference will be made for the nonce are of special interest to municipal engineers. First come the paving materials shown by the Enderby and Stoney Stanton Granite Company, who also show samples of footway paving made by the Empire Stone Company. The Inverawe Granite Company exhibit some of the products of their quarries, as do also the Bispham Hall Colliery Company. "Glutrin" is a road-binding material made by the Robeson Process Company. The process of asphalting and applying tar to roads is catered for by the Ransome ver-Mehr Machinery Company with their Fawcett tar-macadam mixer, the Taroads Syndicate with their well-known asphaltic macadam and tar-spraying machines, and their compounds "Mexphalt," "Pitchmac," and "Tarco," Messrs. Llewellins & James with their tars-spraying machine, and Messrs. Johnston Bros. with their rapid heating "1912" tar boiler and reservoir tar brooms. Interesting exhibits are Messrs. J. & W. Stewart's "cast-in-place" method of concrete piling, and the Ransome ver-Mehr Machinery Company's interlocking system of piling.

The above forms little more than a brief classified list of what is to be seen at Manchester, and a more extended space may now be devoted to a selection from the more important exhibits.

### RANSOME-VERMEHR MACHINERY COMPANY.
Caxton House, Westminster.
(Stand 1. Row A.)

The first exhibit of this company is a No. 4 Ransome tar-macadam mixer (Fawcett's patent), and it is of particular interest, inasmuch as it is similar to the one recently supplied to the Southport Corporation, and now in use at their tar-macadam depot. This type of mixer works on the batch principle, receiving to every batch 9 cub. ft. of stone. This is duly mixed with the necessary proportion of tar, taken from the tar-measuring tank fitted to the mixer. It must be noted, too, that in addition to this accurate measuring and gauging of ingredients, the mixing operation is in full sight of the attendant during the whole period a feature of great importance for tar-macadam; while, for mixing bitumastic materials, the drum at a slight extra cost may be supplied steam-jacketed, in order to maintain the material at that uniform high temperature which is necessary when bitumen is being used as distinct from ordinary coal tar.

Another interesting exhibit is a No. 0 Ransome concrete mixer, which is equipped with direct-coupled electric motor, mounted on road wheels, and represents a standard size of equipment which has been very largely adopted in this country for reinforced and general concrete work. As with all Ransome mixers of this type, the machine is complete in every respect with charging, measuring hopper and automatic water tank, the motor supplied being of the totally enclosed type, complete with starters and switch. These mixers, which are manufactured by Messrs. Ransome & Rapier, Limited, of Ipswich, have proved themselves in practice the most soundly constructed, rapid and economic mixers obtainable, and among its users may be mentioned the British Admiralty,



The Ransome Tar-Macadam Mixer.

War Office, and India Office, all of which departments have adopted it exclusively.

The company also exhibit their improved design of Ransome hand mixer, which is suitable for either concrete or tar-macadam, and deals with materials in small quantities on works where the installation of a power-driven plant would not prove of economic advantage. The machines are arranged with charging measuring hopper and water tank, and are geared up

Ransome Concrete Mixer.

so that it is easy for one man to work. The mixing is carried out by a special arrangement of blades, which ensure a thorough incorporation of ingredients, and the drum discharges its batch into a standard navvy barrow.

Especially worthy of inspection is this company's interlocking steel sheet piling, the section of particular interest being type D, which possesses great strength for a minimum weight of material, and is

Ransome Piling in use for Sea Defence Work

at the present time being used at the Rosyth Naval Base and the new reinforced concrete bridge at Warrington. The illustration shows a quantity of this corrugated piling in use during the construction of the new undercliff drive at Bournemouth, and it is interesting to note that, despite the very heavy seas which have been driving against this sheeting through the last winter, it has proved entirely satisfactory, and has prevented the flooding of the works, the contractors being able to continue their operations throughout the whole period.

Engineers must on no account miss the Stand of this firm, their machinery being of the very latest

type, and absolutely indispensable in the execution of engineering and other constructional works. A closing note may be made of their self-discharging skips and cement-testing machines, both of which possess unique and distinct features.

INVERAWE GRANITE COMPANY, LIMITED.
52 St. Enoch-square, Glasgow.
(Stand 22. Row C.)

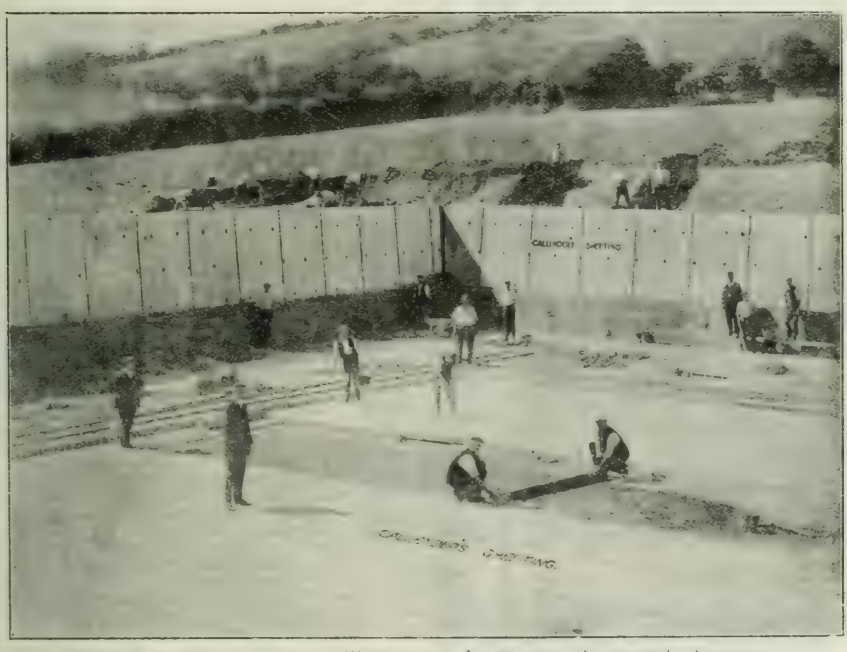
This firm direct the attention of town surveyors and others especially to their "City" pavement. They claim for it that it is noiseless, and that while it possesses all the advantages of wood paving it has greater durability and is cheaper. Being non-absorbent, too, it is hygienic. Those in search of a cheap stone kerb and channelling must inspect that which the firm has prepared largely in view of recent town planning and garden city requirements. They exhibit also samples of macadam stone, which, it will be seen, has broken cubically with a good fracture, and will be found to possess a high degree of toughness and much durability. More specially appealing to architects and builders is the building sample on the Stand. This takes the form of a base course with corner stones and coursed "shoddies." The absorbent stone generally used for building in our cities takes on the grime and smoke, and in a few years turns dark and dull in appearance. The stone exhibited will, it is claimed, always retain its bright appearance in any surroundings. The design shown is one that will compare favourably in cost with facework in any other stone, and the inside of the work can be brought up with brick or any cheap form of stone. The preparation of the stone can be done at the quarries, and the actual work of building can be cheaply and quickly carried out. Architects will also find much to interest them in the stone this firm shows for monumental purposes—a variety of the well-known "Ben Cruachan" stone. It takes on a fine polish, and both polished and in the rough presents a fine appearance. It is eminently suited for all kinds of monuments and memorial stones, for external polished work in buildings, and for internal polished work on walls, and in other positions.

HAYWARD BROTHERS & ECKSTEIN, LIMITED.
Union-street, Borough, S.E.
(Stand 24. Row D.)

The Stand of this firm contains such a variety of goods that it is difficult to do it the justice it demands. The fact that the description of these occupies eighteen full pages in the official catalogue renders it evident that any description in this notice must necessarily be incomplete; indeed, we can do no more than just glance at its salient features. The goods are attractively set out, and a notable feature is the small office built up of various glazings, opening flaps, prismatic stallboards, tiled floor lights, patent puttyless glazing, steel sashes and casements, and other items for which the firm is so justly famous. A steel lantern skylight, full size on columns, also is shown, together with examples of leaded lights, of collapsible gates in their application to lifts, shops, and large courtyard openings, of iron staircases, coal plates, ventilators, metal lathing, heating apparatus, fire-resisting glazing, and other exhibits too numerous to mention.

GEO. M. CALLENDER & CO., LIMITED.
25 Victoria-street, London, S.W.
(Stand 31. Row D.)

Many interesting illustrations of waterproofing methods are furnished by this firm. First we have an example of a reservoir, rendered watertight with their "Callendrite" sheeting, which shows the original system of permanently waterproofing reservoirs, tanks, ponds, swimming baths, &c., by means of "Callendrite" sheeting, as invented by Messrs. Callenders nearly forty years ago. In the centre of this tank is a column of loose porous bricks, under the top course of which, just above water level, is inserted a small piece of "Callendrite" dampcourse, above which the bricks are perfectly dry. Another dampcourse made by this firm is the "Ledkore" lead and bitumen dampcourse, composed of a core of sheet lead, with a special bitumen covering both sides. It contains no coal tar or pitch, and is an ideal dampcourse for all climates and purposes. Special attention is directed by the firm to the complete unification of the lead core and the bitumen covering. "Protex" is another exhibit, pourtrayed by a small model showing the application of the material to a brick surface which has afterwards been partly rendered with plaster, while another portion is covered with wall paper. Other exhibits include "Solbitu" paint, an absolute preventive of rust for iron and steel work of all descriptions; Limmer mastic asphalt; "Veribest" natural asphalt roofing, which is supplied in one, two and three ply in rolls, complete with nails, cement, and directions for fixing; "Permalithic" flooring, an asbestic flooring, which is jointless, water, fire and acid proof, silent and sanitary, and is strongly




Service Reservoir, Llanelly Waterworks, Lined with Callender's Sheeting.

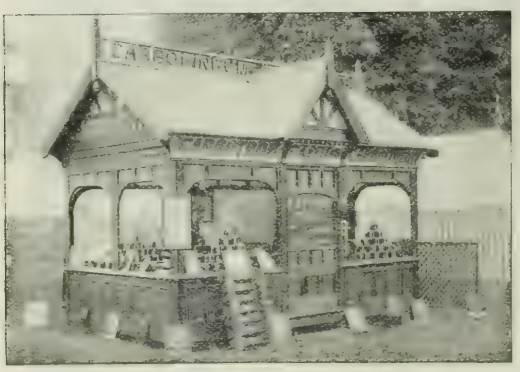
recommended for hospitals, infirmaries, or any buildings where an economical homogeneous floor of pleasing appearance is desired, and "Bitubond" building composition, which has enormous tensile and crushing strength, and is absolutely impervious to moisture. In view of last year's excessive drought, the greatest care should be taken to render storage reservoirs and so forth absolutely watertight, and the specialities of Messrs. Callender will be found the best to conduce to this end.

ROBESON PROCESS COMPANY.
17 Fenchurch-street, London, E.C.
(Stand 32. Row D.)

This exhibit includes a number of photos of roads and footways in various parts of the country and in Paris which have been treated with "Glutrin" road binder. Sections cut from actual Glutrin-treated roads are shown, together with samples of various gravels and other road materials which have been or can be bound with Glutrin. The company claim that Glutrin, by its affinity for silicates of potash and soda occurring in the road stones, forms insoluble crystals, rendering the road water resisting, and that the use of Glutrin adds 50 per cent to the life of a road. To illustrate the affinity of Glutrin for silicates specimen bottles are exhibited showing the formation of insolubles in a mixed solution of Glutrin with silicate of potash and silicate of soda.

C. A. PETERS, LIMITED,
Derby.
(Stand 52. Row E.)

"Carbolineum," the well-known wood preservative, is the key-note of this exhibit, where is shown a specially built wooden pavilion treated with the preparation. Also on view is a full range of samples of treated wood, together with samples of gates, fencing, &c., showing the suitability of "Carbolineum" for all purposes.



TAROADS SYNDICATE, LIMITED.
9 Victoria-street, Westminster.
(Stand 45. Row E.)

The appliances and processes of this company are so well known as to call for little in the way of description. At the Stand may be seen illustrations of various types of tar-spraying machines of from 80 gallons to 1,000 gallons capacity, and capable of executing surface tarring at the rate of from 1,000 to 15,000 super. yds. per day. Illustrations are also given of asphaltic macadam machines which can manufacture up to 100 tons of asphaltic macadam per day. Among what may be called proprietary articles are "Mexphalt," a pure natural asphaltic bitumen guaranteed 99 per cent purity for the construction of asphalt macadam pavement; Beebe's "Patchmac," the standard grout for constructing roads on the Liverpool system, upwards of 100,000 super. yds. of road having been constructed in the city with this material; and "Tarco," a compound for which the Gold Medal has been awarded for the "painting of roads and the manufacture of tar-macadam. Millions of gallons of these materials have been used on their roads and have proved on the country roads for two years and up to date some millions of gallons of material have already been contracted for on roads in the country alone. A general inspection of this Stand will repay the enquirer who is interested in the best and most modern methods of road making and maintenance.

"RONUK," LIMITED.
Portslade, Brighton.
(Stand 57. Row F.)

The very beautiful Stand, specially designed to show the superiority and advantages of the "Ronuk" sanitary method of treating woodwork of every description, has as its central feature a pavilion formed by four Tuscan columns supporting a heavy cornice and dome, the whole built entirely of oak. The pavilion stands on an oak block floor, which is enclosed by an oak balustrade of simple but beautiful design. The whole of the work has been prepared and polished with "Ronuk," and illustrates in a striking manner the value of the "Ronuk" specialities, as also the skill and efficiency of service which the company is able to place at the disposal of architects and builders in their "polishing contract department." Specimens of the company's manufactures are included, with panels of various kinds of wood prepared to show the effect of different methods of treatment. The "Ronuk" patent floor-polishing brushes, and "Ronuk" steel shavings and wool for rubbing down floors, also are exhibited.

LLEWELLINS & JAMES, LIMITED,
Castle Green, Bristol.
(Stand 67. Row G.)

This firm are exhibiting one 250-gallon horizontal and one 80-gallon vertical "W. and B." patent tar-spraying machine. A few facts concerning these may be of interest. The horizontal machine is—our information is obtained from the firm's specification—suitable for pumping any quality of tar, from crude to distilled. The pump will deliver the tar through the spraying nozzle at a pressure of 100 lb. per square inch, and this pressure can easily be reached and maintained by a lad. The patent nozzle is of very simple construction, entirely free from complications, of the highest efficiency in spraying, and very readily cleansed. A rotary filling pump, with suction hose for charging the boiler, is supplied with the machine, or if preferred a set of lifting and tilting gear with strainer fitted in manhole can be substituted without extra charge. With this machine two men can, it is said, cover 1,000 super. yds. per hour, and it has been found by practical experience that after all charges have been paid, a square yard can be covered at the cost of $\frac{3}{4}$ of a penny. As regards the vertical machine, two men can work it easily, and it is claimed that with it from 500 to 800 super. yds. per hour can be treated. It is interesting to record that, while we were in conversation with Messrs. Llewellins & James' representative, a telegram arrived announcing that the firm had just received an order from Norway for one of their machines, and that this machine would be the first used in that country.

ENDERBY AND STONEY STANTON GRANITE COMPANY, LIMITED.
Narborough, near Leicester.
(Stand 79. Row G.)

The following are the bald particulars of the interesting exhibit of this well-known firm: Specimens of worked granite for buildings, bed stones, spur stones, &c.; granite kerbs and channel stones; granite setts for tramway work, crossings and general paving; broken granite for road making; granite chippings and screenings for footpaths, concreting work, &c.; tarred macadam and tarred screenings; moulded samples of architectural stone, and samples of footway paving by the Empire Stone Company, Limited. This again is one of those stands which the municipal engineer should on no account miss. The samples shown are random ones, and have not been selected for exhibition purposes. What the engineer has to look at the Stand may be obtained of equal quality by the ton or yard.

RAVENHEAD SANITARY PIPE AND BRICK COMPANY, LIMITED.
Ravenhead, St. Helens, and Upholland, near Wigan.
(Stand No. 7. Row G.)

The company are exhibiting some really choice specimens of bricks. Especially worthy of the attention of architects and others are their "Ravenhead"

rustic facing bricks, which, although quite a recent introduction, have leaped into high favour, and have now been used in every part of the United Kingdom. It would be impossible to mention even a tithe of the buildings which have been beautified by their introduction; but the following are selected from the long list of local buildings in which they have figured: Groby School, Ashton-under-Lyne; the Grammar School and Parkside Asylum extensions, Macclesfield; County High School, Sale; Lancashire County Asylum, Whalley; and Royal Infirmary extensions and Willox Memorial Church, Liverpool. They have also been largely used in several garden city schemes in Manchester and other parts of the country.

Other exhibits of this firm include rustic Sneck or random walling, which consists of rustic blocks, especially adapted for churches and estate boundary walls in place of stone; sand-faced bricks; and clinker pavors. It is to be noted that this firm are the only makers of "Ravenhead" bricks, and the injunction is a necessary one in view of the fact, as we are informed, that the flattery of imitation has already been accorded to them. Visitors will be well-advised in giving a call at the Stand of the Ravenhead Company and in inquiring for full particulars of their manufactures.

JOHNSTON BROTHERS,
79 Mark-lane, London.
(Stand 88. Row H.)

We have referred above to the exhibits here, and now supplement our brief notice with a few details. The most noteworthy exhibit is the firm's rapid-heating "1912" tar boiler, which is fitted with a heating chamber of special design. It is claimed to be the quickest tar boiler on the market, as no cold tar is fed into the boiler from which heated tar for use is drawn, while the thickest of crude or refined tars, Tarvia or Roadoleum, may, in five minutes, be heated sufficiently liquid for pumping. The boiler can, when fully loaded, be drawn by one man. With Waithman's reservoir tar brooms, shown here, hand-painting may, it is said, be made as speedy as machine work. They have been adopted by over 200 councils during 1911. Only the road, it is to be noted, is tarred with these appliances, and not all objects in the vicinity. Archer's patent brooms for preparing the road surface for tar-painting form another exhibit, and with these a clean surface can be obtained with a minimum of labour.

JONES & ATTWOOD, LIMITED,
Stourbridge.
(Stand 101. Row K.)

Messrs. Jones & Attwood, Limited, are specialists in apparatus and machines for modern sewage works, and exhibit very interesting models of their sprinklers for covering bacteria beds and filters, and converting contact beds so as to increase their efficiency. The models revolve round circular filters and travel to and fro on rectangular ones, and these distributors are automatic, being driven by the sewage itself without cost for power. A single distributor can be made to travel up and down a filter 300 or 400 feet in length, sprinkling in the form of rain in both directions of travel, so that the sewage is well aërated and the filters are rested between each dose, which amounts to not more than 1 gallon per square yard, the rate of travel being proportionate to the quantity of sewage. These appliances are now being generally adopted in sewage purification, and enable a filtration of the highest class to be effected, even on filters as shallow as 3 ft. Circular filters may be as small as 8 ft. in diameter, and are very suitable for isolated country houses or small institutions. Many other specialties for use on sewage works also are shown, including sluice valves, penstocks, disc valves, hand steps, floating outlets, screens, and sundry other ironwork.

**Nottingham Improvement Scheme.** Nottingham Town Council at a meeting last week, adopted a report submitted by the Housing Committee for dealing with a portion of the slum area of the city, at an estimated expenditure of £139,953. The area consists of 34,717 sq. yds., and the medical officer of health, Dr. Milner, reports that it contains thirty-seven mean, squalid, and dilapidated courts and alleys. The streets are extremely narrow, the average width being only about 20ft. The number of houses and other buildings, including eight licensed houses, is 599, no fewer than 432 of which are either back-to-back houses or houses without any back yard.

## CONTRACTORS' APPLIANCES.

We are informed that the (U.K.) "Winget" Concrete Machine Company, Limited, of 11 Star-buildings, Newcastle-on-Tyne, have added to the list of good-made by them, noted for their simplicity, utility and efficiency, the "Ross" concrete spade, and the "Andrews" concrete tamper—two implements which will prove valuable adjuncts to every concretor. These tools do away with the necessity of using fine facing

Fig. 1.

Fig. 2.

material when concreting, thus considerably reducing costs.

The "Ross" spade (Fig. 1) is used where shuttering is employed, the concrete being rammed with the spade close to the shuttering, thus forcing back the coarser aggregate, and allowing the fine material to settle up to face of work, obviating the necessity of "cement rendering" or otherwise facing concrete walls.

The "Andrews" tamper (Fig. 2) is used as a rammer when laying concrete paths, roads, &c., *in situ*, the tamper achieving the same effect of bringing the fine particles of concrete to the surface, which may be

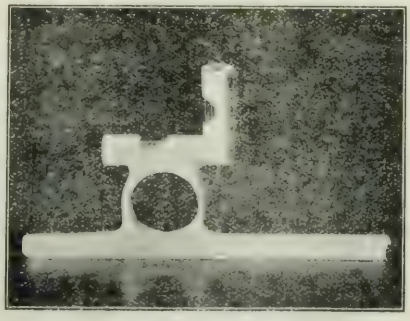


Fig. 3.

"floated off" at once, a finishing coat for "floating off" thus not being required.

Nor should we omit to mention that the "Winget" Company have also placed on the market an exceedingly useful level—viz., the "Kokomo" finger ring level (Fig. 3), which may be utilised either for levelling or plumbing.

Every builder and contractor may with confidence be advised to adopt and use these indispensable tools, which with ordinary care will last a lifetime.

## SEWAGE DISPOSAL APPLIANCES.

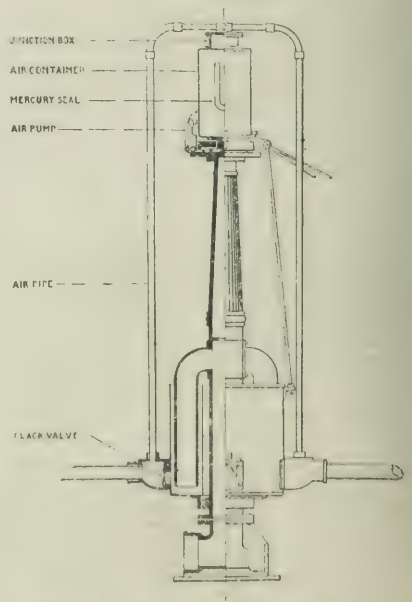
### RECENT IMPROVEMENTS.

The efficiency of the ordinary sewage distributor is largely dependent upon the discharge orifices being clear, and it is quite the usual experience to find that the ordinary revolving arm in a distributor has many of its orifices partly clogged, however careful the attention given to it may be. When the orifices become choked up, or partly so, great unevenness of distribution is caused, the volume with which the sprinkler should deal is considerably diminished, and the power available for revolving the machine is seriously reduced. The "Autoflush" sprinkler, described in the catalogue just issued by Messrs. Tuke & Bell, Limited—whose offices are at 69 Leadenhall-street, London, E.C.—possesses the great advantage that it is self-cleansing. The distributing arms and the orifices of the "Autoflush" sprinkler are automatically flushed out and kept absolutely clear. The flushing out is caused by regular discharges of compressed air from a container which momentarily increases the velocity of the flow through the arms to such an extent as to force out any solid matter which may have collected in them or in their orifices. By this means, prevention of clogging and uniformity of distribution are ensured. The air container is fixed on the revolving crown piece of the sprinkler; below this container is fitted an air pump, operated by a friction wheel which travels upon a circular pathway when the machine is revolving. Inside the container is a mercury seal. When the air pressure in the container has, by means of the air pump, reached a certain degree, the mercury seal is blown or forced, and the compressed air passes through the junction box to the air pipes, through which it is conveyed to the distributing arms. These pipes are fitted with back-pressure valves, so as to prevent the compressed air escaping to the annular tank. When forced out of the trapped pipe, the mercury forms a comparatively shallow film on the floor of the junction box, and when the discharge of the compressed air is completed, the mercury returns to the trapped pipe, thus resealing it. Our illustration shows an 80-ft. diameter "Autoflush" sprinkler in use at Tiverton.

The "Carlton" standard sewage sprinkler, described in the same catalogue, is arranged so that sewage passing from the centre column to the central revolving cylinder by means of over-draw syphons, overflows to the distributing arms; the same liquid head is thus maintained in the revolving cylinder as in the supply chamber. There is thus no friction between the fixed and revolving parts, and also no loss of head. The top of the revolving cylinder being well above the level of the supply, there is no possibility of the machine flooding.

The "Carlton" self-dosing sprinkler is another interesting addition to sewage-disposal apparatus. In this the over-draw syphon bends feed tipping cisterns, which on filling bring the syphons into action and start the machine. When the flow through the syphons becomes too small to revolve the machine, the tipping cisterns revert to their original position, cutting off the syphonage until a further supply has accumulated in the feed channel or tank. The tipping cisterns can be regulated by means of adjustable weights, to fall with a smaller head of liquid. By this means the volume delivered per dose can be regulated exactly. This dosing device automatically provides for continuous rotation during maximum flow, intermittent action and fixed volume per dose

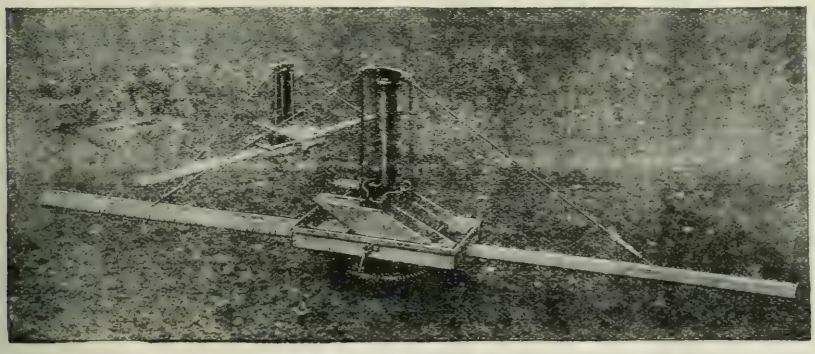
"Autoflush" Sprinklers at Tiverton.




Section of "Autoflush" Sprinkler.

during normal flow, and during the minimum flow the liquid is held back until a dose has accumulated.

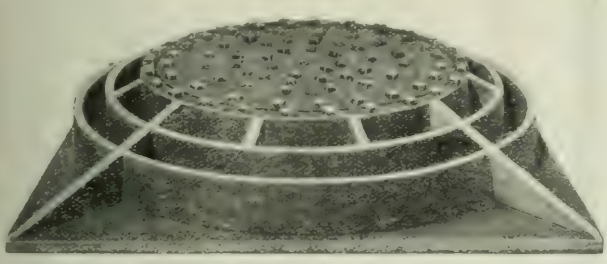
The "Carlton" sprinkler is in operation at Lincoln, Tiverton, Lingfield, Ferry Hill, New Earswick, York, Pinner, Wolverhampton, &c. The catalogue contains many interesting diagrams and photographs relating to these sprinklers.



The "Ideal" Sprinkler.

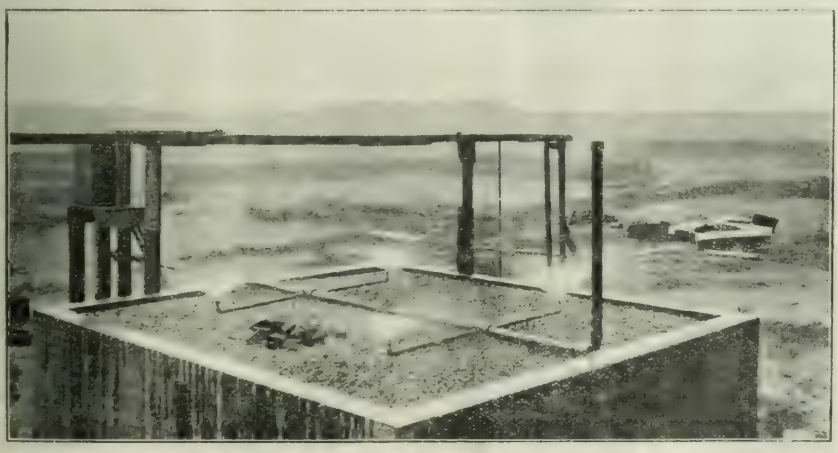
For smaller installations the "Ideal" distributor, shown in our illustration, possesses all the advantages of the water-wheel type of distributor, but is cheaper to install, as it requires no rails or wall round the filter. It is carried on ball bearings at the centre, so as to avoid friction, and therefore requires the minimum of head. There are no holes to clog and no parts to get out of order. The sewage flows into a twin tipper, which fills and empties, causing a partial revolution of the machine at each movement by means of a ratchet and wheel; the sewage discharged from the tippers is distributed on to the filter through the serrated edges of the arms.

There are many other extremely interesting matters in this catalogue, among which we may mention the pulsator ram, used in connection with fixed sprays. The discharge from each spray falls upon the filter at a radius which is constantly increasing or decreasing in accordance with the rise and fall of pressure in the distributing pipes. At each pulsation the pressure attains its maximum almost instantaneously, and it is by this sudden rise of pressure that the sprays or nozzles are kept clear. The fall of the pressure wave during which the radii of the sprays diminish, takes place slowly. The pulsator ram system thus gives a uniform distribution over the whole filter surface, and keeps the spray nozzles absolutely clear. It thus overcomes the defects in the ordinary system of fixed sprays. The pulsator ram works upon the principle of the ordinary hydraulic ram, and is a very simple contrivance.



"Grip" Manhole Cover.

Space does not permit us to mention the many other items of interest in this catalogue. There is, however, one further item to which attention ought to be called viz., the "Grip" patent manhole cover.



Trial "Pulsator-Ram" Installation at Leeds Sewage Works.

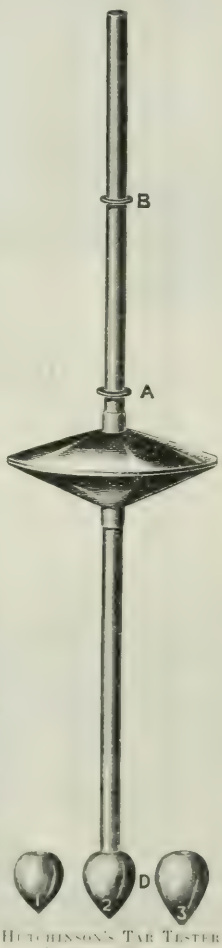
As will be seen from our illustration, the concentric rings which form an integral part of the frame, and which are slightly tapered, provide annular spaces, wider at the top than at the bottom, in which the

road material is not only held up, but in which it becomes more and more consolidated as it is compressed by the traffic. This has the effect of reducing the crumbling of the road material, and of preventing its wearing away from the vertical edge of the frame. The concentric rings are graded in height, and if the road above them becomes worn, they provide an inclined plane to the edge of the frame. This is considered better than a frame with a curved edge, because the road material becomes so thin at its point of contact with the iron that it can only last a very short time; and when it has worn, a depression is left between the road surface and the iron which is not only dangerous, but further disintegration is caused by the surface water held in the depression.

## PHYSICAL PROPERTIES OF BITUMINOUS MATERIALS.

Those of our readers who are interested practically as well as from a scientific point of view in the various methods of what we may term modern road making may remember that we have from time to time advocated the necessity for collecting data with a view to some method of general standardisation of bituminous materials being adopted.

We have every reason to believe that the suggestions contained in the Road Board specifications with regard to chemical analysis of coal tars and their compounds have been successful in encouraging distillers and others to investigate more closely than before the nature and properties of the refined and "prepared" products that were calculated to give satisfactory results when applied to roads. It is time, however, now, when the "season" of this year is so close upon us, to consider whether the methods of chemical analysis before alluded to give all the information necessary to determine whether any particular bituminous material is suitable or otherwise for the requirements of the work in view, or whether it is advisable to supplement those tests by a physical examination.



Hutchinson's Tar Tester (Viscosity Gauge).

Mr. H. P. Maybury, county surveyor of Kent, in his paper on Highway Improvement and Maintenance," read at the annual meeting of the Institution of Municipal and County Engineers at West Bromwich last year, pointed out that "physical tests admittedly must be of more interest to engineers than the chemical and fractionation deductions we have been compelled up to the present day to rely upon."

An endorsement of Mr. Maybury's views comes from a prominent American authority, Mr. W. H. Fulweiler, engineer in the Department of Research of the Gas Improvement Company of Philadelphia. Mr. Fulweiler, in a paper presented before the American Association for the Advancement of Science at the annual meeting at Washington, D.C., in December last, says: "When the writer was first engaged in the examination of bituminous materials for use in road construction or maintenance, he was frequently at loss for an explanation of the failure of materials that had apparently the same chemical analysis. He felt that the chemical data accumulated from the method of analysis that were then in use did not give any definite idea of the binding value of the material. It would seem that this binding quality is the important quality to be determined, and that a test that would give even relative indications would be very valuable."

We regard these expressions of opinion, formed no doubt after careful consideration of the subject, and coming from such experts as Mr. Maybury and Mr. Fulweiler, whose investigations have been conducted at places so widely apart as the United States and England, worthy of very careful consideration.

In The Surveyor of October 20th last we published a description of a new consistometer, designed by Major Crosby, chief engineer to the Maryland Geological Survey, with a diagram showing the arrangement of the apparatus. We mention this, as some of our readers would like possibly to refer to Major Crosby's views on the necessity of giving a definite expression of physical characteristics when drawing specifications. We are not, however, behindhand on this side in recognising the importance of some practical means of ascertaining the binding quality of our tars and pitches, as will be seen by the illustrated description of an instrument recently designed by Mr. John Hutchinson, of Westminster, who tells us that he believes he has succeeded in surmounting the many difficulties experienced in producing an instrument of precision in measuring the binding and cementitious properties of tar.

With this instrument, the entire length of which is 9 in., the test is based on the speed with which the instrument sinks in the liquid under examination, which is in a vessel of given dimensions, and at a predetermined temperature. The rate of speed is measured by the time taken by the instrument in sinking from the ring on the stem marked A to the ring B. The influence which variations in the specific gravity of liquids would have on the test is reduced by the instrument to a minimum, and can be practically eliminated by a simple adjustment of weight at D, using poise No. 1 for the lighter tars, No. 2 for the medium tars, and No. 3 for the heavier. For all practical purposes of the road engineer, manufacturer or contractor, the instrument with poise No. 2, as shown in the illustration, is stated to be sufficiently accurate.

**The Proposed New Road to the West.**—A joint conference between the Middlesex Centre of the Road Improvement Association and a Sub-Committee of the Council of the Association was held at the Great Northern Hotel, King's Cross, N., on the 8th inst., to consider the details of the proposed new exit from London to the West, commencing at West Cromwell-road and terminating at Hounslow, as suggested by the Road Board. After consideration of all the circumstances, it was agreed that the scheme, as a whole, should be approved. One or two minor suggestions are to be put forward, such as improving the facilities for connecting the main Oxford Road with the proposed new road, and so forth. The association and its centre will now take all possible action to induce the local authorities concerned to extend the fullest consideration to the scheme.

**Municipal Work in Toronto.**—A large expenditure is provided for in the estimates for the current year submitted by Mr. C. H. Rust, city engineer of Toronto. The amount required is £513,162, which is divided as follows: Maintenance charges, salaries, street repairs and cleaning, renewal and repair of plant, and last year's overdraft, £107,962; new bridges, including a proposed new concrete bridge at Gerrard-street, £65,041; new pavements, sidewalks, kerbing, opposite exempt properties, £10,350; special works, £7,250; new sewers, £29,040; additional plant, £1,410; total, £221,057, as compared with £89,598 expended last year. Waterworks branch: General maintenance, pumping, distribution, filtration plant and high-pressure service, £78,586, as compared with £64,272 expended last year. On construction it is proposed to spend £208,859, as compared with £26,915 last year. The chief items included in the former amount are: New meters, £20,000; two 15,000,000-gallon triple expansion engines, including buildings and connections, £70,000; new mains, £56,303; intake repairs and extension, £25,000; extension of high-pressure mains, £15,200; new press-house equipment, £16,000.

# The Surveyor

And Municipal and County Engineer.

Vol. XLI. MARCH 22, 1912. No. 1,053.

## Minutes of Proceedings.

**Weather Forecasts and Local Opinion.**

In another part of this issue we have printed a letter from Mr. Frank Harris, engineer and surveyor to the Tonbridge Rural District Council, in which, writing from Southborough, Tunbridge Wells, he compares a local forecast for the "week-end" of the 9th and 10th of this month with another forecast based on information received from the Weather Office, the comparison being, in Mr. Harris's opinion, very unfavourable to the latter. The term "week-end" is generally understood to refer to Saturday and Sunday—although the latter day is the first of the next week—and Mr. Harris does not tell us to which day he is referring. The record for Sunday is: "Very changeable; uncertain weather has been experienced all round—brilliantly fine to dull, gloomy, and wet. Some localities have had from seven to eight hours of sunshine in a day, others from ½ in. to ¾ in. of rain." The London record for sunshine was twenty-four minutes in the twenty-four hours ended at 6 p.m. on Sunday. In some parts of South-East England Sunday morning was fine, and the afternoon dull, with a keenish wind. Now, the Weather Office forecast for the twenty-four hours ended at midnight on Saturday (a forecast issued on Friday evening) was, for districts including "England, S.E.," as follows: 'Southerly and south-westerly winds, fresh or strong, and gusty at times; some rain, fair or fine intervals; moderate temperature." The "general inference" was: "It is expected, therefore, that the unsettled conditions will hold over the week-end." As early as Thursday evening the "further outlook" was "the conditions will be mild and unsettled." It should be noted that different forecasts were issued on Friday evening for Scotland and for the Western Channel. As regards local interpretation of the main elements of the situation disclosed by the Weather Office reports, we have no doubt that there is a field for the competent local meteorologist, who has the advantage of local knowledge, and may, by the aid of the telegraph, avail himself of the latest information as distinguished from that supplied by the newspapers. Since it is not easy, however, to find local men who are able and willing to undertake this work, we believe that far the best practical course is that which we have been steadily advocating the making public of the latest information.

The particular forecast quoted by Mr. Harris is far from being an impressive one. It runs as follows, the italics, which are our own, sufficiently expressing our opinion of its value: "There is now a general rise taking place in the barometer, the southern anti-cyclone expanding in a northerly direction. *If this continues*, quieter weather of the westerly type may be expected for the next day or two, with colder nights than those recently experienced, *but it is too early to be certain of its duration*; but, on the whole, the outlook is better than for some time past." We are reminded of Mr. Punch's forecast for the Derby of 1890, in which, among a number of equally judicious opinions as to the chances of other horses, was the significant hint, "Rainfoin *covers grass*." We are always glad to receive Mr. Harris's interesting letters, and, for a change, would especially welcome his criticisms of the official forecasts on some occasion when the weather at Tunbridge Wells is *worse* than that foretold. It so often happens that the weather at a watering-place is much more genial than that experienced in common villages in the neighbourhood.

* * *

**The Pollution of Rivers in the United States.**

The right to use a natural watercourse for the disposal of their sewage by towns situated upon a river the water of which serves as a source of drinking water supply for the inhabitants of towns lower down in the same watershed has been discussed in this country on several occasions in the past at various meetings as well as in these columns. The same problem has arisen in the United States recently in connection with the city of Pittsburg, and we are indebted to our esteemed contemporary the *Engineering Record*, of New York, for particulars of the case and details of an engineering report upon the subject, which is considered by our contemporary as "the most important sewerage and sewage disposal report made in the United States." It appears that the Health Department of the State of Pennsylvania, in which Pittsburg is situated, practically ordered that city to construct a system of sewers and sewage disposal works which would prevent the discharge into the river Ohio and its tributaries of any matter which might injure the potable character of the water, and the nett result of the report of the engineers engaged for the purpose is that the city authorities are advised to refuse to carry out the orders of the State Department. After careful investigations and exhaustive calculations, it was found that a sum of over £7,000,000 would be required to provide for the needs of the city as at present constituted, but with a population of 800,000, exclusive of the cost

of operation, and this sum would exceed the present legal limits of its bonded indebtedness. But the engineers have advised that such an expenditure is not warranted by the requirements of health, and that it would be far cheaper for the city to undertake the purification of the water required by the lower riparian communities than to purify all its own sewage to the degree required. It is pointed out by the engineers that even if the dry-weather flow of sewage were purified to the utmost degree possible by modern methods, including sterilisation of the final effluent, the overflow in times of storm, the navigation and other sources of pollution outside the sewage from the city would always prevent the river water from being safe for drinking purposes, so that the proper course is obviously to purify the water before use, especially as this can readily be done at a reasonable cost. It is considered that the necessities of the case for the present are confined to the prevention of local nuisance in the river, and that this can be done by constructing settling tanks at the outlets of some of the largest sewers in order to intercept the heavier matters in suspension.

In the opinion of our contemporary the result of the report is to place the city authorities in a position to resist the order of the State Commissioner of Health from the standpoint of equity, and that "the time has come to argue it out to the end, as, until this is done, sanitary engineering will be tied up by the weak, but troublesome, threads of legal uncertainty." This problem will crop up in other countries besides the United States, and we shall look forward with interest to its ultimate solution in the case of Pittsburg and the river Ohio.

* * *

**Baltimore Sewage Disposal.**

While, on the one hand we read of one city in the United States refusing to carry out the orders of the State Health Department to purify its sewage in order to protect the river water from pollution, on the other hand we learn at the same time and from the same source that another city in the same country has just completed the first instalment of its new sewage disposal works on a very elaborate scale. In the latter case, that of Baltimore, after preliminary settling tanks, percolating filters and secondary settling tanks for the filter effluent, it was originally proposed to have intermittent sand filters in order to secure the highest practicable degree of purity and prevent the pollution of the oyster-beds in Chesapeake Bay. The sand filters have, however, been omitted, as it was considered that the settled effluent from the percolating filters will be sufficiently pure to be discharged into the river flowing to the bay without causing objections. If, however, further purification is found necessary, it is proposed to disinfect the final effluent with hypochlorite of lime. The portion of the works just completed is capable of purifying the sewage from a population of 300,000, or about one-half of the present number of inhabitants of the city, and these works will be duplicated at an early date. It is not anticipated that the disinfecting process will be necessary, as the nearest oyster-beds are 14 miles away. One unique feature of these works is that there is a fall of 18 ft. from the settling tanks to the river, and this has made it possible to utilise the final effluent to drive turbines which generate sufficient electric power to light all the buildings on the works, operate the sludge pumps and screens, and raise purified sewage into an elevated tank for use in cleaning out the hydrolytic tanks and flushing out the underdrains of the percolating filters. Another unusual feature is the outfall, consisting of duplicate lines of 5 ft. diameter wood-stave pipe, by means of which the final effluent is carried out into deep water in the Back river. Each pipe is 2,500 ft. long, and is carried on a pile trestle in the river. Special arrangements were made for lowering these pipes into position, and they make a very interesting item of these large works, at any rate to English eyes. As these new works are provided with chemical and bacteriological laboratories, and every facility for investigating the operation of the plant by analysing samples, we shall doubtless have opportunities of judging the results obtained and securing valuable information as to the efficiency of works on a large scale, and designed in accordance with the latest scientific knowledge of the subject.

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**The Diesel Oil Engine.**

It is exceedingly difficult to estimate and it would be almost impossible to overstate—the far-reaching effects on the modern industrial world of the appearance of the Diesel oil engine. It is only about fourteen years since the Diesel engine emerged from the experimental stage, and now it is being built by the thousand in the best factories of all industrial countries. The whole subject is of peculiar interest just now, not only on account of the present deplorable trouble in the coal industry, but also in view of the warnings which scientists have uttered from time to time as to a possible exhaustion of our coal supply. The paper which was read by Dr. Diesel before the Institution of Mechanical Engineers last Friday was of absorbing interest therefore, not only intrinsically, but also on account of the peculiar industrial conditions which at present exist in this country. Dr. Diesel claimed that the engine which is associated with his name has become for all natural liquid fuels what the steam engine and gas engine are for coal, but in a much simpler and more economical way. It may be said to have doubled the resources of mankind as regards power production, and to have made new and hitherto unutilised products of Nature available for motor power. The utilisation of the various natural liquid fuels, however, is not of such great interest to Great Britain, which is exclusively a coal-producing country, as the fact that the Diesel engine can be worked with the by-products of coal distillation and coke plants, such as tar and creosote oils, with equally satisfactory results. It will thus be seen that the increased use of the Diesel engine, rather than threatening the coal industry, opens up a new and more economical field for the use of that material; and in developing its use Great Britain can keep herself free and independent of foreign markets for the supply of liquid fuels by using coal in this way. Dr. Diesel's paper contained a most interesting historical summary of the progress of his invention from the time when the first reliable engine was finished in 1897 after about four years' laborious experimenting. It is remarkable to observe that many of the earliest examples are still working without any change in their fuel consumption.

* * *

**The Metropolitan Paving Committee.**

The Metropolitan Paving Committee was formed as the result of a conference of representatives of the metropolitan borough councils which was held at the Westminster City Hall in 1903, and since that time it has done a tremendous amount of very useful work. The recently-issued ninth annual report contains information as to paving works of all kinds carried out in the County of London during the year by the various road authorities. The report contains no claim of advocacy of any particular material, and its chief value lies in the absolute impartiality which has been observed in the collection and arrangement of statistics. An analysis of the reports from the various boroughs shows that creosoted soft wood retains its popularity as a paving material for main roads. In

most cases it has been laid with close joints and grouted with pitch. There has been considerable divergence of practice as regards the thickness of the concrete foundation, but no doubt the increase in numbers and ubiquity of the motor-omnibus and the ever-swelling volume of heavy traffic of all kinds will render the 9-in. foundation more and more necessary. The effect of the motor-omnibus on macadam roads is the subject of complaint in some cases, but this is a matter which the local authorities will have to face. We have not much faith in the attempts which are being made in some quarters to deal with the motor-omnibus as "extraordinary traffic."

The most prominent feature, however, of this year's returns is undoubtedly the great saving which is shown to have taken place in the cleansing and maintenance of macadam roads which have been tar-sprayed. The amount expended in surface treatment has been returned many times over, and the general condition of the roads has been much improved at the same time.

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**Blaenavon and its Sanitation.**

It is not often that a worse state of things is disclosed than that to which attention is drawn by Dr. Morgan Rees in a report he has presented to the Local Government Board with respect to the general sanitation of Blaenavon. A system of sewerage or sewage disposal is quite unknown to the district, the urban authorities contenting themselves with allowing the sewage to be discharged untreated into the streams and watercourses which contribute to the river Avon Lwyd. During the prolonged drought last summer the sources of the Avon Lwyd were dry, so that the bulk of the water flowing in their courses consisted mainly of raw sewage. The result can be better imagined than described, especially when it is remembered that the sources alluded to, and ultimately the river itself, receive the crude sewage of a total population of close on 60,000. An attempt was made by the Monmouthshire County Council to bring the Blaenavon and adjoining authorities to a sense of their duty by seeking to convince them of the advantage of a common system of sewerage and of sewage disposal for the whole valley. The only result was the production of two rival Bills, which the Local Government Board vainly sought to direct into one objective beneficial to the community, and in the end they were forced to refuse to sanction these measures. Matters therefore remain just as they were in this happy valley, where, it would appear, the housing conditions and the water supply are likewise open to improvement. It does not surprise us to hear that the Blaenavon Council remain perfectly satisfied with the existing state of things, for obviously such a body typifies *laissez-faire* under any and every possible set of conditions, however blameworthy and objectionable these may be. Their excuse is the depression in the local steel and iron industry, and the already heavy burdens on the rates. This may be an excuse, but it is not a justification of a policy which, if persisted in, can only defeat its own ends.

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**Glasgow Main Drainage.**

At the last meeting of the Institution of Civil Engineers consideration was given to three papers dealing with the main drainage of Glasgow, abstracts of which will be found in another column. The first paper was submitted by Mr. A. B. McDonald, the city engineer, and Mr. G. M. Taylor, MM.INST.C.E., and dealt with the scheme generally. The magnitude of the works which have been carried out may be gauged from the fact that the disposal works at Dalmuir and Shieldhall deal with average daily flows of 36,000,000 and 23,000,000 gallons respectively. The second paper, which was concerned more particularly with the construction of the works, was read by Mr. W. C. Easton, B.SC., M.INST.C.E., who described the works executed between 1899 and 1910, at a cost of over £2,000,000. Great difficulties were experienced owing to the presence of old mineral workings, in one case the cost of a 7-ft. sewer amounting to no less than £300 per lineal yard. The final paper was concerned with the mechanical equipment of the western works and of Kinning Park pumping station. Its author was Mr. D. H. Morton, M.INST.C.E., and it was descriptive of the machinery and other equipment required for dealing not only with the enormous volumes of sewage mentioned above, but also with the much greater volumes which come down to the works in time of flood or storm. The general impression given by a perusal of these papers is that of a colossal work carried out with great engineering skill, often in the face of great natural difficulties. It is such achievements as these that strike the imagination of the public and illustrate the benefits which the public derive from the civic engineering profession.

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**The Design of High Dams.**

In our last issue we referred shortly to the paper on "High Dams of Great Length" read before the Concrete Institute by Mr. Reginald Ryves, ASSOC.M.INST.C.E. Mr. Ryves's paper is of very great interest, inasmuch as it contains not only descriptions of the usual three distinct types of dam for wide valleys—*viz.*, the mass dam proper, the parallel slice dam, and Captain Garrett's type—but also of a dam of original design by the author, in which the whole of the water load is taken by masonry in direct compression; and neither the weight of the buttress nor the weight of the arch is taken into account as regards stability, except for resistance to sliding bodily when the ground is comparatively soft. This type, which Mr. Ryves calls the "thrust buttress dam," is entirely original. It is true that some small dams of an apparently similar kind have been designed, but the stability of these has never been calculated by the direct thrust, but always on the principle of moments. Dealing with his own design, the author states that the best slope for the water face is, under normal conditions, 45 deg., and the dam then consists of inclined arches of increasing thickness with increasing depth sloping at 45 deg., the abutments resting against the upstream face of the buttresses, which are built up of layers inclined at 45 deg., the thickness depending upon the material used, and the width of each layer being such that the thrust upon it is the maximum allowed thrust. A dam of this type may be constructed up to a height of 200 ft. with materials allowing of a compression stress of 10 tons per square foot, and up to 300 ft. if a stress of about 16 tons per square foot be allowable. Engineers who are interested in the design of dams should certainly make themselves acquainted with the contents of Mr. Ryves's excellent and instructive paper.

* * *

**Road-Making Specifications.**

One of the best attempts to frame a covering specification for road making is that made recently by a committee of the Canadian Society of Civil Engineers, and reproduced on another page of the present issue, together with a criticism which we have had specially written in the hope that it will help our readers to master the scope and the limitations of these general directions, with the minimum of trouble to themselves. This criticism is, on the whole, favourable; the blame is greater in amount than is the praise; but it is, of course, understood that while praise may be general, blame must be directed to specific points and expressed with precision.

# High Dams of Great Length.

## THE MASS GRAVITY TYPE AND THREE TYPES OF SPAN DAMS.*

By REGINALD RYVES, Assoc.M.Inst.C.E., M.C.I.

The special study which the author of this paper undertook, and on the results of which this paper is based, was a study of high masonry dams of such length that they may be regarded as dams proper, and in no sense as structures partly held up to their work by the sides of the river valleys.

Leaving aside all other considerations arising out of the study, this paper is confined to those connected with the building of dams of a great length, the whole of which length is more than 140 ft. clear of the ground, and a part of which may be as much as 180 ft. or more to hard rock. The height of 185 ft. clear was adopted for purposes of calculation. There are four distinct types of dams for wide valleys:—

(1) The mass dam proper, designed on the ordinary theory.

(2) The parallel slice dam, which is designed in exactly the same way, but with more concentrated water loads.

(3) Captain Garrett's type, or the dam of arches in which the weight of the arches is partly taken into account, but the dam otherwise designed as a gravity dam with concentrated water loads.

(4) The author's proposed thrust buttress dam of arches, in which the whole of the water load is taken by masonry in direct compression.

For a dam 185 ft. high, and where $\alpha$ is the angle of the resultant with the vertical and $\phi$ the angle of the masonry face with the vertical, we get, in a normal design, with masonry of specific gravity 2½, and with $p$ calculated by the usual rules as followed by Wegmann and others, such figures as

$p$ = 7·85 tons per square foot
$p \times \sec^2 \alpha$ = 10·92 " "
$p \times \sec^2 \phi$ = 17·90 " "

Higher stresses than 12 tons per square foot by Bouvier's computation have been allowed underground, but there is no precedent for a long, straight dam which is considerably over 150 ft. clear of the ground for any considerable length.

Coming now to the second class, which is one type of the dam of spans, we find that its height is limited by two considerations. We cannot build truly parallel slices of more than some limiting height without side buttresses. Secondly, the concentration of water loads in these separated slices increases both $\alpha$ and $\phi$ so much that we get very high maximum stresses. Thus, for a dam ¼ solid and ¾ span, the calculation being made as for a mass dam for a liquid with specific gravity 3, we get, for a height of 162½ ft. and specific gravity of masonry 2½—

$p$ = 4·72 tons per square foot
$p \times \sec^2 \alpha$ = 9·10 " "
$p \times \sec^2 \phi$ = 25·39 " "

Although, as Prof. Unwin has pointed out, we need not believe that such a high stress as the last noted actually exists, we are obliged to take the theory into account in comparing one dam with another, at any rate until someone can give us a modification for very flat angles.

It is clear that though this type may be very economical for heights up to 100 ft., and may be used up to 140 ft., if we are not afraid of use it does not help us in designing a very high dam.

Since the weight of the water apron is not taken into account at all in this type, it is one which is adapted for use with thin arches of very strong stone, or a ferro-concrete beam and slab arrangement, for the water apron.

The third type, in which the weight of the arches is partly taken into account, has been successfully used for the Assar dam, in Rajputana, a dam 68 ft. high, designed and built by Captain A. H. Garrett, R.E.

The indeterminate nature of the stresses is, however, against this type for great heights, but with small gaps and large buttresses it has certain advantages.

Captain Garrett has made a design for such a dam 150 ft. high, and the question whether it may be built up to heights of 200 ft. above ground may, perhaps, be left to his initiative.

We now come to the fourth class, the author's typical design for a thrust buttress dam. The best

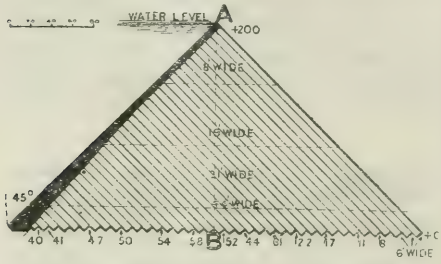


Fig. 1.—Thrust Buttress Dam: Elevation of Buttress and Section of Arch.

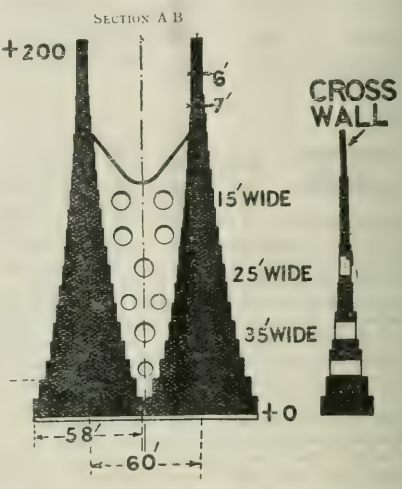


Fig. 3.—Thrust Buttress Dam.

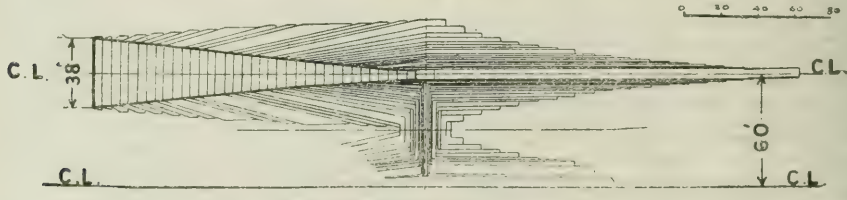


Fig. 2.—Thrust Buttress Dam. Plan.

* From a paper read at a meeting of the Concrete Institute on the 14th inst.

slope for the water face is, under normal conditions, 45°, and the dam then consists of inclined arches, of increasing thickness with increasing depth sloping at 45°, the abutments resting against the upstream face of the buttresses, which are built up of layers all inclined at 45°, the thickness depending upon the material used, and the width of each layer being such that the thrust upon it is the maximum allowed thrust.

The calculation of thrust is made by adding the water load transmitted to any plane parallel to the face to the resolved part of the weight of masonry above the plane in question, the same method of calculation being adopted in every part of the buttress.

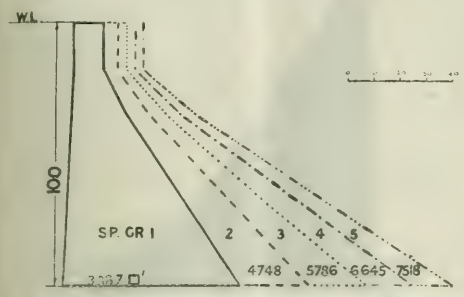


FIG. 4.—A PARALLEL SLICE DAM: GRAVITY BUTTRESS.

The resolved part of the weight of the arch is, in each case, added to the water load. The water loads are thus transmitted by direct thrust, the layers not being bonded together, but left free to take up the deformation under the water load by sliding on one another. If the rock will not take the load at an angle of 45°, the water face may be made flatter and longer. The typical design is, however, that with a 45° slope.

This adoption of a general stress, instead of one varying from nearly zero to some maximum, is an important element of economy.

Comparing this dam with a mass dam, under certain conditions of site and costs of material the following, for dams 162½ ft. high, was found

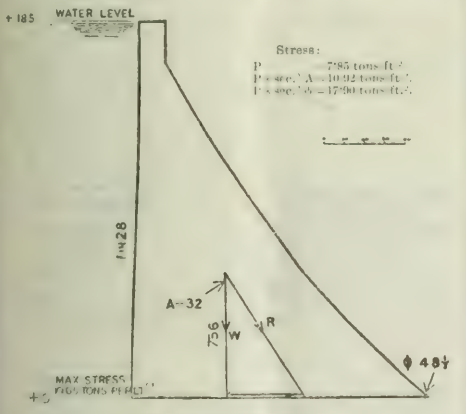


FIG. 5. A MASS DAM.

| | |
|---|---|
| Mass dam, maximum pressure (Bouvier), 10 tons per square foot | Masonry, 100 units. |
| Thrust buttress dam, minimum arch thickness 6 ft., stress in arches 15 tons per square foot, in the buttresses 10 tons per square foot | 95 units. |
| Thrust buttress dam with a minimum arch thickness of 4 ft. | 92 units. |

The difference would be considerably greater if we made, for the mass dam, $p \sec^2 \phi = 10$, or even $p \sec^2 \phi = 12$.

If the rock is not strong enough to take as high a maximum stress as that allowed in the buttresses, the layers can be footed out to a greater width below ground level. There is, for each stress allowed, a limiting height, which brings the buttresses together at their bases. With a stress of 10 tons per square foot the height is a little over 200 ft., and with a stress of 16 tons per square foot about 300 ft.

Such a dam may be built of materials such as slabs of limestone or hard shale, which are not suitable for the rubble masonry or mass concrete of a mass gravity dam.

The definite propositions which the author puts forward are:—

(1) That there is no precedent for the building of a mass gravity dam in an unassisted length more than 150 ft. clear of the ground.

(2) That our present ideas as to maximum stresses allow of the building of such a dam to heights only slightly in excess of this.

(3) That since the improbability of the stress actually reaching $p \sec^2 \phi$ increases as the slope at the downstream toe is flattened, we may, for heights above 150 ft. and for angles flatter than 45°, allow one maximum computed stress for $p \sec^2 \alpha$, and a computed stress for $p \sec^2 \phi$, some 50 per cent higher.

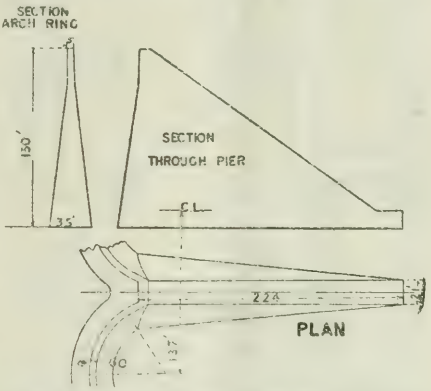


FIG. 6.—GARRETT'S DESIGN FOR A 150 FT. DAM.

(4) That interrupted dams, the gaps being spanned by horizontal or inclined arches, or by beams, offer the important advantages:—

(a) Economy of material;

(b) Absence of contraction cracks and temperature stresses;

(c) Maintenance of waterway during construction;

(d) Cheapness of sluices;

(e) In some cases a wider choice of materials and of methods of building;

(f) And that the interrupted dam, or dam of spans, may be considered as an alternative to the mass gravity dam for great heights, especially as regards the height clear of the ground.

(5) That the author's design for a thrust buttress dam is suitable for heights up to 200 ft., with materials allowing of a compression stress of 10 tons per square foot and up to 300 ft., if a stress of about 16 tons per square foot be allowable.

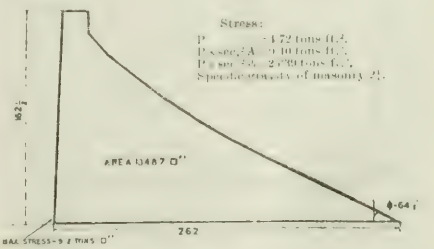


FIG. 7.—A PARALLEL SLICE DAM, ¼ SOLID, ¾ GAP.

(6) That none of the dams at present built are thrust buttress dams, either as regards the method of building or in practical effect.

(7) That, in order to avoid tension near the upstream toe of a high mass dam, or of a gravity but-

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tress in a dam of spans, it is desirable to make the connection with the rock somewhat as follows:—

The upstream third of the base a flat surface with no bonding and *no trench*;

The middle third bonded, but not deeply trenched;

The downstream third effectively bonded with the rock cut in faces at right angles to the thrusts of the masonry.

(8) That when a high dam is to be built with a large part of its total height from foundations below the bed of the reservoir, it may be worth while to relieve that part of the upstream face from water load by directly draining it through the dam.

(9) That dams in the tropics, or near the tropics, with down-stream faces towards the Equator, or facing east or west, may with advantage be provided with temperature-skins to a depth depending on the extent

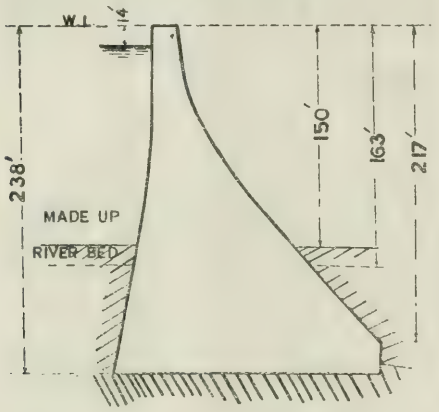


Fig. 8.—New Croton Dam.

to which daily or annual changes in temperature deprive the outer shell of the face of its value as material resisting compressive stress.

(10) That a long and high mass dam may usually be, with advantage, built with gaps in the masonry across the length, these gaps being filled when the temperature of the dam is judged to be nearly at or a little below its future mean temperature. If cracks are specially to be guarded against, the gaps may be filled at the end of the cool season and after the temperature of setting has subsided—that is, when

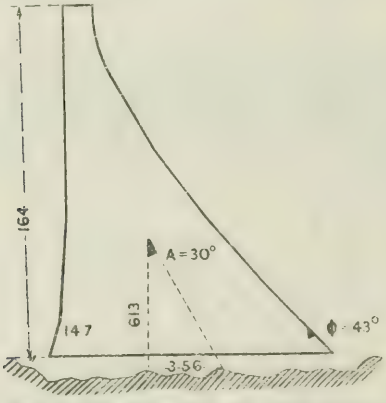


Fig. 9.—Chartrain Dam (Masonry weighs 150 lb. per cubic foot).

the average temperature of the masonry is at its lowest.

(11) That the grading of material in a large dam should be such that the large stones are not "plums," or displacers, but play the part of the stone in ordinary concrete.

The general theory of arched dams is explained, and Captain Garrett's type described, in Professional Paper of the Royal Engineers, Fourth series, vol. ii., Paper No. 1. By Captain A. H. Garrett, R.E.

The author's studies are fully reported in a "Note on Mass Dams and Dams of Arches," a Madras Government paper, P.W.D. (Irrigation).

The author's statement of the general problem and a concise description of his type design for a thrust buttress dam will be found in the *Engineer*, February 24 and March 3, 1911—"The Problem of the High Masonry Dam."

Table No. I. shows, on certain assumption, a saving of about 14 per cent by adopting the parallel

Fig. 10. Proposed Typical Foundation for a High Dam.

-face dam instead of a mass dam for a height of 162½ ft., and a maximum stress of 10 tons per square foot. Table No. II is a similar, but more detailed, comparison for a height of 100 ft. It shows, for 60-ft. spans with a 50 per cent excess rate for arch work, an idle thickness of 1½ ft. in the arches, and an arch stress of 15 tons per square foot, the following savings: "specific gravity 2" dam, 8 per cent; "specific gravity 3" dam, 12 per cent; "specific gravity 4" dam, 14 per cent.

Similarly, with 1 ft. of idle thickness, and no extra

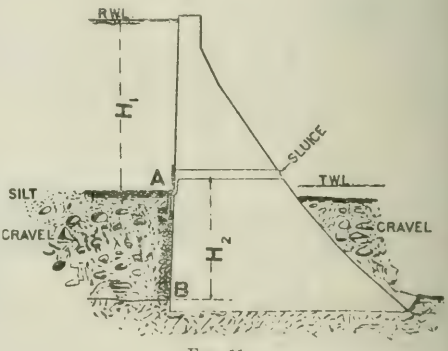


Fig. 11.

rate for arch work, the savings are respectively 15 per cent, 22 per cent and 25 per cent.

With 30-ft. spans, no extra thickness and no extra rate, and an allowed arch stress of 20 tons per square foot, we have savings of 24 per cent, 35 per cent and 39 per cent respectively for the three degrees of concentration of water load.

## DISCUSSION OF MR. RYVES' PAPER.

Mr. E. P. Wells, vice-president, occupied the chair at the meeting of the Concrete Institute, at which the foregoing paper was read.

Mr. Charles F. Marsh, M.Inst.C.E., said that the institute had been fortunate in having a number of very interesting papers read before them, and this paper certainly ranked among the best. He noticed that the author gave the height of the new Croton dam as 238 ft., but thought that the figure was sometimes given as 290 ft. It certainly did not seem impossible to build a dam 200 ft. clear of the ground, and he would have welcomed the author's opinion as to the maximum height to which a reinforced concrete

dam could be built. Had the author made any calculations to show that there was some limiting height above which a reinforced concrete dam could be built, on the score of cost? Referring to Fig. 11, English practice did not favour any piercing of the dam by tunnels, as shown in that figure, but possibly the conditions in India were somewhat different. With regard to the use of plums, referred to in proposition No. 11, if the author meant that these large stones should touch one another, he did not agree with him. Their presence was an important economy, but at least 4 in. or 6 in. of the concrete proper should be left between them.

Mr. Ewart S. Andrews said that he was associated with the theoretical side of the subject, having been at University College when Prof. Karl Pearson and Mr. Atcherly were carrying out their classical experiments with jelly models. He would be glad to know the author's opinion as to the calculation of maximum thrust by Unwin's theory. Did such stresses really exist? As regards tension, he believed that Prof. Pearson and Mr. Atcherly had shown that, owing to a cantilever effect, tension did actually exist near the toe of a dam on the under side. Looking at Fig. 10, he would have thought that the more effective bonding should be towards the upstream end of the base.

Mr. E. Fiander Etchells, F.Phys.Soc., A.M.I.Mech.E., said he thought that it would be of interest to many members, especially those working on the outposts of Empire, if Mr. Ryves would give, in a simple form, the derivations of the two formulæ for the computation of maximum stress, and similar data of dam design. As regarded Fig. 10, he thought that the more the resistance along the base was shear resistance, and the less it was friction resistance, so much the better. Mr. Etchells sketched upon the blackboard a diagram showing the positions of dams in the tropics relative to the sun, and pointed out that this was another matter in which men working under rough conditions abroad would be glad of guidance. He alluded to the necessity, in some regions, of taking earthquake effects into account, and cited a case in which a dam of somewhat slender section, calculated with beautiful precision by its designer, was accepted by the responsible engineer with the section lying on its face, turned through an angle of 90 deg. and this stood through a severe earthquake.

Mr. Morgan E. Yeatman, M.A., M.Am.Soc.C.E., pointed out that the greater dimension alluded to by Mr. Marsh in the case of the new Croton dam probably included the filling of a deep hole which did not extend across the width of the dam proper, so that the section shown by Mr. Ryves was probably a correct representation of the effective section of the dam. He asked the author to explain what thickness he would give to the thrust layers of his buttresses in the thrust buttress dam, and what was the precise form of these layers.

Mr. S. Bylander asked how it was that the author did not get different pressures at different layers, and thought that a definition of the method of calculation would be useful.

Mr. Maurice Behar said that he was confident that very high dams could be built of reinforced concrete, and built cheaply. The use of the material gave reduced pressures, and, in some cases, the amount of excavation was much less. Had the author overlooked the Furens dam as an example of a very high masonry dam?

Mr. A. Alban H. Scott remarked that important lessons were sometimes to be learned from failures, and he would like to know whether the author thought that this applied to failures of dams. As regards the typical foundation shown in Fig. 10, did not the method there shown tend to increase the water pressure under the dam?

Mr. W. G. Perkins suggested that reinforced concrete might be successfully used for a dam of the author's type.

Mr. R. Dudley, Assoc.M.Inst.C.E., remarked that the foundation shown typically in Fig. 10 might be all right theoretically, but how could it be applied to the practical cases in which, owing to the varied nature of the rock, the excavation for the foundation had to be very irregular? When, for instance, a deep vein of loose material had to be cleared out, what would the author do with his foundation at that place?

The Chairman complimented the author on his interesting paper. Referring to the design of the author's thrust buttress dam, he suggested that the buttresses might be closer together near the base, in order to reduce the spans of the arches and economise material. He suggested, also, that the upstream face might be made in steps instead of a flat surface. This would not affect the distribution of stress, and would be of great practical advantage as a means of carrying the scaffolding during the successive stages of the work. He remarked on the low maximum stress, 10 tons per square foot could be safely borne by very poor concrete.

Mr. Ryves, in replying to the discussion, said that some of the suggestions made might be better met by the preparation of a further note than by further consideration at that meeting. He had ample materials, and was prepared to select from them anything likely to be of service to the members. Dr. Unwin's proof of maximum stress $= p \sec^2 \phi$ was doubtless correct; but the actual magnitude of the stress is in doubt, because $p$ may be much smaller than is supposed in some parts of the dam. He would like to point out that his design for a thrust-buttress dam had no precedent, even on the smallest scale, for although dams and weirs had been built with inclined faces, and their designers felt safer because some of the water load was transmitted to the rock, nevertheless, such dams were calculated to resist toppling moment by weight moment, and were essentially gravity dams. It would be found that in recent examples of American dams the materials were not disposed for direct thrust, and that the upper part of the water face had in no case any materials behind it in the line of thrust. As to what he had said about the cost of building a reinforced concrete dam of great height, it was suggested that he should design such a dam and offer the design for criticism by experts. He preferred to let the experts do the designing, when he would be prepared to do the criticising. In Fig. 10 the connection between the ground water upstream and the tail water downstream was represented as a sluice. River dams had, in many cases, to be provided with sluices for keeping down the silt, and for other purposes; and where such a sluice existed advantage could be taken of it to reduce the head over the part of the upstream face which was below a more or less impervious bottom of the reservoir. He did not, of course, advocate such drainage of the soil under the reservoir unless its depths was considerable, and the reduction of head effected a matter of real importance. Another point raised by Mr. Marsh was a very important one—the continuity of the concrete between plums. He (Mr. Ryves) desired to see the plums used freely and near together, but could not have them touching; a foot or more might well be left between them. As one who had also sat at the feet of Prof. Karl Pearson, he welcomed Mr Andrews' remarks. He had made calculations which showed that tension may exist on the underside of a dam with a straight line distribution of normal pressures. He had divided the dam section into vertical layers for purposes of graphical calculation, and these calculations he had pursued, with more and more modification of the straight line curve, until he got no tension. Then he asked himself the question, Is this a reasonable curve? The answer was that the curve so found agreed with opinion and agreed with experiment. The actual distribution, however, depended upon the way in which the dam was bonded into the rock, and his studies had led him to adopt the typical method shown in Fig. 10. A study with the dam assumed to be fixed at the upstream toe showed, of course, severe tension. A study with the upstream half of the base treated as bonded in, and the downstream half free to slide, also showed tension. The best way to avoid tension in any part of the base is to increase the effectiveness of the bond from the upstream to the down-stream toe. This, with special reference to the point raised by Mr. Etchells, meant that typically the upstream third was a friction surface, the middle third moderately bonded, and the downstream third very effectively bonded, and stepped at right angles to the thrust, if possible. With reference to the new Croton dam, he thought that the explanation given by Mr. Yeatman covered the question of the true height of the solid section of the dam. In the design of the thrust buttress dam the thickness of the slabs depended upon the materials used and the method of building adopted. Their width increased from the water face to the middle line, because the weight of the masonry above increased; but from the middle line to the rock that height was constant, and so was the width of the slab. Referring to the Furens dam, alluded to by Mr. Behar, this interesting

dam was in a narrow gorge, and was arched in plan, and did not compare with the valley dams, which were the only types considered in his paper. Mr. Scott had alluded to failures of dams. He (the author) had studied carefully the reports of such failures, but did not think the causes of failure instructive to competent designers. This did not, perhaps, apply to a recent failure of a dam in Spain; but he had no particulars of this case. Mr. Scott had also remarked on Fig. 10 as regards the effect which the method of bonding shown might have in causing water pressure under the dam. Drainage should, however, be considered separately; it must be effective, but it must not dominate the bonding. The trench in the rock upstream of the base, in Fig. 10, was intended to suggest clay puddling at the upstream toe—one of the best ways of making an effective seal. Generally, the foundations had, of course, to be adapted to the shape of the hard rock; but in the case of a vein of sand, or a deep crack, if this occurred in the upstream third of the base he would fill it with concrete up to the surface of the adjoining rock, and would leave the surface of this concrete to harden before putting in the foundations proper. As regards a suggestion made by the chairman, the fact that the widths of the buttress layers were greater towards the base of the dam resulted in the effective spans of the arches being much reduced, and the provision of additional buttresses would not, therefore, be more economical. The chairman's suggestion as to stepping the face seemed to be a thoroughly sound one for the reason given. With reference to the material of the thrust buttress dam, it was true that a concrete which would only take 10 tons per square inch with safety was a very poor concrete, but it might also be a very cheap concrete.

## MUNICIPAL WORK IN CANADA.

*(From a* Surveyor *Canadian Correspondent.)*

Civic engineers, architects, and other professional men have recently made strong protests against the action of corporations and similar public bodies in selecting Americans for good positions and in giving work to American firms. Some of the largest councils have ignored the qualifications of Canadians and British, and have sought expert advice from over the Border. This has been particularly so in the engineering and architectural departments, and there is a considerable amount of soreness over the matter. The latest instance is at Moose Jaw, where an "engineering commissioner" was wanted, the salary being £1,200 per annum. Several Canadians with excellent credentials applied, but these were all passed over for an American. There is naturally a big outcry over this appointment, not against the gentleman selected, but against the ignoring of the Canadians, who certainly had sufficient qualifications for a comparatively small city like Moose Jaw.

* * * *

The activity in building operations in Canada may be judged by the returns from twenty-two of the principal cities of the Dominion, which show that about £23,829,900 were spent in 1911 on new structures and repairs. These figures are based on the building permits issued by the various municipalities. The comparison is with £18,533,045 in the previous year, or a gain of 29 per cent. The statistics do not cover the whole of Canada (as many places do not issue permits), but they may be taken as typical of the entire country. Naturally, the greatest proportionate increase was shown in the West, where new buildings are going up at an immense rate—in some instances the gain was over 100 per cent. Along with this growth there has been corresponding expansion in municipal plants, sewers, buildings, roads, and the hundred-and-one things necessary to keep pace with increased population. British firms have had a good share of the business which is associated with municipal life, and should do even better this year, as there is every indication of greater progress in this particular direction.

* * * *

Builders have to face a certain amount of competition from Americans. Some of the largest houses in New York, Boston, and other cities have established branches in Montreal, Toronto, Winnipeg, and elsewhere, and have met with a fair amount of success. These [illegible] and, as [illegible] there can be no legitimate objection to the competition, the opposition really is to the sub-contractors, who are brought in by the Americans who secure the general contract. The ground of objection is that the smaller men have no permanent interest in the country, employ only the minimum amount of Canadian labour, and deprive local supply houses of business. They are mere birds of passage, whose only interest is to get as much as possible out of Canada without contributing to its upkeep. The Montreal Builders' Exchange want a duty of 10 per cent put upon all work done by these outside contractors. This, of course, is Protection, but it is claimed that it is the only way to prevent unfair competition.

* * * *

In some instances where British firms have tendered for municipal work, and where their bids have been slightly lower than those of Canadian houses, the business has gone to the latter, on the ground that home firms ought to have favourable consideration where there was no great difference in price. The City Council of Vancouver, B.C., has disregarded this principle and awarded a contract to the British Welding Company for the supply of steel water pipes. The next tender, by a local concern, was $1,500 higher, but after discussion the council agreed that it was wise to save this sum.

## RAILLESS ELECTRIC TRACTION.

### PAPER BY MR. BERTRAM FOX.

At a recent meeting of the Junior Institution of Engineers a paper on the subject of "Railless Electric Traction" was read by Mr. Bertram D. Fox, B.A., Assoc.M.Inst.C.E.

Mr. Fox pointed out that mechanically-operated vehicles must be classified broadly as (1) those which run on rails, and (2) those which made use of the ordinary road surface—electrical power being used almost exclusively for the former, and some motive power other than electricity being used for the propulsion of the latter. Greater suitability and economy were given as the reasons for electric power having superseded all other forms of motive power on tramcars, and this would have applied to road vehicles but for the difficulty experienced in the application of electric power owing to the unsuitability of the usual type of trolley or current collector. Special types of trolley had been tried for the trackless car, but their construction imposed too many restrictions. The difficulty in connection with the trolley was finally overcome by adhering to the usual tramway type of overhead line, and adapting the usual tramway trolley to the new conditions, and the economic and technical considerations that had made electric power supersede all other motive powers in tramways would now produce the same result in connection with road vehicles.

The author commented upon the inadequacy of existing tramways to serve the remoter parts of their areas; tramways serving urban areas only, suburban areas must therefore be served by road vehicles. As the traffic problem of urban areas was only solved by electrification of rail vehicles, so the traffic problem of suburban areas would also only be solved by electrification of road vehicles.

The results of the first installations in this country, which were made simultaneously at Leeds and Bradford, where the vehicles have been in continuous service since June of last year, were given.

A discussion followed, in which Messrs. T. Alder, B. E. Dunbar Kilburn, C. T. Wilkinson, H. Burge, W. A. Tookey, A. W. Marshall, E. M. Munro and G. J. Hartley took part, and the author having replied, the proceedings terminated.

### Metropolitan Water Board's Proposed New Offices.

The Metropolitan Water Board have instructed the General Purposes Committee to consider and report on the question of providing new central offices for the board. An offer of a site has been received from the London County Council.

**Old London.** The five models of Old London, which were exhibited at the Franco-British Exhibition, and afterwards at the Festival of Empire, by Mr. John B. Heap, manager of the London Directory and Trading Offices Bureau, Imperial W.C., have been acquired by the London Museum, Kensington Palace, the authorities having had an annexe specially built for their reception.

# London Street Pavings.

## METROPOLITAN COMMITTEE'S NINTH ANNUAL REPORT.

The Metropolitan Paving Committee have issued their ninth annual report relative to the paving works carried out in the County of London by various road authorities, compiled from information which has been very kindly furnished by the engineers to the various authorities concerned. It will be remembered that the committee was formed as the result of a conference of representatives of the metropolitan borough councils held at the Westminster City Hall on January 8, 1903, for the purpose of considering the general question of materials and means of paving the streets of London.

The importance of the committee's work continues to receive wide recognition, applications for the committee's reports, and appreciative references to their usefulness, having been received from many of the chief cities in the United States, France, South Africa, and Germany, as well as the United Kingdom. The committee's work is confined to the collation and assimilation of information relative to different materials and methods of paving under varied circumstances, and no attempt is made by the committee to advocate the use of any particular description of paving. The information furnished in the returns on which this report is based relates to practically all the best known descriptions of paving, the method of laying, the period the paving has lasted, cost of laying, effect of motor-omnibus traffic on the roadway, saving on tar-sprayed roads, and other details. The chief features of this year's return may be very briefly summarised as follows:

*Principal Kind of Paving Laid.*—It would appear that the principal kind of paving laid down during the year under review in main roads was creosoted soft wood, generally laid close jointed and grouted with pitch.

*Foundation.*—Some boroughs favour a foundation of Portland cement concrete 9 in. thick, while others appear to consider a 6-in. foundation sufficient even in main thoroughfares.

*Effect of Motor-Omnibus Traffic.*—Complaint is made that motor-omnibus traffic is detrimental to macadam-paved roads, but in the absence of any statements to the contrary it would appear that such traffic is not particularly detrimental to the surface of wood-paved thoroughfares, provided that an extra thickness of concrete foundation is laid.

*Saving on Tar-sprayed Roads.*—The most striking feature of this year's return is the saving which has taken place consequent on the tar-spraying of macadam roads. From the information supplied by the borough surveyor of Wandsworth, it will be seen that a very considerable saving has taken place in the cost of scavenging, watering, and maintenance of highways since the adoption of the system of tar-spraying macadamised roads. The figures show that the cost of the scavenging, &c., services in the year 1906-7 prior to tar-spraying was £96,035 (including £7,434 for new wood paving). In the year following, this figure had declined to £83,985 (including £3,067 for wood paving), and in the year 1910-11 the cost of these services had fallen to £62,760 (including £10,955 for new wood paving). The amount expended in tar-spraying during the four years 1907-10 was £6,731. The returns from other boroughs also show a saving, and it is agreed on all hands that there is a great improvement in the road.

The returns sent in during the past year have been put in tabular form, and may be briefly summarised as follows:—

### FULHAM.

In Fulham a small area of bituminous macadam was laid 2½ in. deep, finished with a coat of liquid bitumen on a foundation of 12-in. hardcore, at a cost of 8s. 6d. per yard super., without foundation, including footways.

Creosoted deal and creosoted larch, 8 in. or 9 in. by 5 in. by 3 in., were also laid, close jointed, grouted in with pitch and cement on existing concrete foundations, at a cost of from 7s. 9d. to 8s. 11½d. per yard super., without foundation, but including the making good of existing foundations.

The surveyor states that the annual cost of maintenance of soft-wood roads is about 1·04d. per yard super.—*i.e.*, if certain repairs have been made in a road, the cost of those repairs is spread over the total wood-paved surface of the road. If the cost was spread over the whole of the wood-paved roads, the cost per square yard would be less.

In the opinion of the surveyor motor-'bus traffic on macadamised roads is detrimental to the wear of the roadway. Forty miles of road surface in Fulham have been treated this year with tar at a cost of ¼d. per super. yard.

The surveyor carried out a series of experiments with tar and bitumen and macadam. The tar was found to be too erratic in character to justify its extended application as a binding agent in macadam construction. After numerous experiments a new method of binding macadam was found by substituting Trinidad Lake bitumen for tar, and this has been proved to give exceptionally good results of a permanent character, fully justifying its extended use. In the surveyor's opinion it will not only improve the streets and reduce the scavenging, but it will also render less necessary the cleaning out of the sewers, which receive a large quantity of grit from the surface of the roads.

### HAMMERSMITH.

A small area of tar-macadam was laid in this borough. The material used was Trinidad Lake bitumen and granite mixed, laid 3 in. thick on a foundation of old macadam road. The tar-macadam was laid by the contractor, the foundation being prepared by the borough council, at a cost of 3s. 9d. per yard super., with foundation. In the opinion of the surveyor there has been a material decrease in the cost of scavenging and watering since the introduction of tar-spraying.

### HAMPSTEAD.

The wood paving laid in this borough consisted of 8-in. by 3-in. by 4-in. creosoted deal blocks, laid close jointed, run in with pitch, and grouted with Portland cement on a 6-in. Portland cement and Thames ballast concrete foundation. The cost of laying per yard super. was 5s. 8d. and 5s. 9d., without foundation, and 7s. 6d. with foundation.

Lithofalt paving blocks, 9 in. by 4½ in. by 1½ in., were also put down. They were laid on wet floating, at a cost of 7s. 10d. per yard super., with foundation; the foundation consisted of a thin coating of concrete, the macadam and hardcore underneath being disturbed as little as possible.

Tar-slag macadam was also put down, the 4½-in. costing 3s. 6d. per yard super. without foundation, and the 3-in. 2s. 6d. per yard super. without foundation.

All the paving laid down is said to have worn satisfactorily.

### HOLBORN.

A large area of tarred-slag macadam was laid in residential streets in this borough during the past year. Some of this paving was laid with one coat 3½ in. thick, but most of it with two coats 4½ in. thick. It was consolidated with the steam roller on a hardcore foundation, and the cost of laying was 7s. 1d. with foundation, and 2s. 8d. without foundation for the 3½-in., and 5s. to 6s. 10½d. per yard super. with foundation, and from 3s. 4½d. to 3s. 5½d. without foundation for the 4½-in. This paving is said to wear fairly well.

Compressed rock asphalt 2 in. thick was laid, compressed with heated pelons on a 9-in. Portland cement concrete foundation, at a cost of from 12s. 6d. to 13s. 9d. per yard super., with foundation. A very small area of 1½-in. asphalt was also laid.

In Shaftesbury-avenue some 3,400 super. yards of creosoted Swedish deal blocks, 3 in. by 9 in. by 5 in., were laid, pitch-grouted with cement finish on a 9-in. Portland cement concrete foundation. These were laid by contractors under a fifteen years' maintenance contract, which provided for the annual payment by the borough council to the contractors of 1s. 7d. per yard super., including first cost of the paving.

The engineer mentions that in one case in High Holborn repaving of a large area was rendered necessary by underground movement of the subsoil.

### KENSINGTON.

The principal streets in this borough were paved with creosoted deal blocks, 8 in. by 3 in. by 5 in. and 8 in. by 3 in. by 4½ in. They were laid grouted with

tar, pitch and cement, on a 6-in. Portland cement concrete foundation, by a contractor, at a cost of 7s. 0½d. to 7s. 9d. per yard super. without foundation, and 12s. 5d. per yard super. with foundation. It appears that the paving which this paving replaces lasted in Fulham-road and Kensington High-street eleven years, in Earl's Court-road seventeen years, in Bayswater-road ten years, and in Gloucester-road sixteen years.

In minor thoroughfares, asphalt and Kensington asphalt clinker blocks, 9 in. by 3 in. by 4½ in., were laid, grouted in cement on a foundation of hardcore. The cost of this paving is not given.

CITY OF LONDON.

Most of the paving laid in the City during the past year consisted of natural rock asphalt, compressed, laid to a depth of 2½ in. on a 9-in. Portland cement concrete foundation. This was put down by a contractor, under a maintenance contract, at a cost of 15s. per yard super. with foundation, and 9s. without foundation. The annual cost of maintenance per yard super. is 9d. The engineer states that the asphalt paving which this paving replaces in Newgate-street and King Edward-street lasted for periods of seventeen and a-quarter years and twenty years respectively. Two-inch asphalt was also laid in a less busy thoroughfare on an 8-in. Portland cement concrete foundation, at a cost of 13s. per yard super. with foundation, and 8s. 6d. without foundation. The annual cost of maintenance per yard super. of this pavement is 5d.

Creosoted deal blocks, 3 in. by 8 in. by 5 in., were also put down on an 8-in. Portland cement concrete foundation, the joints being filled in with a boiling mixture of pitch and oil. The work was done by a contractor, under a maintenance contract, at a cost of from 11s. 4d. to 13s. per yard super. with foundation, and from 7s. 8d. to 11s. without foundation, the annual cost of maintenance per yard super. being from 6½d. to 9d. Some of this paving replaced hard wood paving, which had been previously laid. The engineer states that there are no macadam-paved roads in the City.

The following letter, dated February 27, 1912, addressed to the chairman of the committee, has been received from the City Engineer of London:—

"In reply to your inquiry as to the extra cost of paving carriageways in the City of London, I find that, due to the increase of motor vehicles, the existing foundations of many of the main thoroughfares are not of sufficient strength to withstand the weight and strain now imposed upon them: and am of opinion that the minimum thickness of the concrete foundation should be 9 in." The City Engineer proceeds to quote prices which show that the extra cost per yard super. of the 9-in. as compared with the 6-in. foundation, is 1s. 8d. in the case of 2¼-in. asphalt and creosoted deal blocks.

LONDON COUNTY COUNCIL.

The return furnished by the London County Council deals with soft wood, macadam and asphalt paving laid in eight boroughs.

In Lea Bridge-road, Hackney, where the gradient was 1 in 65 and 1 in 34, creosoted deal blocks, 8 in. by 3 in. by 5 in., were put down. These were laid dry and grouted with pitch on a 9-in. Portland cement concrete foundation, at a cost of 16s. per yard super. with foundation, and 10s. 3d. without foundation. In Belvedere-road, Lambeth, where the gradient is 1 in 61, with a great deal of heavy warehouse traffic, 9-in. by 3-in. by 5-in. creosoted deal blocks were laid, run with pitch, and then cement grout, on a 9-in. Portland cement concrete foundation, at a cost of 12s. per yard super. with foundation, and 8s. 3d. without foundation. In Harrow-road, Paddington, a main road with a gradient of 1 in 700 and 1 in 436, 9-in. by 3-in. by 5-in. creosoted deal was laid, pitch grouted, on a 6-in. Portland cement concrete foundation, at a cost of 13s. 9d. per yard super. with foundation, and 8s. 6d. without foundation. In Baltic-street and Hatfield-street, Finsbury, 2-in. asphalt was put down on a 9-in. Portland cement concrete foundation, at a cost of 1s. 8d. per yard super. with foundation and 1s. 4d. without foundation.

ST. MARYLEBONE.

A very large quantity of soft-wood paving has been laid in this borough, besides compressed asphalt and tar-macadam.

The creosoted deal blocks, 5 in. by 3 in. by 9 in., were laid close jointed and grouted with pitch and creosote oil, on a foundation of concrete from 6 in. to 9 in. deep, varying with the character of the street, the cost of laying being from 9s. 0¾d. to 15s. 1¾d. per yard super. with foundation. The work was done by the council with direct labour, and the annual cost of maintenance per yard super. is put at from 3½d. to 8d.

The compressed asphalt was laid to a depth of 2 in. on a 6-in. concrete foundation, the work being done by contract at a cost of 12s. 6d. per yard super. with foundation.

Large areas of tar-macadam were laid in residential thoroughfares. This material was laid in two coats and rolled, the total thickness when finished being 4½ in., the surface being dusted with fine granite chippings. It was laid on an old macadam foundation, at a cost of from 3s. 5d. to 4s. 1d. per yard super. with foundation.

STOKE NEWINGTON.

Acme sectional Jarrah hard-wood blocks, 8 in. by 3 in. by 3 in. were laid in this borough on a 9-in. cement foundation. This paving is laid with a very narrow strip between each course, grouted with a special mixture of bitumen. The paving was laid by a contractor, at a cost of about 16s. per yard super. with foundation, and replaces paving which had lasted from nine to thirteen years.

WANDSWORTH.

In this borough creosoted soft-wood (Archangel thirds), soft-wood blocks, 8 in. by 3 in. by 5 in. and 9 in. by 3 in. by 5 in., were laid, dipped in a mixture of tar and pitch and grouted with Portland cement mortar on a 6-in. Portland cement concrete foundation. The work was done by a contractor, at a cost of 11s. 9d. per yard super. with foundation. Some of this paving was laid to replace creosoted soft-wood paving which had been down eleven years.

WOOLWICH.

In a main business thoroughfare soft wood 9 in. by 3 in. by 5 in. creosoted blocks were laid, grouted in with pitch and tar on a 6-in. Portland cement concrete foundation, at a cost of 12s. per yard super. with foundation, and 8s. 7d. without foundation. The foundation was prepared by the local authority, the wood being laid by contractors.

In this borough some 82,500 yards super. of roadway was tar-sprayed, with the result that the cost of watering was considerably decreased. The surveyor states that the motor-bus traffic is very injurious to macadam-paved roadways.

CITY OF WESTMINSTER.

Large areas of creosoted pine blocks, 8 in. by 3 in. by 5 in., were laid in the City of Westminster during the period dealt with in this report. The blocks were laid close jointed, grouted with a mixture of boiling pitch and creosote oil, and after with cement grout, top dressed with ⅜-in. ballast on a 6-in. Portland cement foundation. The paving was laid by a contractor, at a cost of from 7s. 9d. to 8s. 4d. without foundation, and from 11s. 2d. to 12s. 5d. with foundation. Some 2-in. asphalt was also laid, at a cost of about 8s. 1½d. to 8s. 3d. per yard super. without foundation, and 13s. 6d. to 13s. 8¾d. with foundation. The engineer states that the effect of motor-omnibus traffic on macadam roads is detrimental.

Attached to the committee's report are supplementary tables prepared by the borough engineers of Fulham, Greenwich, Hammersmith and Wandsworth, showing highways maintenance charges before and since tar-spraying of roads, the opinions of surveyors extracted from the returns supplied to the committee up to date—being also quoted as to the wearing of different kinds of paving. Another table shows the initial cost of laying per yard super. per street as given in the latest return.

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**Lambeth Bridge.** The House of Commons have rejected the London County Council (Lambeth Bridge) Bill, the grounds of objection being the insufficient width of the proposed structure.

**Failure of Glass Paving Blocks.** Some years ago interest was shown in the alleged possibilities of glass paving blocks. The United States Consul at Lyons now reports that a glass maker of that city manufactured some which he was allowed to lay on a thoroughfare where the city traffic is very heavy. The blocks lasted less than two years, many of them being split, and all of them having their edges badly chipped. They seem to demonstrate conclusively that though they may be used for footways they can never be serviceable in a city thoroughfare.

*METROPOLITAN PAVING COMMITTEE'S REPORT:*

*Statements, prepared by the Engineers of the undermentioned Boroughs, showing the comparative cost of scavenging, watering, and maintenance of highways before and since the roads were tar-sprayed:*

FULHAM.

| Year. | Total mileage of roads repairable by council. | Tar-spraying. Mileage. | Tar-spraying. Area (sup. yds.). | Tar-spraying. Cost. | Cost of Highways. Scavenging (excluding loan charges for sheets). | Cost of Highways. Watering. | Cost of Highways. Maintenance (excluding trenches and tar-spraying). | Cost of Highways. New wood paving. | Cost of Highways. Total of columns 8 and 9. | Total of columns 6, 7, 8 and 9 (excluding tar-spraying). | Loads of slop removed. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | M. F. Y. | M. F. Y. | | £ | £ | | £ | £ | £ | £ | |
| 1907 8 | 60 6 53 | Nil. | | | 12,697 | | 7,385 | 952 | 8,337 | 21,034 | 13,409 |
| 1908 9 | 61 1 87 | 20 0 0 | 281,600 | 319 approx. | 13,636 | | 8,052 | 4,720 | 12,772 | 26,089 | 9,584 |
| 1909 10 | 61 2 55 | 40 0 0 | 563,200 | 639 „ | 12,147 | | 8,446 | 2,337 | 10,483 | 21,991 | 7,066 |
| 1910 11 | 61 3 124 | 44 0 0 | 612,840 | 700 „ | 11,000 | | 9,834 | 824 | 10,658 | 20,958 | 5,751 |

NOTE. During the last two years an increased amount has been spent in the reconstruction of roads (usually done with ordinary macadam) by the adoption of bituminous macadam, which is more costly than ordinary water-bound macadam.

GREENWICH.

| Year. | Total mileage of roads repairable by council. | Tar-spraying. Mileage. Tar macadam | Tar-spraying. Mileage. Macadam. | Tar-spraying. Area (sup. yds.). | Tar-spraying. Cost. | Cost of Highways. Scavenging (excluding loan charges for sheets) | Cost of Highways. Watering. | Cost of Highways. Maintenance (excluding trenches and tar spraying). | Cost of Highways. New wood paving. | Cost of Highways. Total of columns 8 and 9. | Total of columns 6, 7, 8 and 9 (excluding tar-spraying). | Loads of slop removed. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | M. F. Y. | M. F. Y. | M. F. Y. | | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | |
| 1906 7 | 61 7 0 | | | | — | 6,891 6 3 | 2,355 17 1 | 18,972 15 5 | 390 10 0 | 19,363 5 5 | 28,610 8 9 | 15,396 |
| 1907 8 | 61 7 0 | 0 0 213 | 0 0 113 | 3,331 | 61 9 5 | 7,496 1 1 | 2,520 3 7 | 13,619 6 9 | 3,554 9 2 | 17,173 15 11 | 27,190 3 7 | 15,051 |
| 1908 9 | 62 0 0 | 0 3 160 | | 5,510 | 81 19 3 | 8,181 17 4 | 2,186 10 5 | 16,920 13 7 | | 16,920 13 7 | 27,289 1 4 | 17,817 |
| 1909 10 | 61 1 129 | | 1 3 193 | 19,142 | 145 17 11 | 7,205 9 11 | 1,907 9 5 | 12,904 16 2 | | 12,904 16 2 | 22,017 15 6 | 14,384 |
| 1910 11* | 65 2 172 | 1 1 68 | 4 0 45 | 77,861 | 891 15 9 | 7,954 15 3 | 1,837 3 7 | 8,045 1 0 | 245 9 3 | 8,290 10 3 | 18,082 9 1 | 15,351 |
| | | | | | 1,184 2 4 | | | | | | | |

* NOTE.—The usual amount of maintenance work was not undertaken during this year owing to widening work being taken in hand for the Woolwich-road tramways.

*METROPOLITAN PAVING COMMITTEE'S REPORT:*

*Statements, prepared by the Engineers of the undermentioned Boroughs, showing the comparative cost of scavenging, watering, and maintenance of highways before and since the roads were tar-sprayed:—*

HAMMERSMITH.

| Year. | Total mileage of roads repairable by council. | Tar-spraying. | | | Cost of | | | | | Total of columns 6, 7, 8 and 9 (excluding tar-spraying). | Loads of slop removed. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mileage. | Area (sup. yds.). | Cost. | Scavenging (excluding loan charges for sheets). | Watering. | Highways. | | | | |
| | | | | | | | Maintenance (excluding trenches and tar-spraying). | New wood paving. | Total of columns 8 and 9. | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | M. F. Y. | M. F. Y. | | £ s. d. | £ s. d. | Water only. £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | |
| 1908 9 | 52 5 6 | — | — | — | 12,700 1 2 | 509 13 6 | 5,159 13 1 | 11,056 1 8 | 16,215 14 9 | 29,425 9 5 | 17,995 |
| 1909 10 | 52 5 146 | — | — | — | 12,256 14 2 | 438 4 0 | 6,078 6 2 | 1,153 1 9 | 7,231 7 11 | 19,926 6 1 | 16,680 |
| 1910—11 | 52 5 146 | — | 282,903 | 571 13 11 | 11,925 8 1 | 416 9 9 | 5,636 5 6 | — | 5,636 5 6 | 18,078 2 7 | 16,545 |

NOTE.—Labour on watering is included in cost of scavenging shown in column 6.

WANDSWORTH.

| Year. | Total mileage of roads repairable by council. | Tar-spraying. | | | Cost of | | | | | Total (excluding tar-spraying). | Loads of slop removed. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mileage. | Area (sup. yds.) | Cost. | Scavenging (excluding loan charges for sheets). | Watering. | Highways. | | | | |
| | | | | | | | Maintenance (excluding trenches and tar-spraying). | New wood paving. | Amount. | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | M. F. Y. | M. F. Y. | | £ | £ | £ | £ | £ | £ | £ | |
| 1906 7 | 180 3 219 | — | — | — | 35,959 | 10,082 | 42,560 | 7,434 | 49,994 | 96,035 | 67,722 |
| 1907 8 | 181 3 10 | 2 4 127 | 43,969 | 156 | 31,338 | 7,213 | 42,367 | 3,067 | 45,434 | 83,985 | 56,423 |
| 1908 9 | 183 7 143 | 16 1 57 | 244,279 | 1,018 | 31,938 | 7,369 | 39,297 | 11,638 | 50,935 | 90,242 | 67,914 |
| 1909 10 | 186 3 108 | 37 3 50 | 587,229 | 2,386 | 30,549 | 6,544 | 24,408 | 11,218 | 35,626 | 72,719 | 55,810 |
| 1910 - 11 | 188 4 3 | 52 4 26 | 783,559 | 3,171 | 27,247 | 4,349 | 20,209 | 10,955 | 31,164 | 62,760 | 44,952 |
| | | | | £6,731 | | | | | | | |

*Table showing the initial cost of laying per yard super. per street of the different kinds of Paving.*

| Description of material used. | Fulham. | | Hammersmith. | | Hampstead. | | Holborn. | | Kensington. | | London. | | Marylebone. | | Stoke Newington. | | Wandsworth. | | Westminster. | | Woolwich. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | With foundation. | Without foundation. | With foundation. | Without foundation. | With foundation. | Without foundation. | With foundation. | Without foundation. | With foundation. | Without foundation. | With foundation. | Without foundation. | With foundation. | Without foundation. | With foundation. | Without foundation. | With foundation. | Without foundation. | With foundation. | Without foundation. | With foundation. | Without foundation. |
| Jarrah ... | — | | | | — | | | | — | | | | | | 16s. 0d. | | | | | | | |
| Deal ... ... | — | — | | | 7s. 6d. | 5s. 8d. to 5s. 9d. | — | | 12s. 5d. | 7s. 0½d. to 7s. 9d. | 11s. 4d. to 13s. 0d. (Maintenance Contract) | 7s. 8d. to 11s. 0d. (Maintenance Contract) | 9s. 0¾d. to 15s. 1¾d. | — | — | | 11s. 9d. | | 11s. 2d. to 12s. 5d. | 7s. 9d. to 8s. 4d. | 12s. 0d. | 8s. 7d. |
| Larch ... | | 7s. 9d. to 8s. 11½d. | | — | | | — | | | | | | | | | | | | | | | |
| Asphalt ... | | | | | | | 12s. 6d. to 13s. 9d. | | | | 15s. 0d.¶ to 13s. 0d. (Maintenance Contract) | 9s. 0d.¶ to 8s. 6d. (Maintenance Contract) | 12s. 6d.† | — | | | | | 13s. 6d.‖ to 13s. 8½d.‖ | 8s. 1½d. to 8s. 3d. | | — |
| Lithofalt blocks | | | | | 7s. 10d. | | — | | — | | | | | | — | — | — | | | | | |
| Bituminous macadam | — | 8s. 6d.* | | | | — | 7s. 1d.§ | 2s. 8d.§ | | — | | — | | | — | — | | | | | | |
| Tar macadam | | — | | 3s. 9d. | | 2s. 6d.† to 3s. 6d.† | 5s. 0d.† to 6s. 10½d.† | 3s. 4½d.† to 3s. 5½d.† | | — | | | | | — | — | | | | | | — |

* Including footways. † 3 inch. ‡ 4½ inch. § 3½ inch. ‖ 2 inch. ¶ 2¼ inch.

*METROPOLITAN PAVING COMMITTEE'S REPORT:*

*Table showing the Surveyors' opinions as to the wearing of different kinds of paving. (Extracted from the Returns supplied.)*

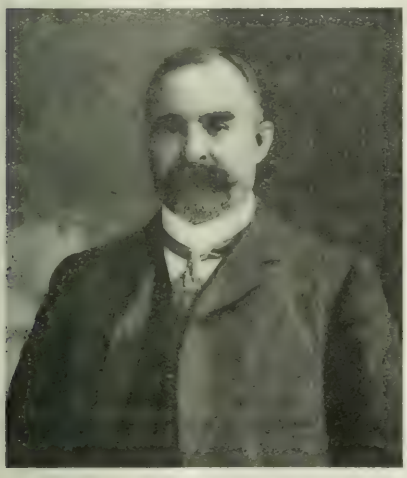
| Description of paving. | Battersea. | Fulham. | Hackney. | Hammersmith. | Hampstead. | Holborn. | St. Pancras. | Shoreditch. | Stoke Newington. | Wandsworth | Westminster. | Woolwich. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Karri ... ... | Wearing well, but surveyor does not recommend less than 5-in. blocks | — | — | — | — | — | ... | — | Soft wood wears infinitely better than hard wood | The soft-wood blocks wear uniformly, and produce a fairly even road surface. The hard-wood blocks wear unequally and at the edges, producing an uneven, cobbly surface | - | — |
| Jarrah ... ... | | — | Good, except against tram lines | Considered satisfactory | Wearing well | Worn well | Worn satisfactorily | Satisfactory; one street unsatisfactory | | | - | Satisfactory |
| Deal ... ... ... | — | Excellent | Uneven | Wearing well | Satisfactory | - | — | — | | | Satisfactory | |
| Fir ... ... ... | — | — | — | | | Worn well | — | — | | | Satisfactory | - |
| Beech ... ... ... | — | — | | Considered satisfactory | ... | — | - - | — | | | - | — |
| Red Gum ... ... | - | — | Bad | — | — | — | - - | — | | | In some cases much worn and uneven, in another showing signs of wear, and another in bad condition, much worn | Not satisfactory |
| Rock asphalt ... ... | | — | — | Considered satisfactory | — | Worn well | No wear perceptible | Satisfactory | | | Satisfactory | |
| Compressed asphalt ... | - | — | - | Wearing well | — | Good | - | — | | | - | - |
| Sanitary blocks ... | | — | — | — | — | — | - | — | | | Mostly satisfactory | — |
| Patent sectional Jarrah blocks | — | — | — | — | Very satisfactory | — | — | | — | - | — | - |
| Basalt lava setts ... | — | — | — | - - | Satisfactory | — | — | | | | — | |
| Tarred slag macadam | | - | — | — | — | Good | — | — | — | | - | - |
| Lithofalt blocks ... | — | - - | — | — | Clean and durable for medium traffic | Good | - | — | - | — | - | - |
| Flints ... ... ... | - - | — | - | Wearing well | — | - | — | — | — | - - | — | - |

## THE ROAD BOARD PERSONNEL.

### 5.—MR. JOHN A. BRODIE.

Mr. John A. Brodie, city engineer of Liverpool, who is one of the members of the Advisory Committee of Engineers to the Road Board, is a member of the Institution of Civil Engineers, and was recently elected a member of the council of that institution. He is a member of the Institution of Mechanical Engineers, a Whitworth Scholar, and a past-president of the Liverpool Engineering Society, and has had conferred upon him by the Liverpool University—of which he was in the year 1903 elected a Professor of Engineering—the degree of Master of Engineering. His recent appointment as adviser to the Government of India in connection with the laying out of the new capital of Delhi will be fresh in the minds of our readers.

Mr. Brodie has had an extensive and varied experience in civil engineering, having commenced his professional apprenticeship in 1875 in the engineering workshops of the Mersey Dock estate, under the eminent dock engineer the late Mr. G. Fosberry Lyster, M.INST.C.E. In the year 1879 he secured a Whitworth Scholarship, and proceeded to Sir Joseph Whitworth's works for a further three years' training



MR. JOHN A. BRODIE.

in engineering, and on finishing this course he took charge of harbour works in Spain, on the completion of which he was appointed general engineering assistant in charge of many important works in the city engineer's department, Liverpool.

In 1882 Mr. Brodie left the public service and entered into private practice in Liverpool as a civil engineer in partnership with Mr. John T. Wood, M.INST.C.E., and designed and supervised during construction large sewerage, water supply, road, tramway, light railway, and a variety of other works. It was during this period that he designed and carried out the improved system of handling refuse at destructors, a method by which the objectionable practice of heaping refuse on the destructor top is avoided. At the same time he designed and brought into use a type of combined destructor and steam generator, and these appliances are in use in many of the largest cities in the United Kingdom and abroad.

In the year 1898 Mr. Brodie was selected out of a large number of candidates to take up the appointment of city engineer of Liverpool, the responsibilities in connection with which may be gathered when it is stated that there are about 520 miles of roads and 840 miles of main outfall and passage sewers, and that in connection with these works and the cleansing operations of the city—which are also under his control—a constant staff of between 3,000 and 4,000 men are employed, the average expenditure in works since he has held the appointment having been £500,000 per annum.

During Mr. Brodie's occupancy of the post of city engineer he took entire control of the construction and maintenance of the permanent way and pavement of the electric tramways, comprising a length of more than 100 miles, also the erection of six car sheds, the electrical equipment and cars being constructed under the joint supervision of himself and the city electrical engineer (Mr. A. Bromley Holmes, M.INST.C.E.).

Comprehensive street improvements have also been carried out, the schemes including concrete construction carrying roadways across the site of the Georges Dock, and reinforced canal bridges, and the laying out and construction of new wide roads through building areas on the outskirts of the city, and since his appointment the expenditure on street improvements has been considerably in excess of £1,000,000.

The development of the system by which main radial roads have been widened in every case to a minimum of about 60 ft.—during recent years this has been increased to 80 ft.—has been extensive during Mr. Brodie's term of office. An important recent development has been the construction in approximately a circular direction on the eastern boundary of the city from Walton in the north to Sefton Park in the south, of a wide road or boulevard, the total length of which will be six miles. The minimum width of this road is 84 ft., and the maximum width 108 ft. During 1910 Menlove-avenue, 1,200 yds. in length and 114 ft. in width, was constructed, this thoroughfare leading from the Calderstones Park to Allerton-road. The carriageway of the road is 66 ft. wide, and has a double line of tramways in the centre, with footpaths and two side paths adjoining, and the road is laid out throughout its entire length with two grass plots of 12-ft. and 6-ft. width respectively, these grass plots being planted with trees.

In connection with road construction, Mr. Brodie has introduced several novel methods with the object of obtaining a cheaper surface than the ordinary sett pavement in residential and streets of light traffic, and among these may be cited concrete-macadam blocks and the use of pitch-macadam pavements. During recent years this latter system has been developed in Liverpool to a great extent, particularly from the point of view of standardisation. One of the advantages of this system is that the area of surface which can be brought up into thoroughly sanitary condition is about three times as much for the same cost which was formerly incurred in connection with the construction of cube sett pavements.

During Mr. Brodie's term of office a large outfall sewer for the drainage of the storm water in the central and low-lying area of the city has been constructed, and a large new outfall sewer for the relief of the Wavertree and southern districts of the city was recently in progress. On taking up the responsibility of the cleansing work of the city, Mr. Brodie, in addition to reorganising the staff and working of the department, introduced several improvements, having for their object the reduction in the cost of handling the materials, the arrangements including a special design of sanitary ashbin for fixing in the outer-back passage wall of premises, and capable of being removed from the outside and emptied direct into the cart. This bin abolished the evils of large ashpits and contamination of atmosphere, and allowed of more frequent and economical collection of refuse.

Mr. Brodie is also the designer of an original method of construction of labourers' dwellings in concrete made from destructor clinker, an example of which are the labourers' dwellings in Eldon-street, Liverpool. In his system each of the sides of a room, including the floors and ceilings, are put together at the joints by dovetails on a principle somewhat similar to that of a joiner's box. Mr. Brodie also takes part in the development of motor vehicles, and was one of the first members and vice-presidents of the Liverpool Self-propelled Traffic Association, and, in addition, has also frequently been called upon to give evidence before Departmental Committees and at the Local Government Board with regard to the regulations in connection with heavy motor cars, street traffic, and so forth.

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In reply to questions in the House of Commons on Tuesday it was stated that Mr. Brodie will receive, in addition to travelling and living expenses, a fee of 1,750 guineas for his services in connection with the laying out of the new capital city at Delhi, it being added that the amount of his salary for the period of his absence will be refunded to the Corporation of Liverpool by the Secretary of State for India. The engagement is for five months.

## CORRESPONDENCE.

*"All truth is precious, if not all divine."*—Cowper.

### INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS: ELECTION OF DISTRICT REPRESENTATIVES TO THE COUNCIL.

*To the Editor of* The Surveyor.

Sir,—May I be permitted through the columns of your paper to express my appreciation of the honour thrust upon me in my election to the new council of the institution?

This honour is enhanced (1) by the fact that I have not sought directly or indirectly this important office, and (2) that it is the first election under the new constitution by popular vote of the entire membership of the institution.

I recognise this imposes obligations; among those being the duty to carry on and to bring into existence and active life many of the aims as yet undischarged, and which influenced my entry to the council two years ago. A little has been accomplished in that time; much more remains to be done.

The new constitution has been obtained; affiliation with the Scottish Road Surveyors has been carried; district meetings in greater number have been held, and generally a keener interest aroused in the affairs and progress of the institution. But if we are to live up to the needs and calls upon us, we must move forward less slowly, and with some more spirit than even the recent past has shown.

For those reasons it is important that in the further election of district representatives for the management of the district business, as well as for the election of district representatives upon the council, the gentlemen to be returned should be (1) prepared to put their shoulders to the wheels of our slowly moving machinery, and (2) be prepared to attend with fair measure of frequency the council meetings. Unless those two conditions are obtained I shall not have much expectation of better things in store for the institution; with those two conditions satisfied, all things are possible to us.

This is my plea for this appeal. An opportunity such as never before, is given to the enlarged voting strength, and *to the younger members in particular*, to exercise their newly conferred franchise in the return to the council of district representatives saturated with the spirit of progress, and of determination to make our institution not only worthy of the past, but actively alive and responsive to the needs and calls of the present.

To name would be invidious, but the published lists of candidates about to be issued to the members will readily suggest those who will adopt and actively support this forward movement.

It was hoped that among the ten already elected would have been one or two representatives of the younger members of the institution, such as deputies or other responsible members of the technical staffs. This, however, with added facilities for attendance at the council meetings (which I hope may soon be realised), is yet to be, along with many other items for the betterment of our institution, for which we have waited and worked, but have not yet seen.

Verily, the land lies now open, let us go in and possess it! Yours, &c.,

A. H. Campbell.

Engineer's Office,
1 Parliament-square, Edinburgh.
March 19, 1912.

### WEATHER FORECASTS.

*To the Editor of* The Surveyor.

Sir,—I beg you will insert this letter to show that the matter has not been lost sight of.

In the *Daily Graphic* of Saturday last a certain London firm stated that they had made special arrangements with the Meteorological Office for a week-end forecast, and the following is that for the last week-end, a forecast sufficient to give anyone the blues:—

"Very unsettled. Rain, with fair intervals. The winds will be southerly and south-westerly, very strong and gusty at times."

The actual weather was as follows: Beautiful, calm springlike day, warm, wind direction south-easterly—a day to make you feel glad you were alive. I think you will admit it was a bit out.

I enclose a forecast given in our local paper, of which the following is an extract:—

"There is now a gradual rise taking place in the barometer, the southern anti-cyclone expanding in a northerly direction. If this continues quieter weather of the westerly type may be expected for the next day or two, with colder nights than those recently experienced. On the whole, the outlook is better than for some time past"—a correct forecast, and one which proves my contention that the Meteorological Office is not sufficiently local or correct in its prognostications.—Yours, &c.,

Frank Harris.

Broadway, Southborough,
Tunbridge Wells.
March 12, 1912.

[Our remarks on this interesting letter will be found in a "Minute."—Ed. The Surveyor.]

### THE BREEDING GROUNDS OF MOSQUITOES.

*To the Editor of* The Surveyor.

Sir,—In view of Dr. Nash's interesting article on "Sewage Works and Street Gullies as Breeding Grounds of Mosquitoes," which appeared in The Surveyor of March 15th, it would be instructive to know whether any refuse heaps with old tin cans, pots, &c., were in existence near the spots infested by mosquitoes.

When in Bermuda two years ago, I found that heaps of house refuse containing empty tins and pots had been dumped in the marshes, or "sinks," lying to the back of the city of Hamilton. Most of these receptacles were partly full of water, and were ideal breeding grounds for myriads of mosquitoes. Every one that I examined—possessing sufficient "water privilege"—contained numbers of ova, larvæ, nymphs and imagines. These tins are now (I trust) collected and kept under cover, until laid on a level stretch of road and the steam roller passed over them.

I was told that many of the natives in the West Indies keep a small fish in their rain-water tanks, not exactly for purposes of keeping down mosquitoes, but to ascertain whether any enterprising friend has poisoned the water.—Yours, &c.,

G. Bertram Kershaw.

West Wickham, Kent.
March 16, 1912.

**Surveyors' Institution: Country Meeting at Nottingham.**—The Council of the Surveyors' Institution have accepted an invitation from the Nottingham and Lincoln Committee of the institution to hold the next country meeting at Nottingham on May 30th and 31st.

**National Physical Laboratory Report: The Roads Department.**—In the annual report of the National Physical Laboratory, presented at a meeting of the General Board last week, reference is made to the two rooms which have been provided at the laboratory for mechanical tests on road materials and the endurance of specimen roads. For the former, in order to preserve continuity with the work which has already been in progress in other countries for many years, it was decided to obtain standard machines as used by the United States Office of Public Roads. The machines installed comprise an abrasion machine of the Deval type, a Page impact machine, a hardness machine of the Dorey type, three machines for testing the cementitious value of rocks and a standard penetrometer. For the endurance tests the specimen road—at present represented by a model—will be laid in the form of a circular track, 2 ft. 6 in. wide, with a mean diameter of 31 ft. The central 2 in. of this track will be tested by the rolling on it of eight 3-in. steel wheels, rotated by a motor carried on a steel arm, which revolves round the centre post. The radial distribution of the wheels is such that the whole width of 2 ft. is covered in one revolution of the arms, and, as a further precaution to ensure uniform wear, each wheel is rapidly moved backwards and forwards radially through a distance of 1 in. by a cam mechanism. The pressure of each wheel on the track can be adjusted up to 1 ton. It is estimated that in the case of a road of tar-macadam, by the use of steel wheels running at 10 miles an hour, twenty-four hours' continuous running would represent one year's wear on a typical heavily trafficked road.

# Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, assoc.m.inst.c.e.

*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

## THE MONTHLY PREMIUM.

Mr. S. S. Harpur, of Maesteg, writing to acknowledge the receipt of the books sent to him in respect of the premium for February, says:—

"I shall find them to be a very excellent addition to my collection of engineering works, and I tender my very sincere thanks for so handsome a gift."

## QUESTIONS.

This week answers are invited to the following questions:—

**227. Refuse Disposal.**—Describe, with illustrations, the most efficient and economical form of refuse destructor for a village of 500 inhabitants. (M.Inst.Mun. and C.E., *Secondee.*)

**230. Refuse Sorting.**—Describe, with sketches, a device for the mechanical sorting of house refuse.

**233. Tramways.**—Sketch a "turn out" or "passing place" on a single line of tramway; figure the leading dimensions, the angle of the crossings, and describe the length, position, and character of the "points" required for diverting the traffic. (M. and C.E.)

**234. Pumping Station.**—Sketch and describe a small pumping station capable of lifting 100,000 gallons of water from a borehole in the rock and delivering through a rising main 500 yds. long into a reservoir, the total vertical lift being 100 ft. After working out the theoretical horse power required, state the brake horse power and type of engine you recommend, and give your reasons. (M. and C.E.)

**235. Elasticity of Steel.**—A rectangular steel bar, 3 in. by 2 in., is placed on edge between bearings 3 ft. apart. What load placed at the centre will deflect the bar $\frac{1}{4}$ of an inch? Assume E = 30,000,000 lb. per square inch. (M.R.S.I.)

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T. R. submits the following notes on the fundamental formulæ in hydraulics:—

It must be remembered all through the study of hydraulics that it differs from mechanics, &c., in that it is not an exact mathematical science, but the results obtained are got by combining reasoning with actual experiment. The idea of "head" is fundamental and very important.

*Definition.*—The pressure at a point is the pressure on unit area if the pressure on every part of such unit area were the same as it is at the point in question. The great thing to remember is that when a liquid is under a given head, that head can be used up in any or all of three ways, *viz.*:—

(1) Producing pressure.
(2) Producing velocity.
(3) Overcoming resistances.

The following points should next be thoroughly grasped. When a liquid flows through an orifice:—

(*a*) The velocity of flow is not the same as the theoretical velocity of each particle.

(*b*) The area of flow is not the same as the area of the orifice.

(*c*) The effective head is not always the same as the actual head (there may be extra head due to difference of pressure).

The following is the notation used:—

$v$ = theoretical velocity
$V$ = actual velocity
$g$ = acceleration due to gravity
$h$ = head
$a$ = theoretical area (*i.e.*, area of orifice)
$A$ = actual area (*i.e.*, contracted area of flow)
$q$ = theoretical discharge = $av$
$Q$ = actual discharge = $AV$

By measurement it is found that $A = \cdot 64a$

The question is: What is the relation between $v$ and $V$?

Now $q = av$
$Q = AV$
By measurement $Q = \cdot 62q$
and $A = \cdot 64a$

$\therefore Q = AV$ becomes $\cdot 62q = \cdot 64a \times V$
but $q = a \times v$

Dividing $\frac{\cdot 62q}{q} = \frac{\cdot 64aV}{av}$

$\therefore \frac{\cdot 62}{\cdot 64} = \frac{V}{v}$ or $V = \cdot 97v$ or $\cdot 97 \sqrt{2gh}$.

Since head produces velocity, this loss of velocity may be expressed as wasted head instead of as a coefficient (*i.e.*, ·97). To do this we consider the actual velocity, and compare the actual head with the theoretical head which would be required to produce the actual velocity.

Note.—Above we considered actual head, and compared the actual velocity with the theoretical velocity which would be produced by the actual head.

Actual velocity = V

$\therefore$ Theoretical head (to produce this if there were no resistance) = $\frac{V^2}{2g}$

Now the actual head ($h$) is greater than this

$\therefore$ Loss of head is $h - \frac{V^2}{2g} = h^1$

*Definition.* The coefficient of resistance (denoted by F) is the ratio of head lost to theoretical head.

$$F = \frac{h^1}{\frac{V^2}{2g}}$$

$$\therefore h^1 = \frac{FV^2}{2g} \text{ or } h^1 = Fh$$

To find F (for circular orifice)

$$V = \cdot 97 \sqrt{2gh}$$

$$\therefore \frac{V}{\cdot 97} = \sqrt{2gh}$$

$$\therefore \frac{V^2}{(\cdot 97)^2} = 2gh \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

$$\frac{FV}{2g} = h^1 \quad h = \frac{V^2}{2g}$$

$$\therefore \frac{FV^2}{2g} + \frac{V^2}{2g} = h$$

$$\therefore \frac{V^2}{2g}(F + 1) = h$$

$$\therefore V^2(F + 1) = 2gh = \frac{V^2}{(\cdot 97)^2} \quad \text{(from (1))}$$

Divide both sides by $V^2$

$$\therefore F + 1 = \frac{1}{(\cdot 97)^2} \quad \therefore F = \cdot 06 \text{ (for circular orifice).}$$

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**Evening Classes for Road Cleaners.**—Richmond (Surrey) Corporation have decided that all lads employed in road scavenging must attend evening continuation schools. The council is paying the fees.

**Birmingham Water Supply.**—On the termination of the discussion at next Tuesday's meeting of the Institution of Civil Engineers on the three papers dealt with elsewhere in this issue—on the subject of Glasgow's main drainage, a paper entitled "The Works for the Supply of Water to the City of Birmingham from Mid-Wales" will be presented by Messrs. E. L. Mansergh and W. L. Mansergh, MM.INST.C.E.

**Town Planning.**—A course of lectures on "Town Planning" will be started at the offices of the Garden Cities and Town Planning Association, 3 Gray's Inn place, W.C., on April 12th, and continue each Friday until Whitsuntide. The first lecture will be given by Mr. Raymond Unwin, and other well-known authorities will deal with town planning from the municipal, estate development, housing and sociological standpoints, while a general review of examples of town planning will conclude the present series. The lectures will be open to all who are interested in the subject, and opportunities for questions and discussion will be afforded. Tickets for the course may be obtained from the secretary of the association, Mr. Ewart G. Culpin.

# Workmen's Cottages for Guildford.

## BOROUGH ENGINEER'S DESIGNS.

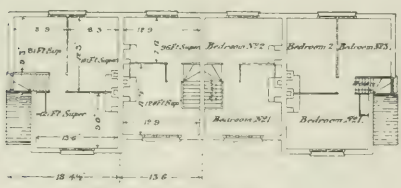
*(Conclusion.)*

In last week's issue we reproduced the designs of Mr. Thos. J. Capp, a local architect, for twelve of the twenty cottages for workmen which are about to be erected by the Corporation of Guildford. The remaining eight houses, as we have already intimated, are to be carried out from the plans of Mr. C. G. Mason, Assoc.M.Inst.C.E., the borough engineer, who proposes to erect two blocks of four houses, each block to consist of two designs *viz.*, C and D—the two outer ones being of design C and the inner ones of design D. The frontage of design C is 18 ft. and design D 13 ft. 6 in.

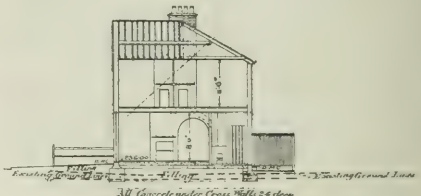
The external walls will be constructed of 9 in. of solid brickwork throughout, supported upon proper

*Front Elevation.*

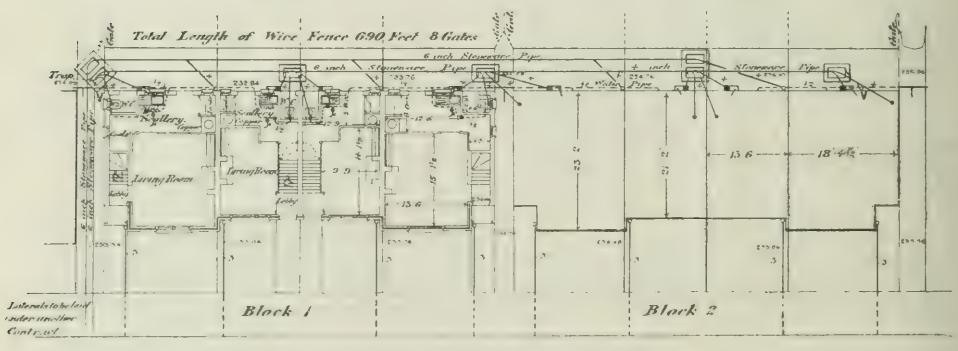
*Back Elevation.*



*First Floor Plan.*



*Cross Section.*




*Ground Floor Plan.*

Designs for Workmen's Cottages at Guildford.

(Mr. C. G. Mason, Assoc. M. Inst. C.E., Borough Engineer, Architect.)

footings resting upon 9 in. of lime concrete. The damp-courses are to be formed of mastic bitumen. The walls of the ground floor rooms will be constructed externally with red sand-facing bricks, and the upper parts of walls stuccoed. The internal partitions are to be built up of 2-in. and 4-in. Portland cement and breeze hollow partition blocks, which will be plastered and distempered.

The roofs will be covered with red sand-faced tiles hung upon battens.

The ground floors will consist of 6 in. of Portland cement concrete with the surface rendered in the scullery, and 1¼-in. flooring boards nailed to patent cement and breeze dovetail-fixing blocks bedded in the concrete in the living room. The hall will be tiled. The first floor will be constructed of 10-in. by 2-in. joists covered with 1¼-in. flooring. The ceilings will be plastered.

DESIGN C.

*Ground Floor.*—The ground floor comprises a small lobby; a living-room, 15 ft. 1½ in. by 13 ft. 6 in. (1,564 cub. ft. in extent); a scullery, 13 ft. 6 in. by 6 ft. (562 cub. ft.); a small larder, and a water-closet reached from the backyard, which will be paved for a depth of 6 ft. The living-room will be fitted with a cottage range and dresser, the scullery with a copper and a sink and draining board. The first floor comprises a front bedroom 11 ft. by 13 ft. 6 in. (1,150 cub. ft.), fitted with a fireplace; a back bedroom, 10 ft. 3 in. by 8 ft. 3 in. (648 cub. ft.), fitted with a fireplace; and a small back bedroom, 7 ft. 3 in. by 8 ft. 9 in. (500 cub. ft.), with no fireplace, but fitted with an air-brick.

DESIGN D.

*Ground Floor.* The ground floor comprises a small lobby; a living-room, 14 ft. 1½ in. by 9 ft. 9 in. (992 cub. ft.); a scullery, 7 ft. by 12 ft. 9 in. (448 cub. ft.); a small larder, and a water-closet reached from the backyard. The rooms will be fitted similarly to those of Design C. The first floor comprises a front bedroom, 12 ft. 9 in. by 12 ft. 9 in. (1,024 cub. ft.); and a

The Surveyor
And Municipal and County Engineer.

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back bedroom, 12 ft. 9 in. by 6 ft. 6 in. (628 cub. ft.), both rooms having fireplaces.

| *Income.* | £ s. d. | *Expenditure.* | £ s. d. |
|---|---|---|---|
| 2 Cottages at 6s. a week for 52 weeks | 31 4 0 | (*a*) £0942 | 28 18 5 |
| | | (*b*) 67 feet at 2s. 1d. | 6 19 7 |
| 2 Cottages at 5s. 6d. a week for 52 weeks | 28 12 0 | (*c*) 37½% of £59 16s. 0d. | 22 8 6 |
| | | Insurance | 0 6 0 |
| | | Profit and Voids | 1 3 6 |
| | £59 16 0 | | £59 16 0 |

(*a*) £0·042 per £1 = Annual Instalment of Principal and Interest on Loan for Buildings spread over a period of 60 years at 3½ per cent.

(*b*) 2s. 1d. per foot frontage = Apportioned Annual Instalment of Principal and Interest on Loans for land, roadway, sewers, and drains, and has been based upon existing loan.

(*c*) 37½ per cent of rent=25 per cent annual payment for rates, 10 per cent for repairs, and 2½ per cent for collection.

The block of four cottages, the cubic contents of which will be 27,546 ft., is estimated to cost, at 6d. per cubic foot, £689. For the three-bedroom cottages a rent of 6s. will be charged, and for those of two bedrooms 5s. 6d. per week, both amounts, of course, to include rates.

**Ligno-Concrete.** A paper dealing with this combination of timber and concrete will be read before the Society of Engineers at a meeting to be held at the Institution of Electrical Engineers, Victoria Embankment, W.C., on Monday, April 1st. The chair will be taken at 7.30 p.m.

**London County Council and Railless Trolley System.**—The Highways Committee of the London County Council report that they have decided provisionally to recommend the council in due course to seek authority next session to enable them to run cars on the railless trolley system of electric traction on certain routes. In order that information may be prepared for evidence when Parliamentary powers are sought, certain experiments, costing £200, will have to be carried out.

**"Sewer" and "Drain" Defined.**—A Bill introduced by Mr. Harmood Banner, M.P., at the request of the Association of Municipal Corporations and of the Urban District Councils' Association, seeks to amend the definitions of "sewer" and "drain" in the Public Health Acts. The Bill provides that a drain shall be one constructed on private land by the landowner or builder, and that a sewer shall be one which has either been constructed by the local authority or has been laid along a public street; with this important exception, however, that where a drain has been constructed by a builder or landowner along a private street that is to say, along a street which has become a highway, but which is not repairable by the local authority the drain is to be a sewer, provided it has been constructed to the satisfaction of the local authority.

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Bedford T.C.** (March 5th. Mr. R. H. Bicknell).—£4,071 for laying down tar-macadam in certain streets.—It was stated that the roads had been surfaced with tar slag. The inspector: Why should you adopt slag at the surface and do away with hard stone? I know that is the idea of Mr. Hooley, of Nottingham. The borough engineer (Mr. N. Greenshields): We find the slag takes the tar very much better than the granite. The granite does not bind together so tightly as the slag. I think that has been found in many cases. The tar takes hold of the slag and penetrates to a greater depth and really lasts longer.

**Bermondsey B.C.** (March 11th. Mr. T. C. Ekin).—£18,363 for the extension of their electricity undertaking.—The inquiry was in the nature of an appeal to the board against the decision of the London County Council declining to sanction the borrowing of that sum. The decision was arrived at on the ground that the borough council had refused to supply information which the London County Council considered was essential for the proper consideration of the application. The county council did not consider the application on its merits. Mr. T. Bullivant, who appeared on behalf of the county council, stated that the view of that body was that the borough council were not entitled to go into the matter, as the county council had not dismissed the application on its merits, but simply on the ground that the information necessary had not been supplied. The inspector pointed out that if the London County Council refused their sanction, or did not give their sanction within six months, an appeal should be made to the Local Government Board, whose decision should be final. He would make a note of Mr. Bullivant's objection. The application was then proceeded with on its merits. In the course of the inquiry it was stated that contracts for some of the plant had already been entered into. Asked by the inspector what would be the effect if the application were not granted, the town clerk replied that it would involve the borough in an additional 5d. rate.

**Bray U.D.C.** (March 11th. Mr. A. D. Price).—£3,500 asked for by the council for the purpose of extending the electric lighting works.—It was stated that the electrical undertaking had not paid in the past, but was now paying owing to the increased number of private consumers. Mr. Sowter, electrical engineer to the council, gave evidence as to the electric plant the township had, and the new plant they wished to obtain under the loan they were asking for. Mr. Sowter was asked if he thought it right that they should sell the electric current at a loss. He replied that if they increased the price of the current they would lose a very large number of consumers.

**Cookstown U.D.C.** (March 16th. Mr. J. F. MacCabe).—£2,000 for the erection of twelve artisans' dwellings under the Housing of the Working Classes Acts.—Dr. C. H. P. D. Graves, medical officer of health, said the great need was for houses at 9d. to 1s. 3d. a week. The labourers who were earning only 9s. or 10s. a week could not afford more. The artisans' houses were fairly good, but the labourers could not afford to pay 2s. 6d. to 3s. 6d. a week rent.

**Coventry T.C.** (March 12th. Mr. M. K. North).—£7,000 for the purchase of property in Leicester-row, for a works depot, and £1,850 for the enlargement of the Market House.—The town clerk, Mr. G. Sutton, said the need of a central depot pressed itself with the growth of the city. The proposed enlargement of the Market Hall, the other branch of the enquiry, was stated to be also due to the growth of local needs.

**Dungannon U.D.C.** (March 15th. Mr. J. F. MacCabe).—£4,200 for the erection of dwelling-houses under the Housing of the Working Classes Acts.—Mr. J. M. Hamilton, town clerk, stated that it was proposed to purchase from Lord Ranfurly two fields in Miltown and Donaghmore-road, and as a preliminary scheme twenty-four houses would be erected.

**Hull T.C.** (March 5th. Major J. Stewart).—£16,500 for the erection of stables and other buildings at the depots in Stepney-lane and Cleveland-street.—The town clerk (Mr. H. A. Learoyd) stated that the necessity of spending the money arose from the decision of the council to do their own street scavenging. Of the amount stated £6,850 would be required on account of

workshops, equipment, and stores. Land for the purpose was available, and the present situation of the workshops was not at all suitable or sufficient. The inspector said he gathered that it would be cheaper for the corporation to do several things other than by contract. The town clerk replied that he did not know whether it would be cheaper, but it would certainly be more efficient. The chairman of the Works Committee had distinctly stated that it would not be cheaper. It was also proposed to erect stables and cartsheds at a cost of £8,650, including spray baths for the workmen.

**Navan U.D.C.** (March 14th. Mr. A. D. Price).—£1,250, improvements and additions to waterworks; £1,000 for erecting a technical school; and £86 10s. (supplementary) for providing storage for fire appliances.—In the course of his evidence Mr. W. A. Cheeke, engineer, said it was proposed to pump 150,000 gallons of water in twelve hours with a suction-gas plant and gas engine at 30-horse power.

**Northants C.C. and Oundle U.D.C. and R.D.C.** (March 5th. Mr. A. A. G. Maleh). This was an inquiry into joint applications by the Northants County Council and the Urban and Rural District Councils of Oundle for sanction to borrow sums of £6,250, £900, and £325 for the purpose of defraying their respective proportions of the cost of widening and improving Oundle North Bridge.—The Northants county surveyor, Mr. A. G. Morris, stated that as far as could be ascertained the bulk of the bridge was in good condition, but one arch had completely given way, while he was afraid other parts of the old structure would be found in bad condition. The Nene Commissioners would clear the bed out and cut away the embankments and widen the river under the bridge, which would much improve the waterway.

**Poole T.C.** (March 6th. Mr. W. W. E. Fletcher).—£850 for purposes of extensions at the Alderney Infectious Diseases Hospital.—The town clerk gave details of the new buildings, for which a contract had been entered into with Messrs. Smith & Co., of Stratford, London, for £647. The new block would be for diphtheria cases only, leaving the existing block available for other cases, principally for scarlet fever. The borough surveyor, Mr. S. J. Newman, gave details regarding drainage and other matters.

### APPLICATIONS FOR LOANS.

**Atherstone R.D.C.** £400 for the purchase of land for workmen's dwellings.

**Barkisland U.D.C.** £3,000 for water supply works.

**Clitheroe R.D.C.**—£1,250 for sewage disposal works.

**Ealing T.C.**—£1,650 for road improvement works.

**Evesham R.D.C.**—£10,000 for the erection of sixty houses at Broadway.

**Hastings T.C.**—£6,827 for waterworks purposes, and £920 for the extension of the electric light mains.

**Hebburn U.D.C.**—£180 for a bridge at Dunstan-street.

**Itchen U.D.C.** £350 for making up roads.

**Paignton U.D.C.**—£125 for the provision of a shelter and convenience, and £610 for a Foden steam wagon.

**Penzance T.C.**—£2,350 for sinking a well and laying new mains.

**Richmond (Surrey) T.C.**—£19,400 for wood paving.

**Street U.D.C.**—£1,000 for housing purposes.

**Sunderland T.C.**—£4,500 for wood-block paving works.

**West Bromwich T.C.**—£1,700 for street making, and £1,700 for the improvement of the High-street.

**Weymouth T.C.**—£4,000 for providing a new refuse destructor and other works.

**Worcester T.C.** £1,675 for pumps and motors and other equipment at the waterworks.

### LOANS SANCTIONED.

**Ealing T.C.** £1,700 for the purchase of land for [illegible] and £1,000 for [illegible].

**Hastings T.C.** £220 for the purchase of [illegible].

**Leicester T.C.** £17,350 for a new public hall.

**Lichfield T.C.** £2,000 for the purchase of land and [illegible] and £1,000 for a [illegible].

**Teignmouth U.D.C.**—£900 for widening and making [illegible].

**Wellingborough R.D.C.** £1,000 for the [illegible] scheme.

**Whitstable U.D.C.**—£220 for the construction of a retaining wall at West Cliff.

### FORTHCOMING INQUIRIES.

| MARCH. | £ |
|---|---|
| 25.—**Melksham.** For public market purposes (Mr. W. O. E. Meade-King) ... ... | 330 |
| 26.—**Chesterfield.** For electricity and paving purposes (Mr. H. R. Hooper) ... ... | 9,450 |
| 26.—**Halifax.** For sewage disposal and fire brigade purposes (Mr. R. G. Hetherington) ... ... ... ... ... ... | 25,000 |
| 26.—**Havant.** For street widening purposes (Mr. Edgar Dudley) ... ... ... ... | 2,000 |
| 26.—**Hendon.** For street improvement purposes (Major J. Stewart) ... ... ... ... | 10,835 |
| 26.—**Newcastle-upon-Tyne.** For the provision of a bowling green (Mr. F. H. Tulloch) | 1,300 |
| 26.—**Norwich.** For electricity purposes (Mr. T. C. Ekin) ... ... ... ... ... | 19,000 |
| 26.—**Plymouth.** For private street works (Mr. W. O. E. Meade-King) ... ... ... | 693 |
| 26.—**Portsmouth.** For asphalt paving works (Mr. M. K. North) ... ... ... ... | 2,000 |
| 27.—**Basford.** For street widening purposes (Mr. Courtenay Clifton) ... ... ... | 200 |
| 27.—**Bognor.** For making up a footpath (Mr. M. K. North) ... ... ... ... ... | 538 |
| 27.—**Bromley.** For street and public convenience purposes (Mr. R. H. Bicknell) ... | 718 |
| 27.—**Kingsbridge.** For the provision of a refuse tip (Mr. W. O. E. Meade-King) ... | 200 |
| 27.—**Petersfield.** For depot, street and recreation ground purposes (Mr. Edgar Dudley) | 1,549 |
| 27.—**Rhyl.** For water supply purposes (Mr. P. M. Crosthwaite) ... ... ... ... | 3,211 |
| 27.—**Rowley Regis.** For sewerage purposes (Mr. A. W. Brightmore) ... ... ... ... | 1,130 |
| 27.—**Sheffield.** For electricity and street purposes (Mr. H. R. Hooper) ... ... ... | 61,824 |
| 28.—**Ashwell.** For water supply purposes (Mr. Courtenay Clifton) ... ... ... ... | 3,000 |
| 28.—**Chirbury.** For works of water supply (Mr. P. M. Crosthwaite) ... ... ... | 700 |
| 28.—**Doncaster.** For purposes of the water undertaking (Mr. H. R. Hooper) ... ... | 8,000 |
| 28.—**Gosport.** For private street works (Mr. M. K. North) ... ... ... ... ... | 1,950 |
| 28.—**Hitchin.** For water supply purposes (Mr. A. W. Brightmore) ... ... ... ... | 1,300 |
| 28.—**Ilfracombe.** For street and sewerage purposes (Mr. W. O. E. Meade-King)... ... | 2,600 |
| 28.—**Whickham.** For street and cemetery purposes (Mr. F. H. Tulloch) ... | 6,113 |
| 29.—**Barnstaple.** For sewage disposal purposes (Mr. W. O. E. Meade-King) ... ... | 200 |
| 29.—**Bournemouth.** For the purchase of land for a playground (Mr. M. K. North) ... | 760 |
| 29.—**Shildon.** For the provision of a recreation ground (Mr. F. H. Tulloch)... ... ... | 3,000 |
| 29.—**Welwyn.** For water supply purposes (Mr. A. W. Brightmore) ... ... ... ... | 2,943 |
| 30.—**West Hartlepool.** For the provision of bowling greens (Mr. F. H. Tulloch) ... | 908 |

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**Southampton Water Supply.**—A new reservoir is to be constructed at Southampton, at an estimated cost of £50,000.

**Association of Engineers-in-Charge.**—The annual dinner of this body will take place to-morrow (Saturday) at the Holborn Restaurant.

**Visit Abandoned.** The proposed visit of the Institution of Municipal Engineers to the showrooms and works of Messrs. Doulton & Co. on Wednesday next has been abandoned on account of the coal strike.

**Design and Planning of Working-Class Dwellings.**—A paper on this subject will be read by Mr. Sidney Palmer at a Southern District meeting of the Institution of Municipal Engineers, which is to be held at the institution offices on Wednesday, April 3rd, at 7 p.m.

# Municipal Work in Progress and Projected.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Ayrshire, Guildford, Hastings £4,500; housing and town planning—Dublin; roads and material—Ayrshire £2,556, Richmond £19,400; sewerage and sewage disposal—Hampton, Salcombe £11,350, Teddington; water, gas and electricity—Langholm £6,000.—Particulars of other works projected will be found on our "Local Government Board Inquiries" page.

## ADMINISTRATION.

**Holsworthy R.D.C.**—It has been agreed to support the resolution of the Okehampton Rural District Council, drawing attention to the additional burden placed on parishes by reason of the increasing demands made by central authorities for improvements other than a local character, and suggesting that relief should be afforded by an extended period for the repayment of loans being allowed and further grants made from the Imperial Exchequer. The Culmstock Council's request to the Devon County Council asking for relief in the cost of repair to roads caused by through traffic has also been approved by this council.

**Surrey C.C.**—The Nethern Asylum Committee purchased a steam wagon and trailer on July 16, 1910, and after paying all working expenses, the saving in haulage of goods from Coulsdon Station up to December 31st last was no less than £532, so that the wagon has more than paid for itself in less than eighteen months.

## BUILDINGS.

**Ayrshire C.C.**—It has been agreed by the Northern District Committee to erect a public slaughter-house for Stevenston, and a committee has been appointed to choose a site and carry out the necessary preliminaries.

**Boston T.C.**—The tender of Messrs. John Lucas & Sons, Boston, at £479, has been accepted for the construction of a covered-in ring at the market, and that of the same firm, at £78, for closing in divisions to form pens.

**Glamorgan C.C.**—The new county hall at Cathays Park, Cardiff, has been almost completed. The whole of the exterior facing and sculpture of the new hall is faced with Portland stone, and the stylobate and steps to the front are of granite. The general idea of the plan and arrangement has been to shut off the whole of the council suite from the executive portion. The entrance hall, ante to council chamber, and council chamber are faced with Portland stone, which is treated in a simple and economical manner. The fittings of the council chamber are of English oak upholstered in acid-proof pigskin. Messrs. E. Vincent Harris and Thomas H. Mordie were the architects, and the contractors were Messrs. J. E. Turner & Sons, Cardiff. The entire cost of the hall and equipment is about £60,000.

**Guildford R.D.C.**—The council have approved of the proposal to reconstruct the following bridges: Broadmead Bridge, £1,050, and temporary bridge, £60; £1,110; Cartbridge No. 2, £161; do. No. 3, £190; do. Send, £640—£2,101. The contributions reduce the total to £1,600. The surveyor, Mr. J. Anstee, has been instructed to prepare the necessary plans and specifications for the works.

**Hampton U.D.C.**—Mr. S. H. Chambers, the surveyor, was last week authorised to invite tenders from local builders for the supply, at a cost not exceeding £15, of a shelter for use by tuberculosis patients.

**Hanwell U.D.C.**—An open-air swimming bath is to be built on the Churchfields Recreation Ground, at an estimated cost of £1,200.

**Hastings T.C.**—The council have approved a recommendation of the Entertainments and Visitors' Committee in respect to a scheme for a sunken band-stand in Lower Warriors-square Garden, substantially on the lines of a plan prepared by the borough engineer, Mr. P. H. Palmer, the cost not to exceed £4,500, exclusive of architect's fees and legal expenses. The designs are to be obtained by open competition.

**Southport T.C.**—It has been agreed to provide a band-stand in connection with the extensive improvements on the Lower Promenade, at a cost of £431.

**Ventnor U.D.C.**—The tender of Messrs. D. Day & Sons, of Bonchurch, at £3,325, has been accepted for the construction of the sea-wall and Eastern Esplanade. The material to be used is local rag.

## HOUSING AND TOWN PLANNING.

**Dublin T.C.**—A report of the Improvement Committee has been adopted recommending the clearance of sites adjacent to the South Quays, and the erection of dwellings thereon under Part I. of the Working Classes Act, 1890, and the Housing of the Working Classes Act, 1908. The dwellings are to be erected on the "flat" system.

**Hampton U.D.C.**—Mr. J. J. Draper, a member, has been appointed to represent the council at the conference to be held in London next month under the auspices of the National Housing and Town Planning Council.

**Llangollen R.D.C.**—The council have approved a resolution passed by the Gwynfrai Rural District Council to the effect that while the principles expounded in the Housing Act were fully appreciated, and the necessity for providing suitable houses for the working classes duly recognised, local rates at present are so over-burdened that, in the opinion of the council, a substantial Imperial grant should be given towards the expenditure incurred by the carrying out of the Act in question.

**Surbiton U.D.C.**—In view of the fact that the Surrey County Council are preparing plans and estimates for the proposed main arterial road through this and adjoining districts, whose town planning schemes may be affected by the ultimate direction of such road as decided upon by the Road Board, it was on Monday agreed to meet members of the Maldens and Coombe and Esher and the Dittons Councils with a view to a joint representation of views being submitted to the board.

## PARKS AND OPEN SPACES.

**Eastbourne T.C.**—A Special Committee recommend the purchase of Devonshire Park, with its theatre, baths, concert halls, and other buildings, at a nett sum of £102,965, in order that the resort may be maintained.

**Glasgow T.C.**—Seventy-three and a-half acres of land are to be purchased from Sir John Stirling Maxwell for the extension of Ronken Glen.

**West Bromwich T.C.**—The council have accepted with thanks the offer of the Rev. Thomas Jesson to hand over Oakwood House, ground, cottage, and about 10 acres of land.

## REFUSE COLLECTION AND DISPOSAL.

**Largs T.C.**—Three acres of land on the farm of Holehouse are to be freed for the purposes of refuse destruction. An estimate from the contractors, Messrs. Heenan & Froude, at £420, for the addition of an engine house and a house for the stone crusher, has been accepted by the council, making the total cost of the building and plant (except steam engine) about £5,300.

**Willington (Durham) U.D.C.**—The surveyor, Mr. J. H. Gardner, has been instructed to prepare the necessary plan for a new refuse tip, the existing tip at Oakenshaw being considered unsatisfactory.

## ROADS AND MATERIALS.

**Ardrossan T.C.**—It has been decided to plant trees in several of the principal streets of the town.

**Ayrshire C.C.**—It has been agreed by the Northern District Committee to remake New-street, Stevenston, at an estimated cost of £2,456, and to make up part of the roadway between the Cross and North-street, Dalry, at a cost of £100.

**Bath T.C.**—A question with respect to the ethics of tendering was raised at the Surveying Committee, when the General Purposes Sub-Committee reported that three tenders for pitching and paving were received, but no recommendation as to which tender should be accepted was made by the committee. The surveyor, Mr. C. R. Fortune, observed that the price of one tender showed that the tenderer proposed to do the work at less than the surveyor could purchase the material for. A suggestion was made that

this tender should be ruled out, but objection was raised to this. Alderman Green referred to past difficulties that had arisen in such cases, and Mr. Wills strongly objected on principle to the acceptance of such a tender. It was finally decided that the tenders should go back to the General Purposes Committee.—The tender of Messrs. Glover & Sons, at £115, has been accepted for the provision of three water vans.

**Dorking U.D.C.**—It has been agreed to purchase property at the corner of London-road for the purpose of carrying out an improvement, and the surveyor, Mr. W. A. Clegg, has also been instructed to prepare a preliminary plan showing what improvement can be effected in South-street.

**Esher and the Dittons U.D.C.** — The surveyor, Mr. H. C. Fread, last week presented estimates for making up Imber Park-road, providing for paving the paths with a 4-ft. strip of artificial stone and a 2-ft. strip of gravel. An additional length of 32 ft. of sewer will be laid before the road is made up. The estimated total cost is £902, or 10s. 8d. per foot frontage. Both paving and sewer extension were approved.

**Haddington C.C.**—Judging by what took place at a meeting of the county road board recently, some misapprehension appears to have arisen with respect to the attitude of the Road Board towards road improvement in Scotland. The chairman, Sir A. Buchan Hepburn, reported that it now appeared that only a trifling sum would be available under the Development and Road Improvement Funds Act, 1909, in the future. The chairman of the Road Board had written, stating that he was afraid his meeting with the road surveyors last year had been taken much too seriously. He had only intended to elicit for his private guidance some information about the state of the roads in Scotland, and he had made it clear that the proceedings had no formality, and he certainly did not promise or settle anything. Commenting on above letter, the joint sub-committee of the county district expressed the opinion that the statements were not in accordance with the fact as vouched for by the county road surveyors. It was reported that grants had been made to the county under the Act for the sum of about £3,000, apportioned as follows: Eastern district £2,146, western district £698, and that payments of £876 had already been received. Considerable discussion took place, it being pointed out that the board in their extensive roads improvement scheme for the county had proceeded on the understanding that the central fund would contribute three-fourths of the total cost. The matter was remitted to the District Committees for their further consideration.

**Hastings T.C.**—The council have accepted the tender of Messrs. Forbes, Abbott & Lennard, Limited, Shoreham, to supply 40,000 gallons of distilled tar at 4d. per gallon.

**Havant U.D.C.**—The surveyor, Mr. A. E. Stallard, has received instructions to purchase a tar-drag brush machine for tar-spraying at the price of £68 10s.

**Longtown (Cumberland) R.D.C.**—It has been agreed to widen the road at Breakings Brow by 10 ft., and erect two bridges at the Toe, Bewcastle, at a cost of about £80.

**Poole T.C.**—The borough surveyor, Mr. S. J. Newman, has received instructions to report upon the condition of the back roads at Heckford Park and Denmark.

**Retford R.D.C.**—The question of doing up the "Dukeries" road, which has been left in a neglected state for twenty-five years, has been referred to the surveyor, Mr. T. Henry.

**Richmond (Surrey) T.C.**—It has been agreed to lay down wood paving in part of Kew-road, up to the approach to King Edward VII. Bridge, at an estimated cost of £19,400, and to ask the Surrey County Council similarly to pave the approach to and portion of the Surrey half of the bridge.—With respect to the proposed new main road at Richmond, the council have passed a resolution affirming that, as the road would not be of any benefit to the borough of Richmond, they object entirely to the construction of such road, but if a new road must be made they suggest that it should be made by the widening of existing roads instead of cutting through property, resulting in serious depreciation and enormous expense, as proposed, and that as regards the Old Deer Park a route near the railway would be much preferable.

**Rutherglen T.C.**—Property to the value of £1,500 is to be purchased for the purpose of widening a congested street at the east end of the town.

**Surrey C.C.**—On the application of the Road Board it has been decided to furnish certain statistics at an estimated cost of £140, but at the same time it was agreed to call the attention of the board to the expense of furnishing them "with the statistics so frequently demanded."

**Tipton (Staffs) U.D.C.** — The surveyor, Mr. W. H. Jukes, has been authorised to purchase a 250-gallon tar-spraying machine from Messrs. Llewellyn & James, at £67.

**Wanstead U.D.C.**—The tenders of Messrs. G. J. Anderson, Poplar, at £117, for improvements in the High-street, and at £371 for improvements in Belgrave-road (second part), have been accepted.

**Worcester T.C.**—The council, on the recommendation of the Streets Committee, have decided to lay granolithic pavements on both sides of Lich-street at a cost of £140; on the south side of Fish-street at a cost of £80; and on the east side of the Tything from St. Mary's-street to St. Oswald's-road at a cost of £215.

## SEWERAGE AND SEWAGE DISPOSAL.

**Brierley Hill U.D.C.**—The work of making the connections with the sewers is to be carried out by contract labour.

**East Molesey U.D.C.**—The surveyor, Mr. J. Stevenson, has received instructions to report on the provision of public lavatories in the vicinity of the riverside.

**Halesowen R.D.C.**—The tender of Messrs. Taylor & Co., at £463, has been accepted for works of sewerage in several roads.

**Hampton U.D.C.**—With reference to the proposals of the surveyor, Mr. S. H. Chambers, for extensions and alterations at the sewage disposal works, Mr. Chambers has been asked to prepare an alternative scheme to deal with the present volume of sewage and the extra quantity which will have to be provided for in the event of Hampton Court Palace being connected with the sewer.

**St. Austell U.D.C.**—The surveyor, Mr. E. D. Groves, has prepared plans showing a scheme for western main drainage. The surveyor estimated the cost at £630. The council have adopted the scheme, and instructed the surveyor to carry it out by means of direct labour.

**Salcombe (Devon) U.D.C.**—A scheme has been prepared for the redrainage of the town. This provides for new main sewers throughout the town where the existing ones do not exceed 6 in.; for a new main sewer from Woodcot to Shadycoombe berth, concentrating at a point near Victoria-place into a storage tank capable of holding 100,000 gallons. The outfall pipe from this would lead along the foreshore, and the sewage would be discharged into deep water. The estimated cost is £8,250. The village of Batson is, in addition, provided for at a cost of either £2,000 or £3,100. Meanwhile the engineer has been asked to give his opinion upon carrying out the scheme in sections, the most essential to be constructed first.

**Standish (Lancs) U.D.C.** — Contracts have been accepted for the construction of the sewage outfall works and pipes for the Eastern portion of the district.

**Teddington U.D.C.**—Last week the council approved an important scheme prepared by Mr. M. Hainsworth, the surveyor, of sewage disposal and refuse destruction, and it was agreed to advertise for tenders for the work. Contract No. 1 will include: (*a*) Outfall sewer; (*b*) buildings, chimney shaft, tanks, contact filters, &c. Contracts Nos. 2 and 3 will include (*c*) machinery and plant; (*d*) furnaces. In the course of the discussion the surveyor said that the first preliminary report was prepared in 1905; in 1908, of three schemes submitted, the council selected one to cost £35,000, and the Local Government Board, after a local inquiry, approved of that expenditure. If they had been a year later in going to the Local Government Board they would not have got it through for less than £6,000 more, because the requirements of the board were now very much more stringent. A reference to the arrangements made with Mr. Hainsworth as engineer for the scheme will be found under "Personal" in this issue.

**Tiverton T.C.**—Dr. Sweeting, head medical inspector of the Local Government Board, has submitted an exhaustive report on the sanitary arrangements of the borough, and recommended that no time should be lost in dealing with the insanitary houses and areas in the borough under the Housing Regulations of 1910. The council should also reconsider the ques-

tion of covering the open stream from the source of the water supply to the works.

## WATER, GAS, AND ELECTRICITY.

**Barnstaple R.D.C.**—The question of supplying Knowle with a water supply, at an estimated cost of £500, is under consideration.

**Buckie T.C.**—Numbers of citizens having recently sustained personal injuries by colliding with lamp-posts after the lamps were out on dark nights, the council have agreed to paint portions of the lamp-posts with luminous paint.

**Greenock T.C.**—For the new offices for the department the Electricity Committee have acquired a site at Dellingburn. The scheme is estimated to cost over £1,200.

**Langholm T.C.**—The Local Government Board have sanctioned the scheme prepared by Mr. Harry W. Taylor, A.M.INST.C.E. (Messrs. Taylor & Wallin, Newcastle-upon-Tyne and Birmingham), for the augmentation of the water supply of the burgh of Langholm. By this scheme additional springs in the Ewes Water Valley will be tapped, a large new reservoir built, and the distributing in the town considerably improved. The cost is about £6,000, and the work will be commenced at once.

**Leicester T.C.**—The water department shows a nett profit for the year of £27,055.

## MISCELLANEOUS.

**Lowestoft T.C.**—Messrs. Shand & Mason's tender, at £290, has been accepted for a steam fire engine.

**Maldens and Coombe U.D.C.**—£100 is to be provided in the next estimate for the installation of ten hydrants. The chairman of the Fire Brigade Committee, Mr. F. W. Maskell, has also intimated that he will presently ask for £1,000 for a motor fire engine.

## PERSONAL.

Mr. H. E. Folkes, of Stourbridge, has been appointed surveyor to the Lye and Wollescote (Worcestershire) Urban District Council.

Mr. E. H. Carder, assistant building surveyor to the Plymouth Corporation, has had his salary increased from £150 to £170 per annum.

Mr. G. Sheppard, borough surveyor of Newark, has announced his impending retirement from the office he has held for thirty-six years.

Mr. W. J. Hadfield, surveyor of highways to the Sheffield Corporation, has had his salary raised from £600 to £650, with a further increase of £50 next year, on account of extra duties now devolving upon him.

Mr. Seels, first assistant in the office of Mr. R. H. Jeffes, surveyor to the Maldens and Coombe Urban District Council, is to have increases of salary of £10 per annum to a maximum of £200; and Mr. Beard, second assistant, similar increases to £150.

Messrs. C. G. Atkinson (borough engineer's office, Wimbledon), Wm. Phelps (Shepton Mallet), W. Crowhurst Rubie (city engineer's department, Birmingham), and John Stuart (education architect, Wakefield), have been elected members of the Royal Sanitary Institute.

Mr. W. S. Lythgow, the present surveyor for the eastern division of Penrith, has been appointed by the rural council surveyor for the whole district, at a salary of £145, including travelling expenses, rising to a maximum of £160, the surveyor to provide and maintain a motor cycle.

Messrs. Victor Alden (London), Reginald Birkett (Manchester), Alfred Cordery (London), Alexander T. Cranmer (Twickenham), Robert Gellatly (Kingston, Jamaica), Charles A. King (Edinburgh), and Alfred W. Lovell (Hull), have been elected members of the Concrete Institute. Mr. A. C. Hughes, who resigned in 1911, has been reinstated as a member.

Mr. M. Hainsworth, surveyor to the Teddington Urban District Council, is to receive the sum of £300 for his services in connection with the sewage disposal works, the sum to be paid by quarterly instalments, in addition to his salary, for a period of three years. With a recollection of the difficulties that arose out of a similar arrangement in a neighbouring Thames Valley district, Mr. Hainsworth will no doubt appreciate the desirability of the council's resolution being supplemented by an agreement under seal.

Messrs. C. H. Cooper, borough engineer of Wimbledon; R. W. Jeffes, surveyor to the Maldens and Coombe Urban District Council; H. T. Mather, surveyor to the Surbiton Urban District Council; and S. H. Chambers, surveyor to the Hampton Urban District Council, were among the delegates present at two meetings held recently at Wimbledon under the auspices of the National Town Planning Council, the object of the gathering being to explain to members of local authorities in the South and South-West of London the duties imposed upon them by the town planning sections of the Housing and Town Planning Act.

Captain George Swinton, chairman of the London County Council, has been appointed chairman of the Committee of three constituted by the Secretary of State for India to deal with the question of the site of the new capital at Delhi and its laying out. The other members of the committee are Mr. John A. Brodie, M.INST.C.E., city engineer of Liverpool—an account of whose career appears on another page of this issue—and Mr. Edwin L. Lutyens, F.R.I.B.A. Mr. H. V. Lanchester, F.R.I.B.A., who is at present engaged in work in India, will join the committee, which will assemble at Delhi about the middle of April, where it will find materials ready for consideration, and will have the assistance of the Department of Indian Public Works and of other departments of the Indian Government. It will act under the instructions of and report to the Government of India. Its work, which will be of a general and preliminary nature, and will involve no questions of detailed planning or architectural design, is expected to occupy four or five months.

At the Institution of Civil Engineers' Examinations of last February, the pupils of Mr. G. P. Knowles, 39 Victoria-street, were very successful indeed, one of them heading the list and obtaining the Bayliss Prize. Courses for the next examination are just commencing.


## FOR OTHER ADVERTISEMENTS

See End of Paper.

OLD LEATHER Hoseing, Leather Belting, Rubber Valves, Rubber Boots, Motor Tyres, Canvas Hoseing wanted. Cash on receipt of invoice.—Ward, 18 Chertsey-road, Chiswick.

FOR SALE one pair Driving Wheels, suitable for Aveling & Porter's 15-tons Steam Roller, rimmed with Hadfield's manganese steel; rims 4 in. thick. The wheels may be seen at Linlithgow upon application.—J. D. Lapham, County Road Surveyor, Linlithgow.

BILLERICAY RURAL DISTRICT COUNCIL.

BILLERICAY AND MOUNTNESSING SEWERAGE.

CONTRACT No. 1.

The Billericay Rural District Council invite Tenders for the Provision, Laying and Jointing of about 6,645 yards of Stoneware Pipe Sewers, varying from 6 inches to 12 inches in diameter, together with Manholes, Flushing Chambers and other incidental works, in accordance with the Plans, Sections and Specification prepared by Mr. R. J. W. Layland, the Surveyor to the District Council.

Drawings may be seen, and Specification, Bills of Quantities and Form of Tender obtained, at High-street, Billericay, the office of the Surveyor to the Rural District Council, on and after the Twenty-fifth day of March, 1912, on payment of a deposit of Two Guineas, which will be refunded on receipt of a *bonâ-fide* Tender and the return of all documents to the Surveyor.

Sealed Tenders, in the envelopes supplied, endorsed "Sewerage Works—Contract No. 1," to be delivered at my office not later than 12 noon on the Eighth day of April, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
C. E. LEWIS,
Clerk to the Council.

New-road, Brentwood.
March 20, 1912.

## BILLERICAY RURAL DISTRICT COUNCIL.

BILLERICAY AND MOUNTNESSING SEWAGE DISPOSAL.

CONTRACT No. 2.

The Billericay Rural District Council invite Tenders for the Provision, Laying and Jointing of about 67 yards of 12-inch Outfall Stoneware Pipe Sewer, together with Manholes; also the Construction of Sewage Tanks, Bacteria Beds, Sludge Trenches, Effluent Drain, and other incidental works, in accordance with the Drawings and Specification prepared by the Engineers.

Drawings and Specification may be seen, and Bills of Quantities and Form of Tender obtained, at the offices of the Engineers, Messrs. Willcox & Raikes, 63 Temple-row, Birmingham, on or after the Twenty-fifth day of March, 1912, on payment of a deposit of Two Guineas, which will be refunded on receipt of a *bonâ-fide* Tender and the return of all documents to the Engineers.

Sealed Tenders, on the envelopes applied, endorsed "Sewage Disposal Works—Contract No. 2," to be delivered at my office not later than 12 noon on the Eighth day of April, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

C. E. LEWIS,
Clerk to the Council.

New-road, Brentwood.
March 20, 1912.

## EAST SUFFOLK COUNTY COUNCIL.

MAIN ROADS.

TENDERS FOR ROAD MATERIALS, CARTING, HAULING AND TOOLS, Etc.

The East Suffolk County Council are prepared to receive Tenders from actual Quarry Owners or Proprietors for the Supply of Road Materials for the three Districts—namely, Ipswich, Halesworth and Eye—to the 31st March, 1913, or for a further period.

Tenders are also invited for Carting and Hauling, and for the Supply of Tools, Road Implements, Oil, Grease, &c., for the said Districts.

Specifications and Forms of Tender can be obtained on application to the Chief Surveyor of Main Roads, County Hall, Ipswich.

Sealed Tenders, endorsed "Tender for Roads," should be delivered at the Office of the Clerk of the County Council, County Hall, Ipswich, on or before the 10th day of April, 1912.

The Council does not bind itself to accept the lowest or any Tender.

A. TOWNSHEND COBBOLD,
Clerk of the East Suffolk County Council.

County Hall, Ipswich.
March 20, 1912.

## FOOTS CRAY (SIDCUP) URBAN DISTRICT COUNCIL.

SURVEYOR'S GENERAL ASSISTANT.

Applications are invited for the above Appointment. Candidates must be reliable Surveyors, Levellers and Draughtsmen, with a good knowledge of the routine and book-keeping of an Urban District Surveyor's Office, and must possess one of the following qualifications—viz., Examination Diploma of the Institution of Municipal and County Engineers, or Professional Associate of the Surveyors' Institution (Building Section).

Salary, £80 the first year, £90 the second, and £100 the third, subject to approved service.

Applications (duly endorsed) should be addressed to A. E. Leonard, Esq., Clerk to the Council, and received not later than Thursday, the 28th day of March, 1912.

(By order)

WM. AUGUSTUS FARNHAM,
Engineer and Surveyor.

Council Offices,
Sidcup,
Kent.
March 21, 1912.

## BOROUGH OF SOUTHEND-ON-SEA.

TO BUILDERS AND CONSTRUCTIONAL ENGINEERS.

The Corporation of Southend-on-Sea is prepared to receive Tenders for the Extension of the existing Car-shed at the Corporation Depot, London-road.

Plans may be seen, and Specification, Conditions, Form of Tender, and Bill of Quantities obtained, on and after Monday next, 25th March, on deposit of a cheque for £1 1s. (which will be returned on receipt of a *bonâ-fide* Tender and the return of all documents), upon application to Mr. Ernest J. Elford, C.E., Borough Engineer and Surveyor.

Sealed Tenders, endorsed "Extension to Car-shed," to be delivered at my Office on or before noon on Thursday, April 4th, 1912.

No Tender will be considered unless on the prescribed Form.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order,

H. J. WORWOOD,
Town Clerk.

Town Clerk's Office,
Southend-on-Sea.
March 19, 1912.

## URBAN DISTRICT OF FINCHLEY.

GRIT FOR TAR-PAINTING.

The Council invites Tenders for the Supply and Delivery on Rail, at the following Stations on the High Barnet Branch of the Great Northern Railway—*viz.*, East Finchley, Finchley (Church End), Woodside Park and Totteridge—and the following Station on the Great Northern Railway Main Line—*viz.*, New Southgate—of from 300 to 400 tons of Gritting Material, ranging from dust to $\frac{5}{16}$ths of an inch.

Specification and Form of Tender may be obtained on application to the Council's Engineer, Mr. C. J. Jenkin, M.INST.C.E., at the Council Offices, Church End, Finchley.

Sealed Tenders, on the prescribed Form, endorsed "Grit for Tar-painting," to be delivered to the undersigned not later than 12 o'clock noon on the 19th day of April, 1912.

The Council does not bind itself to accept the lowest or any Tender.

E. H. LISTER,
Clerk of the Council.

Council Offices,
Church End,
Finchley, N.
March 20, 1912.

## KIDSGROVE URBAN DISTRICT COUNCIL.

APPOINTMENT OF CLERK OF WORKS.

Applications are invited for the position of Clerk of Works to superintend the Construction of Ferro-concrete Reservoir, Erection of Pumping Plant (driven by Wind Engine and Oil Engine), and the Laying of Cast-iron Water Mains, &c.

The appointment will be for about 3 or 4 months.

Salary £2 2s. per week.

Only experienced persons need apply.

Applications, stating age and experience, accompanied by copies of three recent testimonials, and endorsed "Clerk of Works," to be sent to me on or before Saturday, 30th March, 1912.

F. C. CRIMES, P.A.S.I.,
Engineer and Surveyor.

Surveyor's Office,
Kidsgrove,
Staffs.
March 20, 1912.

## THE GOOLE URBAN DISTRICT COUNCIL.

GENERAL ASSISTANT.

An Assistant is required in the Engineer and Surveyor's Office at a salary of £85 per annum. Applications to be in candidate's own handwriting, stating age, and giving full particulars as to present and previous appointments and training (with dates), and to be accompanied by copies of not more than three testimonials. Applications to reach the undersigned not later than 9 a.m. on Monday, April 1st, 1912.

Canvassing Members of the Council will be a disqualification.

C. G. BRADLEY,
Engineer and Surveyor.

Council Offices,
Goole.

# Glasgow Main Drainage Works.

## PAPERS AT THE INSTITUTION OF CIVIL ENGINEERS.

At a meeting of the Institution of Civil Engineers held on Tuesday consideration was given to the three papers of which we append abstracts:—

### THE MAIN DRAINAGE OF GLASGOW.

By A. B. McDONALD (city engineer) and G. M. TAYLOR, MM.INST.C.E.

This paper commences with a retrospect of the many past endeavours to free the river Clyde from the pollution of the Glasgow sewage, going as far back as the year 1605. At this time the river was quite tideless and fordable in many places at Glasgow. Trade was insignificant, as seaborne traffic could reach the city only after transportage into small boats at Dumbarton.

In 1662 the town council ordered a small quay to be built at the Broomielaw, and this was the commencement of the great transformation of the Clyde into one of the busiest waterways in the United Kingdom.

As trade increased all fishing interests were forgotten, and the condition of the river became foul in the extreme. Sixty years ago the condition of things was so bad that a scheme was suggested for the construction of a reservoir in the upper ward of Lanark, to impound flood-water and discharge it during the summer, in order to scour the sewage in the harbour out to sea. This was the first of numerous voluntary suggestions which were formulated.

In 1859 the late Mr. J. F. La Trobe Bateman, past-president of the Institution of Civil Engineers, and the late Prof. Anderson reported on the subject. Later reports were made by the late Sir Joseph Bazalgette, past-president of the Institution of Civil Engineers, and the late Sir John Hawkshaw, past-president of the Institution of Civil Engineers, and in 1878 Mr. Bateman again reported, but nothing was done, and the condition of the river became worse and worse.

Soon after this a Bill was deposited in Parliament for the construction of the Glasgow underground railway, which was projected in such a way as to dislocate the entire sewerage system then in existence. The corporation strongly opposed this measure, but eventually arrived at an agreement on obtaining from the promoters an undertaking that they would bear the expenses of reconstructing the sewers to the approval of the council; and in conference with Sir Joseph Bazalgette a system was designed whereby the sewage of the north-eastern area was conveyed to Dalmarnock. The corporation then engaged the late Mr. G. V. Alsing to design works for the purification of the sewage at Dalmarnock. The general arrangement of these works is at present as follows:—

The sewage, amounting to an average daily flow of 18,250,000 gallons, is passed through vertical screens, and thence into two catchpits. The solids are removed from these pits by mechanical means. The sewage then flows into the pump-well, whence it is lifted by means of five centrifugal pumps into a mixing-pit, where the chemicals are added. The mixture is passed into precipitation tanks, where the solids are allowed to settle. The tank-effluent passes direct into the river. The sludge from the precipitation tanks is pumped into three storage tanks, where it settles until about 50 per cent of the top liquid can be drawn off. High-pressure rams then raise the sludge to the presses. About 247,000 tons of wet sludge are dealt with per annum.

The Dalmarnock works were regarded by the corporation in the light of an experiment, and the results proved so satisfactory that it was resolved in 1895 to proceed on similar lines with works for dealing with the remainder of the city.

Works were constructed at Dalmuir to deal with the north-western part of the city, and at Shieldhall for the area lying south of the Clyde.

High and low level intercepting sewers have been constructed for the north-western area. Part of the low-level sewage is raised into the high-level sewers at the Partick pumping station, situated on the banks of the river Kelvin, and the remainder is raised at the purification works.

The process of purification at Dalmuir may be briefly summarised as follows: The sewage, amounting to an average daily flow of 36,000,000 gallons, passes through a screen chamber and thence into catchpits, where the heavier solids settle, and are removed by means of a dredger. The chemicals are added in the catchpit, and the sewage then flows into one or other of eight precipitation tanks, having a combined capacity of 12,000,000 gallons. The sludge is pumped into an elevated tank, whence it flows by gravitation into the hold of the sludge-steamer. The steamer carries about 1,200 tons of sludge in closed tanks a distance of 40 miles from Dalmuir, and last year it dealt with over 300,000 tons of sludge.

The sewage is treated with a solution of persulphate of iron and lime. The persulphate is formed from proto-sulphate of iron.

The works designed for the treatment of the sewage of the southern district at Shieldhall deal with an average daily flow of 23,000,000 gallons. They are to a large extent a repetition of those at Dalmuir. High and low level intercepting sewers have been constructed. The low-level sewage from the eastern part of this area is raised into the high-level sewers at the Kinning Park pumping station, and the low-level sewage from the western half is raised to the works at Shieldhall.

Great difficulties were encountered in the construction of the works in the southern area. The sewers in many places were found to overlie coal workings of unrecorded date, necessitating a large amount of special construction in cast-iron segments. The erection of the Kinning Park pumping station also proved a matter of great difficulty owing to the insecure nature of the sub-strata, which consisted mainly of silt, and at the purification works there was an abnormal amount of subsoil water, which rendered exceedingly difficult the construction of the deeper parts of the machinery buildings. These difficulties were overcome, and the whole of the works have been in successful operation since May, 1910.

The precipitation process adopted at all three works completely removes the suspended solids from the sewage, and effects a high degree of purification upon the liquid. In consequence, the condition of the Clyde has improved so much that in place of being a dead river it has returned to a live and satisfactory condition.

In the appendix to the paper tables are given showing the sizes of the various sewers, quantities of sewage dealt with, costs, and analyses.

### THE CONSTRUCTION OF THE GLASGOW MAIN DRAINAGE WORKS.

By W. C. EASTON, B.SC., M.INST.C.E.

The Glasgow main drainage works, as described in the previous paper, consist of three schemes. The two larger of these cost over £2,000,000, and the present paper deals with their construction, which covered the period from 1899 till 1910.

Owing to the fact that, apart from sundry differences, the two schemes are similar, and that the construction of the second was not put in hand until an interval had elapsed after the completion of the first, there was naturally a great opportunity for developing the special ideas gained from the experience of the first in the construction of the second. The author consequently deals largely with a comparison between the methods employed.

Four leading developments in ideas obtained from the experience on the construction of the first were applied on the second—namely:—

(1) To standardise designs.

(2) To use tunnel in preference to open cutting, particularly if it involved the use of sheet-piling.

(3) To adopt longer drives and smaller sizes for tunnel.

(4) To take full advantage of the fact that the Glasgow main drainage staff was capable of executing the more difficult work without the aid of contractors.

The more interesting portions of the works described are:

The difficulties and expense incurred through the presence of old mineral workings. The most expensive case was where the cost of a 7 ft. sewer amounted to nearly £300 per lineal yard.

The construction of the rising main, which affected its design considerably. Incidentally this work further illustrates the development of ideas already referred to.

An experiment in tunnelling in concrete segments, lined with brickwork.

The Kinning Park pumping station provided the most difficult construction work on the schemes. This station is founded rather below the middle of a 44-ft. bed of running silt, closely surrounded by buildings and streets carrying tramways. The design—apart from the mechanical equipment—was entirely controlled by construction, and the whole station was a work which, from the difficulties of the site, gave the Glasgow Committee a great deal of anxiety. The five stages employed in the construction of the sub-structures are described; great care was taken in detail, such as the keeping of very close piling diaries. In an appendix the measurement of the main work is given, priced on its actual cost to the corporation, and amounting to about £37,000.

Appendixes to the paper give an abstract of unusually thorough analyses of cost, made by the author on the instructions of the town clerk for Parliamentary purposes. The results show considerable economy effected by the developments in ideas applicable to the special conditions obtained from the experience of the western works. This economy was effected on the prices for the more difficult work, particularly where iron tunnel and air pressure were used.

The opinion is expressed that the main factor in this result was the manner in which Glasgow used its main drainage staff in executing work without contractors. The author considers that this factor operated chiefly in a moral way, in making the staff leaders instead of directors. As the author had on these works over ten years' concurrent experience in the execution of work both with and without contractors, the paper concludes with some remarks on the general question of public bodies carrying out such work without contractors. The opinion is given that the factor of "youth" was one of the essentials.

Two deliberate, although somewhat paradoxical, conclusions are then stated on the general question—namely:—

(1) That, generally speaking, an attempt by a public body to create a department and carry out works without contractors is not likely to be attended with success.

(2) Under special circumstances such as those which ruled on the construction of the western and southern schemes of the Glasgow main drainage works, the holding of a staff fit and ready at once to undertake, when called upon, the most difficult sections of an ideal method.

## GLASGOW MAIN DRAINAGE: THE MECHANICAL EQUIPMENT OF THE WESTERN WORKS AND OF KINNING PARK PUMPING STATION.

By D. H. Morton, M.Inst.C.E.

This paper deals chiefly with the following items of the works: The mechanical equipment of the western works; the mechanical equipment of the Dalmuir purification works; the pumping machinery for Clydebank drainage; and the overhead sludge tank at Dalmuir. The author also describes the mechanical equipment of the Kinning Park pumping station.

At the Partick pumping station the sewage discharged from the city intercepting sewer and the Partick intercepting sewer—6 ft. and 5 ft. in diameter respectively—is dealt with. The sewage flows across the station, through screens and pumps, and is delivered directly into the main outfall in front of the station. The lift is 36 ft. The dry-weather flow is about 16,200,000 gallons per day of twenty-four hours. The present wet-weather capacity is 32,400,000 gallons, with a pump in reserve. There are three triple expansion vertical pumping engines, with three-throw plunger pumps. The capacity of each pumping engine is 16,200,000 gallons per day, with a speed of twenty revolutions per minute. There are four Lancashire boilers carrying steam at a pressure of 160 lb. per square inch, and a complement of auxiliary machinery.

The volume of sewage flowing through the Dalmuir purification works in dry weather is scheduled at the rate of about 38,000,000 gallons in twenty-four hours. The wet-weather flow may be 60,000,000 to 100,000,000 gallons. Only a small portion requires to be pumped—that for the drainage of Clydebank, where the lift is 19 ft. There are three centrifugal pumping engines, driven directly by enclosed double and triple expansion engines, three electric generators driven by enclosed triple-expansion engines, and duplicate steam-driven condensing sets, which are common to the pumping engines and to the generator engines. All other items or parts of the mechanical equipment are driven electrically, and the works are lighted throughout by the same means. The aggregate motor equipment is equal to 500 b.h.p. There are four Lancashire boilers. The screen-house is equipped with rough and fine screens, and with a special catchpit, 156 ft. long by 24 ft. wide, with sloping sides, and a travelling-ladder bucket dredger to raise the spoil. The precipitants employed are persulphate of iron and a saturated solution of lime water. Saturation tanks, settling tanks, and chemical and mechanical plant are provided for the manufacture of these agents, the former from ferrous crystals, the latter from burned limestone. The sludge from the main precipitation tanks is discharged into the well of the sludge pump-house on the river bank. There are three centrifugal sludge pumps, each driven by a 50 b.h.p. motor, entirely enclosed. Each pump lifts 1,500 gallons per minute through a mean height of 40 ft. into the storage tanks, the bottoms of which are raised about 13 ft. 6 in. above the river wharf. There are two tanks of cast iron, each 150 ft. long by 35 ft. wide by 10 ft. 3 in. deep inside, and the capacity of each is 1,500 tons of sludge. During storage in the tanks the density of the sludge is increased by a systematic draining away of the thinner liquor, the moisture being reduced from 93 per cent to 86 per cent. Suitable pipe connections, with gantries and swivel pipes on the wharf, enable one of the tanks to be emptied of its contents, and the sludge steamer to be loaded with 1,200 tons of heavy sludge in thirty minutes, all storage and cleansing included.

The Kinning Park pumping station on the southern works (corresponding with Partick station on the western works) has a rather small site, nearly square, about 120 ft. by 106 ft. The lift is about 46 ft., including the friction of rising mains, about 660 yds. long, which connect the station with the main outfall sewer. The dry-weather flow is at present 15,000,000 to 16,000,000 gallons, and the wet-weather flow is about 33,000,000 gallons, or more, in twenty-four hours. There are three pumping engines, very similar in essentials to those at Partick pumping station. At twenty-three revolutions per minute, the capacity of each pumping engine is about 17¾ million gallons in twenty-four hours. There are three boilers of water-tube type, with superheaters, mechanical stokers, and a feed-water heater. The auxiliary machinery is chiefly driven by electrical energy. The intercepting sewer terminates in a small catchpit to trap detritus and heavier solids, which are removed periodically by a bucket grab-dredger. Three sets of rough and fine screens are provided, also penstocks for the pump wells, and sluice valves on the delivery pipes, to enable any pump to be isolated, or to use either of two rising mains. In order to save space the screening chamber and the catchpit chamber are placed entirely below yard level, and partly under the floor of the boiler-house.

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**City of London Improvement.**—The Improvements Committee of the London County Council will recommend a contribution of half the cost of widening Leadenhall-street, which is to be undertaken by the Corporation of London at a cost of £252,000. Negotiations for this improvement were begun twelve years ago.

**Removal of Central Tramway Standards.** — West Bromwich Town Council, as a direct result of the representations of the Roads Improvement Association, have, we understand, resolved to remove the existing tramway standards from the centre of the High-street and re-erect them at the sides of that thoroughfare. The town council are obtaining a loan of £4,500 to cover the cost of this work. The Midland centre of the Roads Improvement Association have for some time past been in negotiation with the town council in regard to this matter, and have followed up their representations with specific facts and well-considered arguments demonstrating that the existing central standards are a great obstruction and serious source of danger to ordinary vehicular traffic. High-street, West Bromwich, forms a section of the existing road between Birmingham and Wolverhampton, and the activities for the removal of the standards in question are part of the Midland Centre's programme to improve the traffic facilities between these two places.

# Road Making in Canada.

## A COVERING SPECIFICATION.

The following specification, which has been prepared by a committee of the Canadian Society of Civil Engineers, is intended as a general guide, and may be regarded as more or less of the nature of a covering specification. We have added a criticism, specially prepared for THE SURVEYOR:—

A standard specification should not be understood as one to be followed rigidly under all circumstances. Properly treated, no 2 miles of road should be constructed in precisely the same way. For this reason every road should be a problem in itself, to be treated in accordance with local conditions and requirements, always, however, following the scientific principles underlying the making of good roads. A standard specification is one that may be drawn upon to meet average conditions, but in every case it should be varied to meet the special requirements of the work undertaken.

Owing to the great variation in requirements, particularly in the grading and drainage of a new road, it is exceedingly difficult to draw up a specification which will not be cumbersome, and which will not, because of intricacy and indefiniteness, cause contractors to be alarmed to such an extent that their prices will be considerably advanced. For this reason the great majority of municipal councils have been in the habit of building roads by day labour rather than by contract. In justice to the work, road specifications should be simple and definite, but the necessity of safeguarding the municipality from "scamped" work makes an ideal difficult to reach.

As between work wholly performed by day labour and the other extreme of contract work there is a middle field of safety to the municipality. It is that all earth work, including draining and grading, should be done by day labour under the municipal road superintendent. For this work he could use the grading equipment which all municipalities possess, and could carry on the work at the most favourable seasons of the year. Having provided for grading and drainage, with incidental details, the placing of stone or other road metal could readily be let by contract.

The standard specifications in this report have been prepared with a view of a simple treatment of all classes of work performed under contract, but should be modified to meet special requirements.

### STANDARD SPECIFICATION FOR STONE AND GRAVEL ROADWAYS.

(1) Scope of Specifications.—The work covered by these specifications is to include the supplying of all labour, machinery, plant or materials which are needed to construct durably and expeditiously, and to fully complete ready for travel a roadway which is in general to be straight and in the centre of the road allowance, with a uniform width between the inside of open ditches. Roads are to be given an easy flowing grade, cutting hills and knolls, and filling depressions. The steepness of hills is in no case to exceed a rise of 4 per cent. On roads not previously metalled, earth excavated from the ditches is to be drawn to the centre to form the grade or turnpike. On old stone or gravel roads, earth shoulders are in general to be turned away from the centre, across the open ditches, if so directed, and the crown of the road restored by placing new metal on the old stone or gravel base.

(2) Plans, Stakes, &c.—All work under these specifications is to be in accordance with the plans, profiles, and schedules forming part of these specifications, and to the lines and levels given on the ground by the engineer. Stakes and bench-marks placed for the purpose are not to be moved or effaced when avoidable.

(3) Width of Road.—The width of road shall be uniform, unless otherwise directed, for curves or other irregularities, widths of grade between shoulders to be 24 ft. and the stone or gravel 8 ft. wide for single-track roads, and 14 ft. wide for double-track.

(4) Crown.—The finished and consolidated roadway is to be circular, and have an average crown of 1 in. to 1 ft. from side to centre. Earth excavation and the placing of stone are to be uniformly, such as will produce that camber, except as otherwise directed by the engineer in case of hills, swamps, rock excavation and other irregular conditions. Where the width and quality of stone used in this area will permit, the average crown may be reduced to ½ in. to 1 ft., if so directed by the engineer.

(5) Excavation and Fill.—Excavation or fill is to be made in all cases to the required depth below the elevation of the finished roadway. Surface soil, vegetable mould, logs, stumps, or other weak or perishable material are to be removed to a sufficient depth to secure a firm foundation, and such excavation shall be filled with durable material to the height of the sub-grade. The sub-grade thus obtained is to be made thoroughly firm and solid by pounding and rolling. In swamp land, roots and muck are, if practicable, to be removed in advance of filling to a firm bearing.

(6) Roadsides.—The land at the sides of the road between the gutters or open drain and the fences is to be graded from margin of the roadway as may be directed, the roadsides to be left smooth by grading and levelling, care being taken not to injure or bark trees and shrubs that may be marked for preservation, or where such preservation is directed by the engineer.

(7) Lane and Street Intersections.—All intersections of roads, lanes and entrances are to be properly graded, and stoned or gravelled as directed, to conform to the finished grades of the intersecting roadways; and tile or other culverts or crossings are to be well laid, under instructions from the engineer.

(8) Broken Stone Surface and Quality of Stone.—The surface of the roadway is to be covered with crushed stone to a minimum depth of 8 in. after consolidation, to be regularly and perfectly spread over the whole of the road-bed to a depth to conform to the cross-section shown on the drawings. The crushed stone is to be durable limestone, granite or field stone, of such quality and broken to such dimensions as may be approved by the engineer. All stone used must be free from clay, loam or earthy material. Samples of material to be used are to be placed with the engineer, and all material is thereafter to conform to the quality of such samples.

(9) Placing Stone on the Roadway.—The broken stone is to be placed on the roadway in the following manner:

(a) Coarsely crushed stone or "tailings" of a size that will pass through a 4-in. ring, and be retained by a 2½-in. ring, is to be placed over the central portion of the sub-grade to such a depth and width as the total depth of stone will permit; this is to be rolled dry to a firm and even surface, and additional stone is to be added wherever depressions appear, or the camber becomes too flat under the roller. Where "tailings" are not available, their place shall be taken by the grade of stone described in the following subsection:

(b) Upon this shall be spread a layer of crushed stone, such as will pass through a 3-in. ring, and be retained by a 1½-in. ring, to be 4 in. in depth after consolidation at the centre, and such further depth at the centre and sides as will bring the roadway to the line of the finished grade. This is to be rolled dry to a firm and even surface. Additional stone is to be added wherever depressions appear or the camber becomes too flat under the roller.

(c) The roadway so formed shall be coated with screenings; these to be thoroughly saturated and rolled until perfectly consolidated to the satisfaction of the engineer. Screenings are to consist of stone chips and dust, such as will pass a 1½-in. ring, an excess of dust to be removed by a dust jacket attached to the screen, if required by the engineer. Screenings are not to be dumped from wagons on the stone, but are to be spread from the wagons or from piles deposited along the roadside.

(10) Screenings not to Exceed Necessary Amount.—Special care must be taken that the screenings shall not be in excess of the quantity necessary for consolidating the road, nor shall less be used than is needed to maintain a smooth surface. The screenings shall be uniform and thinly spread, and additional quantities shall be added as may appear necessary after watering. Screenings are to be added to or removed from the surface as may appear necessary to the engineer at any time during the progress of the work.

(11) Manner of Rolling and Wetting Roadway.—Rolling shall be commenced at the edges of [illegible]

the road, working towards the centre, and shall be continued until the earth sub-grade and each layer in succession is firmly set. The final rolling must be continued until the road-bed is perfectly consolidated and unyielding, to the satisfaction of the engineer. During the whole of the final rolling herein specified a sprinkling cart is to pass immediately in front of the roller, so that at all times the surface of the road will be saturated with water.

(12) Gravel.—Gravel where expressly permitted by the engineer shall have a minimum consolidated depth of 8 in., and the widths of metal, drainage, grading, and all other details and requirements wherever applicable, as stated elsewhere in this specification, shall apply. The gravel used shall be clean, free from an excess of clay, loam, or sand; shall be compact, and composed of varying sized grains up to 2 in. diameter. If the gravel contains large stones these are to be removed at the pit, or if drawn to the road may be raked forward and spread in the bottom of the road. Should the gravel contain an excess of large stone, or of fine material, treatment by crushing, or screening, or both, shall be provided, such as is necessary to produce a satisfactory road metal. Where gravel does not consolidate readily or sufficiently by rolling, approved material, such as limestone or screenings, may be lightly spread over the surface to provide the necessary bond. The gravel, spread to a uniform depth, shall be made wet by sprinkling and rolled until thoroughly consolidated. When crushed or screened gravel is used, care must be taken to use no more screenings on the surface than is necessary for consolidation. The quality of gravel, preparation, method of placing on the road, and means of consolidation must be, in all respects, approved by the engineer.

(13) Surface Drainage.—Open drains or gutters shall be formed along each side of the roadway, of sufficient capacity to carry to an outlet all water entering them, the grade of such drains to follow, where practicable, that of the roadway, but preferably having a minimum fall of 3 in. in 100 ft. The slope of gutters is to be uniform and without pockets or depressions. On hills and hill-slides, where suitable outlets cannot otherwise be obtained, surface water shall be received into catch-basins at suitable intervals, and discharged to an outlet through underground tile, vitrified sewer-pipe being preferably used for that purpose. On hills, concrete or cobble gutters may be required where the rush of surface water is likely to cause erosion.

(14) Tile Drainage. Tile drains, where required to remove an excess of subsoil water, to tap springs, to dispose effectively of surface water, to protect hills or road intersections, shall in general be placed along the side of the roadway, under the open drain or gutter, and shall be of not less diameter than 5 in. The tiles are to be placed in an 8-in. trench, the bottom of the trench to be 36 in. below the sub-grade of the roadway. They are to be uniformly and evenly laid with a fall of not less than 3 in. in 100 ft. to a proper outlet, and with ends closely abutting. All tile used shall be of the best quality of clay, manufactured expressly for drain purposes, in lengths not less than 1 ft., and of uniform diameter throughout. Earth excavated in the laying of these drains shall be returned to the trench, being consolidated on hills, or slopes, if considered necessary by the engineer, to prevent its being washed out, and in every case so disposed of as not to interfere with surface drainage. Where the bottom of the trench is in quicksand, satisfactory means are to be used to keep the tile in a true line, and free from sediment, by laying on a board, surrounding with cinders, sawdust, cotton, or cheesecloth.

(15) Foundation of Large Stone.—Where the natural road-bed is weak, flat, or for any other reason a strong foundation is desirable, a foundation shall be laid below the stone referred to in section 9 of this specification, such foundation to be constructed of cobble stone, coarse gravel, or rough quarry stone of a size not exceeding 8 in. in largest dimensions, and of such depth as, in the opinion of the engineer, the work may require. This foundation is to be rolled to the satisfaction of the engineer; this to be followed by a layer of crushed stone described in section 9 (a) of this specification. Roads of light or low cost are to have an 8-in. layer of clay, or gravel containing clay, laid as base for the metal covering, such clay or gravel to be thoroughly rolled and consolidated before the metal coating is applied.

(16) Side Slopes.—Side slopes in cut and fill are to be 1 and 1½ ft. horizontal to 1 ft. vertical. Earth for fills on side-hills and through ravines, where the grade cutting does not provide sufficient material, is to be obtained from the tops of hills, or such other point as directed, in order that the natural slope of the earth may be maintained and slipping prevented as far as practicable.

(17) Rip-Rap.—Rip-rap, where required to protect the face of embankments or the foot of slopes, unless otherwise directed, shall be of undressed field or quarry stone, laid by hand to a uniform thickness, each stone to be firmly embedded, and at a slope not exceeding 1 ft. horizontal to 1 ft. vertical. The largest stone adapted to the work is to be used.

(18) Concrete Tile Culverts.—Concrete tile culverts, where required, are to be of such size and length and at such depths as may be determined by the engineer, and are to be placed where shown on the plans hereto attached, are to be placed and connected with tile and free outlet, so that water will not stand in them. The spigot end is to be down grade, and joints are to be fitted and made tight with cement mortar. The trench to receive the tile is to have a concave bed, so that the tile will have an even bearing, the earth is to be firmly packed and rammed around the tile, and a minimum depth of 1 ft. of earth is to cover the tile. Each end of the culvert is to have a concrete headwall sunk below the frost line, and of such dimensions as may be necessary for a retaining wall to suit the situation. Concrete tiles are to be strong and of the best quality, sound, free from all defects, smooth, uniformly circular, and made in accordance with an approved specification.

(19) Catch-Basins. — Concrete catch-basins, in accordance with the plans hereto attached. Culverts are to be laid with a good fall drains, at such point and at such depth as the engineer may designate, iron covers for this purpose to be provided.

(20) Cobble-stone Gutters.—Cobble-stone gutters will generally be 3 ft. wide, but are to be of such width and contour as the situation may require. They are to be made of stones from 4 in. to 6 in. long, and from 2 in. to 4 in. wide, set on end and bedded in an 8-in. layer of gravel or coarse sand. The upper interstices of the stones are to be filled with fine gravel or coarse sand, and the whole thoroughly rammed to a firm bearing.

(21) Concrete Gutters.—Concrete kerbs and gutters, if required, shall, unless otherwise directed, be in accordance with the dimensions shown on the drawings hereto attached. The Portland cement, all materials, methods and workmanship shall conform to the best of modern practice and standards. The kerbing and gutters shall be laid on a 6-in. bed of gravel or broken stone, which shall be thoroughly tamped and consolidated. The kerb and gutter shall consist of a concrete core or backing, with a 1-in. surface coat of mortar, the concrete core to be mixed in the proportion of 1 part of Portland cement, 3 of sand, and 5 of broken stone; the surface coat to consist of 1 part of cement and 2 parts of sand.

The entire exposed surface shall be neatly faced by floating and trowelling with a coat of neat cement, and finished with a dampened bristle brush, so as to give a uniform colour throughout.

The work shall be carried on as rapidly as the concrete can be thoroughly rammed, and the whole kerb and gutter shall be completed while in a soft and plastic state, so that it will be monolithic when set.

The kerb shall be divided into sections 8 ft. in length by such means as will insure complete separation. At road and lane intersections the kerb shall be made on a surve of suitable radius, with true and even joints. The temporary forms used in shaping the gutter and kerb shall be set accurately and firmly in place.

### A CRITICISM.

On the whole, this specification comes fairly well within the limits of its scope, as explained in the opening paragraphs, and serves the purpose of a covering specification which will at least ensure, if it be faithfully followed at the proper distance in each case, that the work done will not fall very far short of what is needed to give fair results. A good feature is the frequent recurrence of references to the engineer, since this not only gives the engineer himself the hint as to when his judgment will be needed, but it also serves to show the contractor or foreman where these general directions need to be supplemented by more in the order.

On the other hand, it cannot be overlooked that the directions given are often specific in character when all that can really be done is to give some general hints, unless, indeed, a whole range of directions for different circumstances could be included.

A good feature is that the manner in which the work is to be done is clearly conveyed, and definite points of procedure are specified, as, for instance, "samples of material to be used are to be placed with the engineer. . . ."

WHERE THE SPECIFICATION IS WRONGLY DEFINITE.

There are several matters with regard to which the specification is not definitely wrong, but is wrongly definite. The most striking of these is the direction that side slopes of cuttings and of embankments are to be 1½ to 1. This is, in many cases, a very good slope, but it is wasteful when an embankment will stand perfectly well 1 to 1, or even steeper slopes, and it is for cuttings either much too steep or much too flat for those materials which will stand vertically, such as soft rock or hard soil, but must be sloped at about 3 to 1, or even flatter, if they are to be maintained as earth slopes with grass or small vegetation.

When the material will not stand vertically to a height in excess of some limit, or where a more open cutting is desired, this can be arranged for by steps, or by vertical portions alternating with slopes at which the exposed material will stand. Another notable example of this feature of the specification is the direction that tile drains (14) are to be in a trench 36 in. below the sub-grade of the roadway.

The proper depth depends upon the hydraulic gradient in the soil and the distance of the trench from the edge of the carriageway, and it is quite useless to specify any particular depth. In very stiff soils, in which the gradient is very steep, it is not worth while putting in such drains at the great depth necessary for efficiency, and the crust must be drained by other means.

Another point that may be referred to under this head is the direction that (5) in swamp land roads are to be removed. In some cases it is much better to leave them.

SOME DOUBTFUL MATTERS.

There are some features of the specification as to which doubt must be expressed as regards their value in a set of general directions of this kind. For instance, in the matter of camber, even those engineers who favour a circular arc camber do as the best for most situations will usually admit that in some places and with some kinds of material the rise is better given by two slopes, joined by a curve at the crown. Again, the building up of an 8-in. crust without binding material other than that which is forced in from the top seems to be a process of doubtful value, except where a specially pervious crust is desired. This may, of course, be the case sometimes, so that this point might, perhaps, have been better included among the "wrongly definite" above. As regards the 8-in. layer of clay to be placed upon a subsoil of light sand, it may reasonably be objected that this is a somewhat excessive thickness for pure clay by itself, though not, of course, for the "gravel containing clay," nor would this criticism apply if the specification had directed the rolling in of a fair proportion of the larger stone in excess of that required for the crust proper.

SOME STRONGER DISSENT.

There are several points which seem to call for somewhat stronger expressions of dissent. To limit the steepness of hills (1) on roads generally to 1 in 25 is to set an unreasonable limit to the scope of usefulness of roads, especially in such countries as some of the provinces of Canada. With several kinds of road crust the draught on a slope of 1 in 25 is hardly as great as that on the level, when the weather is wet but without heavy scouring showers, and the cost both of construction and of maintenance imposed by heavy summit cuttings or the greater length of the flatter road skirting sidelong ground have to be taken into consideration. A maximum gradient of 1 in 25 is a text-book idea, followed closely in practice where convenient.

Another matter in which the specification seems to have gone astray is that of the placing of the bottom course. This large stuff, passing a 4-in. ring and retained on a 2½-in. ring, is to be placed in the "central portion" of the sub-grade—that is, where the wheel-loads are least heavy, where the crust is least waterlogged after steady rain, and least denuded by weathering.

The value of the useful set of directions is by no means destroyed by the blemishes to which attention has been directed above, and of (2), followed in the manner intended by its framers, it should prove a very serviceable to Canadian road engineers; but although the committee state that the specifications "should be modified to meet special requirements," that is not quite the whole story, for, like all similar attempts to "specify" generally, it has to be modified to meet quite ordinary and every-day requirements. We must in these matters distinguish between the general, the typical, and the actual.

## SOME RECENT PUBLICATIONS.*

Small Water Supplies. By F. Noel Taylor. Price 6s. London: B. T. Batsford.

This book, recently written by Mr. Noel Taylor, contains a great deal of valuable and interesting matter. It further deals with some of the newest methods. For instance, it discusses the uses of the Digby Dionic water tester, and describes the Humphrey pump. It is also written in such a manner that any practical man can obtain a great deal of useful knowledge from it; but, on the other hand, it appears to have been rather carelessly edited, and it contains many mistakes in English and in composition which should be set right in a future edition. Again, the author has made a great many statements which are open to criticism, as the inevitable result of endeavouring to give practical advice upon a large subject in a few lines. This is particularly noticeable in the case of the information given with regard to wells. The author unhesitatingly tells us what is "no doubt the most favourable position for a well," and in three lines tells us the quality of water which we may expect to obtain from a deep well. He explains the presence of salt water in wells near the sea as being due to capillary attraction, and seems to forget to mention the fact that gravitation frequently has something to do with the difficulty. The practical advice given with regard to well construction and boring is useful.

Considerable space is given to the subject of the flow of the water in channels and pipes, but here, again, some of the statements are certainly open to criticism. The author dwells upon the advantages of the hydraulic ram for small supplies, and gives a very good general description of various kinds of pumps and motors. The description of the Humphrey pump, in particular, is interesting. Works of storage and distribution are then discussed, and these include large earthwork dams, retaining walls, masonry dams, ferro-concrete works, cast-iron tanks, small storage reservoirs and main laying, concerning which a great deal of useful and practical information is given. It is a good book, but needs some correction.

Practical Mathematics and Geometry for Technical Students. Part III. Advanced Course. By E. L. Bates and F. Charlesworth. Price 3s. nett. London: B. T. Batsford.

This work forms a continuation of the text-book on the same subject, written for elementary students by Messrs. Bates and Charlesworth, and is specially designed to meet the requirements of advanced technical students. It covers the complete syllabus for the new "lower" stage examinations in practical mathematics and geometry which are about to be inaugurated by the Board of Education. The advantages of studying together the subjects of practical mathematics, geometry and drawing are now generally recognised, and the present work proceeds on this basis. The scope of the work includes trigonometry, loci, mensuration, algebra, conic sections, vectors, geometry, &c., and the authors have borne in mind throughout the important point that the chief value of the principles enunciated lies in their applicability to practical work. Special attention is devoted to this view of the various subjects and numerous examples are given. While the book will be much appreciated by teachers, it is also suited for the requirements of the private student by reason both of its lucidity and careful graduation.

Pocket Notes and Remembrancer for Sanitary Inspectors, &c. By J. T. Cowderoy. Price 2s. nett. London: The Sanitary Publishing Company, Limited.

This is the fourth edition of a most handy and convenient pocket-book for sanitary inspectors and others who are practically engaged in the public health service. The memoranda which it contains are divided into sixteen chapters. The first of these contains the various Acts of Parliament which are

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

directly affect the inspector is concisely set out; and, in addition, the book contains practical hints on such subjects as slaughter-houses, meat inspection and microscopic stains. There are also glossaries of medical and building terms. The new matter in the present edition includes information as to the procedure under the Housing and Town Planning Act (legal points and inspection regulations), the working of birth-rates and death-rates, and a table showing the proportion of solid matter and water in articles of diet, and so forth. In our opinion the Remembrancer should be the constant companion of every sanitary inspector.

The Precise Calculation of Pipe Drain and Sewer Dimensions. By C. E. Housden. Price 2s. 6d. nett. London: Longmans, Green & Co.

As is pointed out in a sub-title to this useful little book, the precise calculation of pipe dimensions is synonymous with their economic calculation. Herein lies the value of possessing for reference a series of hydraulic tables, such as are contained in the book before us, whence the safe minimum dimensions can be obtained with rapidity and accuracy. Four preliminary chapters are devoted respectively to an explanation of the tables, drains and sewers, permissible velocities, and working examples. Then follows a series of nine tables by which the established formulæ may be applied to any given circumstances without any unnecessary labour or waste of time in mere arithmetical or mathematical calculation. Mr. Housden's little book should prove useful to all who may be concerned in the design of works of sewerage or water supply.

Where to Look. Price 2s. nett. London: Sir Isaac Pitman & Sons, Limited.

The object of this compilation is to provide an index to the more familiar annual books of reference and to a few specified standard works. That such a work supplies a want that is felt is shown by the fact that this is the fifth annual issue. The number of annual reference books published at the present day is certainly rather bewildering, and the inquirer on any topic may well ask "Where to Look" for the information he desires. Such a one will find this well-prepared index of the greatest possible assistance. The number of references has again been increased, and the book may be described as the "open sesame" to the gate of the wide field of information covered by the many reference books to which it refers.

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A paper on "Automatic Fire Extinction," by Mr. George T. Bullock, A.I.E.E., chief surveyor of the Union Assurance Society, read before the Junior Institution of Engineers in 1908, has been quoted as a standard text-book for the examinations of the Insurance Institute of Great Britain and Ireland on fire extinguishment. Taking this into account, the institution have had the paper revised and brought up to date, and copies of the new edition may now be obtained from the publishers (Messrs. Percival Marshall & Co.) for 1s. 1d., post free.

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**C. A. Peters, Limited.**—We have to thank Mr. J. W. Aldred, managing director of Messrs. C. A. Peters, Limited, of Derby, London and Liverpool—whose name is associated with Carbolineum, Carbolineum Avenarius, Sotor, Antioxide, Carbotron, and Okin-vash—for specimens of their advertising drawing-pins, substantially made, and lettered in gilt with a reference to "Carbolineum," the well-known wood preservative. No doubt specimens of these drawing-pins could be obtained on application to the firm, who have just now a stand at the Building Trades Exhibition at Rusholme.

**New York Main Drainage.** The Metropolitan Sewerage Commission of New York has submitted the second of a series of reports in which the necessity for colossal main drainage works for that city is clearly pressed upon. The commission, according to a New York correspondent, recommend that the city should be divided into four drainage areas, in each of which there would be a number of central points at which sewage would be collected and there purified to such an extent that the effluent could be discharged into the harbour without danger to health or the possibility of creating a nuisance. Each phase of the problem is gone into at some length in the report, to which we hope to make more extended reference in a future issue, the final opinion of the commission being given as to the best manner of solving the difficulties to be met with.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President*—Mr. Albert D. Greatorex, M.Inst.C.E., Borough Engineer and Surveyor of West Bromwich.

### REVISED AND COMPLETED LIST OF MEETINGS.

We have received from the secretary, Mr. Thomas Cole, the following revised and completed list of meetings:—

April 6th.—Exmouth.
April 13th.—Stourbridge.
April 27th.—Council meeting.
May 4th.—Nuneaton.
May 24th—29th.—Paris.
June 1st.—Council meeting.
June 7th—8th.—Stirling.
June 15th.—East Ham.
June 22nd.—Lowestoft.
June 29th.—Bridlington.
July 11th—13th.—Annual meeting, London.

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Provincial members who propose to take part in the visit to Paris will, in cases where the journey exceeds a distance of 30 miles, be able to obtain return tickets to London at a single fare and a quarter.

Members desirous of submitting a paper at the forthcoming annual meeting are requested to give early information of their desire.

Premiums not exceeding 30 guineas are awarded by the council for the best papers read by members and associate members during the year.

Thomas Cole,
11 Victoria-street, S.W. *Secretary.*

## INSTITUTION OF MUNICIPAL ENGINEERS.

*President*—Mr. E. A. Stickland, Assoc.M.Inst.C.E., Borough Surveyor, Windsor.

### SOUTH-EASTERN DISTRICT.

A meeting will be held in the council room of the institution, 39 Victoria-street, S.W., on Tuesday, March 26th, at 7 p.m., when there will be an open discussion on "The Size and Design of Street Gullies and Weirs." Members are invited to bring to the meeting drawings and, if possible, models of any street gullies or weirs which have come under their notice.

Bernard Partridge,
Town Hall, *Hon. District Secretary.*
Walthamstow.
March 11, 1912.

### EXAMINATIONS.

The next examination will be held in May next, at centres to be arranged. The papers set at the November examinations may be obtained in book form, price 1s., post free.

B. Wyand,
39 Victoria-street, S.W. *Secretary.*

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**London County Hall: Foundation-Stone Laying.** His Majesty the King on the 9th inst. performed the ceremony of laying the foundation-stone of the new County Hall for London, which is to be erected on a site of 6½ acres at the southern end of Westminster Bridge, at a cost of £1,400,000. The building will be 750 ft. in length, and have an average width of 310 ft. There will be nine storeys, the two lowest being below the road levels. The council chamber will be on the first floor, with committee and members' rooms adjoining, and accommodation for the chief officers, while the remaining floors will be allocated to the staffs of the various departments. The style of architecture, as will be seen from the plans published in our issue of February 7, 1908, is a free treatment of the English Renaissance, adapted to a building containing rooms of various sizes and importance. Mr. Ralph Knott, the architect, is carrying out the work in collaboration with Mr. W. E. Riley, F.R.I.B.A., the superintending architect to the county council, and Mr. Maurice Fitzmaurice, C.M.G., M.Inst.C.E., the chief engineer—upon whom the King conferred the honour of knighthood at the stone-laying ceremony—has undertaken the design and construction of the embankment wall, which is an important feature of the undertaking.

## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned* (*No.* 1359 *Holborn*), *subject to later confirmation by letter.*

ASSISTANT SURVEYOR.—March 23rd.—Newton-in-Makerfield Urban District Council. £70–£75.—Mr. Cornelius Cole, clerk.

CLERK OF WORKS.—March 23rd.—Loughrea Rural District Council.—Mr. F. Bergin, engineer-in-charge, 36 Westmoreland-street, Dublin.

TRACING CLERK. March 25th. Bethnal Green Borough Council. £60 per annum. Mr. C. G. E. Fletcher, town clerk.

ASSISTANT INSPECTOR OF NUISANCES.—March 25th.—Corporation of Burton-on-Trent. 30s. per week.—Mr. J. Chapman, town clerk.

SURVEYOR'S TEMPORARY ASSISTANT.—March 28th.—Corporation of Devizes. £52 a year.—Mr. Joseph T. Jackson, town clerk.

COUNTY SURVEYOR'S ASSISTANT. March 28th. Salop County Council. £2 per week. Mr. F. Crowte, clerk, Shrewsbury.

SURVEYOR.—March 30th.—Pontypool Rural District Council. £100 per annum.—Mr. T. Atkins, clerk.

SURVEYOR'S CLERK.—March 30th.—Teddington Urban District Council. £80—£100.—Mr. G. H. Salmons, clerk.

NUISANCE INSPECTOR.—March 30th.—Corporation of Clitheroe. £104 per annum.—Mr. W. Sell Weeks, town clerk.

ENGINEERING ASSISTANT.—April 2nd.—Paignton Urban District Council. £4 4s. per week. Mr. James R. Mill, clerk.

CLERK OF WORKS. April 10th. Bandon Town Commissioners. £2 per week. Mr J. Coghlan, town clerk.

BUILDING INSPECTOR.—April 10th.—Corporation of Plymouth. £100 per annum. Mr Lance Paton, borough engineer and surveyor.

SANITARY INSPECTOR.—April 13th.—Lewisham Borough Council. £150 £200. Mr. E. Wright, town clerk.

LAND VALUER. April 15th. Board of Trustees for the Improvement of Calcutta. 1,250 rupees per mensem, rising to 1,500 rupees.—Mr. C. H. Bompas, chairman, 5 Clive-street, Calcutta.

ASSISTANT ENGINEERS. May 1st. Indian Public Works and State Railway Departments.—Secretary, Judicial and Public Department, India Office, London, S.W.

## MUNICIPAL COMPETITIONS OPEN.

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PORTLAND.—April 4th.—Designs and plans for council offices, for the urban district council. Premiums of £50 and £10 are offered.—Mr. R. A. Colenutt, clerk.

WOMBWELL.—May 1st.—Designs for public swimming bath, for the urban district council.—Prizes of £40, £30 and £20 are offered.—Mr. W. Quest, surveyor.

HALE.—June 28th.—Designs for a town planning scheme for the urban district council. Premiums of £50 and £25 are offered.—The Clerk.

DUSSELDORF.—July 1st.—Plan for the extension of the city. Premiums of £1,000 and £375 are offered. The Chief Burgomaster.

## MUNICIPAL CONTRACTS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned* (*No.* 1359 *Holborn*), *subject to later confirmation by letter.*

### Buildings.

OSWESTRY.—March 23rd.—For the construction of a bandstand, for the corporation.—Mr. G. W. Lacey, borough engineer and surveyor.

FINCHLEY.—March 23rd.—For the erection of an elementary school, for the urban district council.—Mr. E. H. Lister, clerk.

SOMERSET.—March 23rd.—For the erection of a dwelling-house and farm buildings, for the county council.—Mr. H. T. Chapman, county surveyor.

BRISTOL.—March 25th.—For the erection of a dock-master's house, for the Docks Committee.—Secretary, Docks Committee.

HANWELL.—March 25th.—For alterations to free library, for the urban district council.—Mr. P. Scott, clerk.

BRAINTREE.—March 25th.—For the construction of an open-air swimming bath, for the urban district council.—Mr. H. J. Cunnington, clerk.

SALOP.—March 25th.—For the erection of a school at Oswestry, for the Education Committee.—Mr. W. H. Pendlebury, M.A., secretary, Shire Hall, Shrewsbury.

ELY.—March 25th.—For the erection of a house, offices, and cottages, for the county council.—Mr. R. S. W. Perkins, county surveyor.

OLDHAM. March 26th. For the extension of town hall and municipal buildings, for the corporation.—Mr. J. H. Hollsworth, town clerk.

BRADFORD.—March 26th.—For the erection of a house, for the corporation.—Mr. F. Stevens, town clerk.

CROYDON. March 26th. For the erection of boiler-house and chimney, for the corporation.—Town Clerk.

HALIFAX.—March 26th.—For alterations at a council school, for the corporation.—Borough Engineer.

WEST SUSSEX.—March 26th.—For the erection of a school, for the Joint Education Committee.—Mr. L. Thompson, secretary, Thurloe House, High-street, Worthing.

KENT.—March 27th—April 15th.—For the erection of a school at Tonbridge, for the Education Committee.—Mr. F. W. Crook, secretary, Caxton House, Westminster.

EAST RIDING.—March 27th.—For the erection of two schools, and work of alterations and additions, for the county council.—Mr. J. Bickersteth, clerk, Education Committee, County Hall, Beverley.

CHESHIRE.—March 27th.—For rebuilding a school, for the Education Sub-Committee.—Mr. G. F. Ashton, clerk, 71 High-street, Runcorn.

NORFOLK.—March 27th—April 17th.—For the enlargement of two schools, for the Education Committee.—Mr. T. A. Cox, secretary, Education Office, Shire Hall, Norwich.

GLASGOW.—March 27th.—For the construction of swing bridges over Forth and Clyde Canal, for the corporation.—Mr. John Bowers, town clerk.

BELFAST.—March 27th.—For alterations at public baths, for the corporation.—Mr. R. Meyer, town clerk.

CHELMSFORD.—March 27th.—For the erection of thirty-eight working-class dwellings in five blocks, for the corporation.—Mr. W. Smith, town clerk.

STOCKPORT. March 28th. For the erection of boundary wall, railings and gates, for the corporation.—Borough Surveyor.

WALTON.—March 28th.—For additions to public conveniences, for the urban district council.—Mr. H. W. Gladwell, district surveyor, Town Hall Building, Walton-on-Naze.

LEICESTERSHIRE.—March 29th.—For alterations at a school, for the Education Committee.—The Architect, 33 Bowling Green-street, Leicester.

SKIPTON.—March 29th.—For the construction of a fence wall, for the urban district council.—Mr. E. A. W. Aldridge, surveyor.

RHONDDA.—March 29th.—For the erection of a school and other works, for the urban district council.—Mr. W. P. Nicholas, clerk.

HOWDON-ON-TYNE.—March 30th.—For carrying out brickwork and concrete work, for the Tyne Improvement Commissioners. Mr. N. G. Gedge, Newcastle-on-Tyne.

CHURCH.—April 2nd.—For the erection of new council offices, for the urban district council.—Mr. J. R. Reddish, clerk.

CARDIFF.—April 2nd.—For the erection of stores, for the corporation.—Mr. J. L. Wheatley, town clerk.

SALISBURY.—April 3rd.—For the erection of a new roof to engine-room, for the corporation.—Mr. W. J. Goodwin, city engineer and surveyor.

LINDSEY.—April 4th—18th.—For additions to a school, for the county council.—Mr. S. M. Grant, secretary, 286 High-street, Lincoln.

WEST RIDING.—April 5th.—For the erection of a school, for the Education Committee.—Education Architect, County Hall, Wakefield.

SHEFFIELD.—April 9th.—For the erection of public conveniences and other offices, for the corporation.—Mr. R. M. Prescott, town clerk.

ISLE OF WIGHT.—April 9th.—For the erection of cottage and outbuildings, for the county council.—Mr. J. Dufton, clerk, 20 Holyrood-street, Newport, Isle of Wight.

MANCHESTER.—April 18th.—For the erection of mess-room and lavatories, for the Gas Committee.—Mr. J. G. Newbiggin, engineer, Rochdale-road Station.

FINCHLEY.—April 19th.—For an installation to deal with house and trade refuse, for the urban district council.—Mr. E. H. Lister, clerk.

CORK.—For building thirty-five cottages, for the rural district council.—Mr. J. Cotter, clerk.

## Iron and Steel.

HINDLEY.—March 25th.—For the supply of vertical spindle centrifugal pump and electric motor, for the urban district council.—Mr. T. Robey, clerk.

NEATH.—March 25th.—For the construction of main pipe conduit, branch service mains and storage tank in connection with the Ystradfellte waterworks scheme, for the rural district council.—Messrs. Cuthbertson & Powell, clerks.

HEMSWORTH.—March 26th.—For the supply of water-main pipes, valves, and hydrants, for the rural district council.—Mr. J. Scholefield, clerk.

PETERSFIELD.—March 30th.—For the supply of 4-in. and 5-in. iron spigot and socket pipes, bends, junctions, tapers, and, other specials, for waterworks extension, for the urban district council.—Mr. Percy C. Burley, clerk.

NOTTINGHAM.—April 1st.—For the supply of girders, steel pipes and specials, for the Water Committee.—Mr. J. A. H. Green, town clerk.

LONDON.—April 16th.—For the supply of 484 tons rolled-steel bar, special section, for magnetic brakes, for the county council.—The Clerk.

## Roads.

GUISELEY.—March 23rd.—For the supply of granite, limestone, whinstone and tar-macadam, for the urban district council.—Mr. J. Battye, surveyor.

ROMFORD.—March 23rd.—For the supply of Guernsey granite, for the urban district council.—Mr. J. Turvey, surveyor.

GATESHEAD.—March 23rd.—For the supply of whinstone, macadam, granite macadam, whin setts, whin kerb, flags, and gullies, for the corporation.—Mr. W. Swinburne, town clerk.

ALNWICK.—March 23rd.—For the supply of road materials, for the rural district council.—Mr. J. Short, highway surveyor.

SUDBURY.—March 23rd.—For the supply of road materials, disinfectants, and stoneware pipes, for the corporation.—Mr. W. J. Tait, borough surveyor.

BLYTHING. March 23rd.—For the supply of granite, granite chips, and flints, for the rural district council.—Mr. H. A. Mullens, clerk, Bulcamp, Halesworth.

POCKLINGTON. March 23rd. For the supply of blue stone and slag, for the rural district council Mr. Thomas Robson, clerk.

NORDEN.—March 23rd.—For the supply of granite setts, flags, kerbs, and macadam for the urban district council.—The Surveyor.

ROWLEY REGIS.—March 25th.—For the supply of road stone, for the urban district council.—Mr. D. Wright, clerk, Old Hill.

DONAGHADEE.—March 25th.—For laying down a granolithic footway, for the urban district council Mr. W. D. R. Taggart, town surveyor, 2 Wellington-place, Belfast.

ITCHEN.—March 25th.—For work in thirteen streets, for the urban district council.—Mr. T. A. Collingwood, surveyor, Council Offices, Woolston.

STAMFORD.—March 25th.—For the supply of broken granite, for the corporation.—Mr. F. R. Ryman, borough surveyor and engineer.

MELTON MOWBRAY.—March 25th.—For works of asphalting and repairs, for the rural district council.—Mr. E. C. Moorhouse, surveyor.

BURY.—March 25th.—For making up certain streets, for the corporation.—Town Clerk.

TICEHURST.—March 25th.—For the supply of broken granite, unbroken Kentish ragstone, and broken Sevenoaks stone, for the rural district council.—Mr. W. N. Wood, surveyor, Etchingham, Sussex.

ALNWICK. March 25th.—For works of paving, for the urban district council.—Mr. G. Wilson, town surveyor.

STEYNING WEST.—March 25th.—For the supply of flints and granite, for the rural district council.—Mr. F. Slaughter, engineer and surveyor.

THAME.—March 25th.—For the supply of road materials, for the urban district council.—Mr. J. T. Robinson, surveyor.

NEWMARKET.—March 25th.—For the supply of granite, for the rural district council.—Mr. S. J. Ennion, clerk.

TENTERDEN.—March 25th.—For the supply of road materials, for the rural district council.—Mr. W. L. C. Turner, district surveyor.

CLAYPOLE.—March 25th.—For the supply of granite and slag, for the rural district council.—Mr. F. C. Meyrick, district surveyor, Buckingham, Newark.

THAME.—March 25th.—For the supply of road material, for the urban district council.—Mr. Edward N. Purcell, clerk.

GREAT CROSBY.—March 25th.—For the supply of road materials, for the urban district council.—Mr. Josiah Dean, clerk.

MARYLEBONE.—March 25th.—For slopping north and middle districts, for the borough council.—Mr. J. Wilson, town clerk.

CLAYTON-LE-MOORS.—March 25th.—For the supply of road materials, for the urban district council.—Mr. A. Dodgeon, surveyor.

STOCKTON.—March 26th.—For making up a street, for the rural district council.—Mr. T. H. Faber, clerk.

MALLING.—March 26th.—For the supply of quartzite, basalt or granite, for the rural district council.—Mr. F. J. Allison, clerk.

WOODFORD.—March 26th.—For tarring roads, for the urban district council.—Mr. William Farrington, surveyor.

GATESHEAD.—March 26th.—For the execution of cement path work, for the corporation.—Mr. N. P. Pattinson, borough surveyor.

CROYDON.—March 26th.—For work of street repair, for the corporation.—Mr. F. C. Lloyd, town clerk.

WORSLEY.—March 27th.—For the supply of macadam, granite setts, lonkey setts, grit setts, granite chippings, &c., and making up certain streets, for the urban district council.—Mr. J. P. Monks, clerk.

ENFIELD.—March 27th.—For making up a private street, for the urban district council.—Mr. T. W. Scott, clerk.

WINDLESHAM.—March 27th.—For the supply of road materials, for the urban district council.—Mr. E. T. Close, clerk, High-street, Bagshot.

HALIFAX.—March 27th.—For work of steam rolling, for the rural district council.—Mr. F. Gordon, surveyor

GREAT YARMOUTH.—March 27th.—For the supply of road materials, for the corporation Mr. J. W. Cockrill, borough surveyor.

NEWPORT (Mon.).—March 27th.—For carrying out private street works, for the corporation Mr. A. A. Newman, town clerk.

BARNET. March 27th. For making up a private street, for the urban district council.—Mr. Hy. W. Poole, clerk.

CHIPPENHAM.—March 28th. For the supply of granite, basalt, and limestone, for the rural district council.—Mr. A. H. Lapham, surveyor, Corsham, Chippenham, Wilts.

MARKET HARBOROUGH.—March 28th.—For the supply of granite, for the rural district council.—Mr. W. H. Blount, surveyor, Loughton, Rugby.

CROYDON.—March 28th.—For treating road surfaces with Tarvia, for the rural district council.—Mr. J. S. Killick, highways surveyor.

OLDHAM.—March 28th.—For work of making up, for the corporation.—Borough Surveyor.

PETERBOROUGH.—March 28th.—For the supply of jarrah wood-paving blocks, Portland cement, and stone, for the corporation.—Mr. J. W. Walshaw, city surveyor.

WESTMORLAND.—March 29th—April 3rd.—For road-making work, for the county council.—Mr. F. Bentley, county surveyor, 7 Lowther-street, Kendal.

HAMBLEDON.—March 30th.—For the supply of road materials, for the rural district council.—Mr. S. B. Hasell, surveyor.

MAGOR.—March 30th.—For the supply of broken stone and gravel, for the rural district council.—Mr. A. H. Rees, clerk.

EAST DEREHAM.—March 30th.—For the supply of broken granite and granite chippings, for the urban district council.—Mr. B. H. Vores, clerk.

RAMSEY.—March 30th.—For the supply of road materials, for the urban district council.—Mr. R. F. Serjeant, clerk.

STRETFORD.—March 30th.—For asphalt paving and making good, for the urban district council.—Mr. E. Worrall, surveyor.

EAST GRINSTEAD.—March 30th.—For the supply of granite, granite screenings, tarred granite macadam, hand-picked surface flints, Kentish ragstone and brick rubble, for the urban district council.—Mr. E. P. Whiteley Hughes, clerk.

GOOLE.—March 30th.—For the supply of stone, tar-macadam, asphalt and ashes, for the rural district council.—Mr. G. England, clerk.

ALTON.—March 31st.—For the supply of broken granite and steam rolling, for the rural district council.—Mr. A. F. M. Downe, clerk.

BULKINGTON.—April 1st.—For the supply of stone, for the urban district council.—Mr. E. Cuthbert, surveyor.

BLEAN.—April 1st.—For the supply of gravel, flints, and brick rubble hardcore, for the rural district council.—Mr. F. A. Ward, Eddington, near Herne Bay.

REPTON.—April 1st.—For the supply of broken granite, limestone, slag, broken boulders and local gravel, for the rural district council.—Mr. T. R. Sidgwick, surveyor, Wellington, Derby.

DROXFORD.—April 1st.—For the supply of granite or hard stone, for the rural district council.—Mr. H. Godfrey Pearson, clerk.

RUISLIP - NORTHWOOD.—April 1st.—For the supply of granite, for the urban district council.—Mr. E. R. Abbott, clerk.

EAST ASHFORD.—April 1st.—For the supply of flint, for the rural district council.—Mr. T. W. Pullen, Kennington, Ashford.

NORMANTON.—April 1st.—For the supply of flags, kerbs, channels, setts, granite, limestone and tar-macadam, for the urban district council.—Mr. J. W. Martin, clerk.

BRIDGWATER.—April 1st.—For the supply of broken granite, for the rural district council.—Mr. T. M. Reed, clerk.

MALDON.—April 2nd.—For the supply of broken granite, basalt, slag, Kentish rag, flint, gravel, picked stone, carting, and steam rolling, for the rural district council. Mr. Edgar J. Ennals, surveyor.

EALING.—April 2nd.—For making up an accommodation road, for the corporation. Mr. Geo. E. Bygdes, town clerk.

ST. MELLONS.—April 2nd.—For the supply of broken limestone and gravel, for the rural district council.—Mr. A. H. Rees, clerk.

LIMERICK.—April 2nd.—For the supply of paving setts, for the corporation.—The Surveyor.

LYDD.—April 3rd.—For the supply of tar-macadam and basalt, for the corporation. Mr. T. Kettle, borough surveyor.

HUNSLET.—April 4th.—For the supply of granite, limestone, dross, tar-macadam, kerbs, setts and flags, for the rural district council.—Mr. W. B. Pindar, clerk.

MOTTRAM.—April 11th.—For the supply of rock setts, for the urban district council.—Mr. F. Thompson, clerk, 123 Stamford-street, Stalybridge.

## Sanitary.

WOLVERHAMPTON.—March 23rd.—For the supply of galvanised sanitary pans and dustbins, for the corporation.—Team Committee, Town Hall.

HINDLEY.—March 23rd.—For the construction of cast-iron main sewer, for the urban district council.—Mr. Thomas Robey, clerk.

EARBY.—March 25th.—For the construction of sewers and manholes, for the urban district council. The Surveyor.

STEYNING WEST.—March 25th.—For the removal of refuse, for the rural district council.—Mr. A. Flowers, clerk.

ITCHEN.—March 25th.—For laying surface-water drainage, for the urban district council.—Mr. T. A. Collingwood, surveyor, Woolstan.

ROMFORD.—March 25th.—For work of scavenging, for the urban district council.—Mr. C. T. King, clerk.

DOVER.—March 25th.—For work of scavenging and street watering, for the corporation.—Mr. W. C. Hawke, borough engineer.

EPSOM.—March 26th.—For scavenging work, for the rural district council.—Mr. W. T. Wooldridge, surveyor, Waterloo-road, Epsom.

ORSETT.—March 26th.—For the construction of sewage disposal works, main sewerage, machinery, ejectors, air mains, &c., for the rural district council.—Mr. James Beck, clerk.

LANCHESTER.—March 27th.—For laying sewer, manholes and gullies, for the rural district council.—Mr. W. H. Ritson, clerk.

BURY.—March 27th.—For the supply of stoneware pipe sewer and manholes, for the rural district council.—Mr. J. Isherwood, clerk.

TOTTINGTON.—March 27th.—For the removal of refuse, for the urban district council.—Mr. C. Kirkpatrick, clerk.

LONDON.—March 27th.—Removal of filth from Deptford pumping station, for the county council.—The Clerk.

HUDDERSFIELD.—March 28th.—For the conversion of latrines, for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor.

MONTGOMERY.—March 28th.—For the removal of nightsoil, for the town council.—Mr. C. S. Pryce, town clerk.

SWANSEA.—March 28th.—For laying pipe sewer, for the corporation.—Borough Engineer.

DEWSBURY.—March 29th.—For the supply of disinfectants, for the corporation.—Mr. H. Ellis, town clerk.

HAMPTON WICK.—March 29th.—For horsing and driving water vans and scavenging, for the urban district council.—Mr. L. Fawssett, clerk.

MELTHAM.—March 29th.—For the construction of sewerage and sewage disposal works, for the urban district council.—Mr. W. Carter, clerk.

BRANDON.—March 29th.—For laying sewer and manholes, for the urban district council.—Mr. A. A. Luxmoore, clerk.

YORK.—March 30th.—For the construction of works of sewage disposal, for the corporation.—Mr. F. W. Spurr, city engineer.

STANLEY.—March 30th.—For the removal of house refuse, for the urban district council.—Mr. J. Harris, sanitary inspector.

OSWESTRY.—April 1st.—For the construction of stoneware pipe sewers, manholes, &c., for the rural district council.—Mr. C. H. Bull, clerk.

ST. MELLONS.—April 2nd.—For the construction of a system of sewerage, for the rural district council Mr. A. H. Rees, clerk.

DRIFFIELD.—April 2nd.—For the construction of sanitary pipe drain, inspection chamber and gullies, for the rural district council.—Mr. T. C. Beaumont, surveyor.

LANARK.—April 3rd.—For the construction of sewers at Newton, for the Middle Ward.—Mr. J. T. T. Brown, 97 West Regent-street, Glasgow.

RUNCORN.—April 12th.—For laying stoneware and iron pipes, and manholes, for the rural district council.—Mr. G. F. Ashton, clerk.

MATLOCK.—April 15th.—For the construction of main outfall and subsidiary sewers of earthenware, steel and cast-iron pipes, manholes, detritus tanks, percolating filters and effluent drains., for the urban district council.—Mr. R. Taylor, clerk.

RAUNDS.—April 15th.—For extensions to sewage disposal works, for the urban district council.—Mr. W. F. Corby, clerk.

BRIGHTON.—April 26th.—For the construction of sewers and other works, for the corporation.—Borough Surveyor.

### Stores.

WIGAN.—March 25th.—For the supply of materials, for the Tramways Committee.—Town Clerk.

OGMORE AND GARW.—March 25th.—For the supply of ironmongery, petroleum, disinfectants, Portland cement, paving, kerb, channel stone, manhole covers, stoneware pipe sewers, and bricks, for the urban district council.—Mr. W. T. Olivant-Jones, engineer and surveyor.

NOTTINGHAM.—March 25th.—For the supply of materials, for the Tramway Committee.—Chairman, Tramway Committee, Beastmarket Hill.

IRLAM.—March 25th.—For the supply of road materials, Portland cement, stoneware pipes, hire of steam road-roller, oil and brooms, for the urban district council.—Mr. Joseph Cooke, clerk.

BURNLEY.—March 26th.—For the supply of cast-iron goods, brass fittings, timber and brushes, for the Gas Committee.—Town Clerk.

PETERBOROUGH.—March 28th.—For the supply of Jarrah wood blocks, broken granite, channelling, Portland cement and brooms, for the corporation.—Town Clerk.

COLWYN BAY.—March 30th.—For the supply of drain pipes, ironmongery, disinfectants, pitch, tar and road materials, for the urban district council.—Mr. J. Amphlett, clerk.

SOUTHPORT.—March 30th.—For the supply of stoneware pipes, gullies, bricks, footway tiles, ironmongery, oils, Portland and Roman cement, road materials, iron castings, brooms, paving work, and team labour hire, for the corporation.—Mr. J. Ernest Jarratt, town clerk.

### Miscellaneous.

KENT.—March 23rd.—For the supply of shovels, forks, scavenging brooms, scoops, scrapers, cart grease, tallow and oil, for the county council.—Mr. W. B. Prosser, clerk.

LARNE.—March 23rd.—For scavenging, supplying horses and men, brushes, road materials, and gully traps, for the urban district council.—Mr. W. G. Younge, clerk.

RICHMOND (SURREY).—March 28th.—For works required in laying out portion of cemetery extension land, for the corporation.—Mr. Henry Sagar, town clerk.

PENARTH.—March 30th.—For the supply of a steam or petrol motor wagon, trailer, and water van, for the urban district council.—Mr. George Wainwright, clerk.

BIRMINGHAM.—April 10th.—For the supply of box carts, water vans, tip wagons and hand carts, for the corporation.—Mr. H. E. Stilgoe, city engineer and surveyor.

## TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

ASHINGTON.—For the supply of road metal, for the urban district council.—Mr. G. Beaty, surveyor.—

J. Richardson, Alnwick.—2-in. H.B. Whinstone, to N. Seaton Station, 7s. 11d. per ton; 2½-in. do., to N. Seaton Station, 7s. 6d.; 2-in. do., to Ashington Station, 8s.; 2½-in. do., to Ashington Station, 7s. 7d.

BOW AND BROMLEY.—For rebuilding the Fairfield-road School and erecting a housewifery centre in connection therewith, for the London County Council:—

| | |
|---|---|
| Lorden & Co., Limited, Kensington-square | £21,807 |
| G. S. S. Williams & Son, Barnsbury | 21,070 |
| W. Downs, Walworth | 21,000 |
| C. Wall, Limited, Fenchurch-street | 20,742 |
| McLaughlin & Harvey, Limited, Brecknock-road | 20,524 |
| McCormick & Sons, Limited, Essex-road | 20,397 |
| T. D. Long, Deptford | 20,327 |
| L. H. & R. Roberts, Islington | 19,844 |
| F. & T. Thorne, Isle of Dogs | 19,728 |
| G. Godson & Son, Kilburn | 19,320 |
| Patman & Fotheringham, Limited, Islington | 19,273 |
| G. E. Wallis & Sons, Limited, Haymarket | 19,228 |
| J. & C. Bowyer, Limited, Upper Norwood | 19,047 |
| Rowley Brothers, Woodgreen | 19,045 |
| E. Lawrance & Sons, Limited, City-road | 18,967 |
| Brand, Pettit & Co., Tottenham† | 18,245 |

Architect's estimate, £19,100.

CHESHUNT.—For the supply of materials and the collection of house refuse, for the urban district council:—

Collection of House Refuse.—A. Clark, £362.
Flints.—Wills & Peckham, Limited, and Boyer & Sons.
Forage.—C. H. Webster.
Granite.—W. Griffith & Co., Limited.
Ironmongery and Repairs to Tools.—W. T. Woollard & Sons, S. Pontifex & Co., E. J. Woollard and P. Burgess.
Oils.—E. J. Woollard and A. Duckham & Co., Limited
Stoneware Pipes, &c.—Turner & Lisney.
Tar and Tar Compounds.—Bristowe & Co., Limited.
Tar Macadam.—J. Smart & Son.
Team Labour and Cartage.—Mrs. Kitteringham, A. Clark, J. F. Rayner and H. Wright.

CHISWICK.—For the supply of materials, for the urban district council.—Mr. E. Willis, engineer:—

Horse-hire.—J. Ball, Chiswick.
Asphalte.—Bradshaw's Asphalte Company, Limited, London.
2-in. and 1½-in. Hand Broken Granite.—Brooks, Limited, London.
¾-in., ½-in. and ¾-in. Chippings and 2-in. and 1½-in. Machine Broken Granite.—J. Mowlem & Co., Limited, London; Croft Granite, Brick and Concrete Company, Limited, Croft.
Kentish Pit Flints.—Fry Brothers, Greenwich.
Jute Press Cloths.—Woods, Sons & Co., London.
Copperas.—Higginbottom & Co., Manchester.
Sludge.—C. Murrell, London (for three years).
Buxton Lime.—Buxton Lime Firms Company, Limited, Buxton.
White Lime.—Hall & Co. (Croydon), Limited, New Wandsworth.
Grey Lime.—J. Knowles & Co. (London) Limited, London.
Cement.—J. Knowles & Co. (London), Limited, London.
Disinfectants.—Burt, Boulton & Haywood, Limited, London.
York Stone.—Brooks & Brooks, Cloughfold.
Granite Kerb and Channel, &c.—Brookes, Limited, Halifax.
Tar Paving.—J. Smart & Son, London; W. Shepherd & Sons, Rochdale; E. Catchpole & Sons, London; Whitwick Granite Company, Limited, Whitwick.
Pipes, Gullies, &c.—Doulton & Co., Limited, London (London-made); Sankey & Co., Hammersmith (London-made); J. Knowles & Co. (London), Limited, London (country-made).
Drysaltery.—Robertson & Sons, Chiswick; Middleton Brothers, London.
Ironmongery.—Robertson & Sons, Chiswick; J. Gibb & Co., London; W. & F. Archer, Upper Edmonton (Brooms).
Forage.—Grant & Co., Chiswick.
Oils.—Robertson & Sons; Snowdon Sons & Co.; Middleton Brothers.

CROSSNESS.—For the erection of penstocks, pipes and valves in connection with the enlargement of the pumping station, for the London County Council:—

| | |
|---|---|
| Markham & Co., Limited, Chesterfield | £3,210 |
| Glenfield & Kennedy, Limited, Kilmarnock | 3,100 |
| J. Cochrane, Barrhead | 2,992 |
| J. Blakeborough & Sons, Brighouse† | 2,745 |

NEWPORT (Mon.).—For the erection of seven houses, and other works, for the corporation.—Mr. C. F. Ward, borough architect:—

| | |
|---|---|
| G. Edwards | £5,583 |
| H. Thomas & Son | 5,107 |
| F. Jerrett | 5,034 |
| E. E. Jenkins | 4,900 |
| F. C. Parfitt | 4,880 |
| Kirby & Westacott | 4,819 |
| E. C. Jordan | 4,770 |
| G. F. Leadbeter | 4,700 |
| C. H. Reed | 4,668 |
| P. H. Saunders | 4,664 |
| Morris & Biddle | 4,572 |
| F. W. Powles | 4,293 |
| J. H. Williams | 4,280 |
| H. Smith | 4,136 |
| W. Moore | 4,072 |
| R. W. Moon‡ | 3,921 |

Borough Architect's estimate, £4,297.
‡ Provisionally accepted.

EPSOM.—The tender of J. Oakes & Co. has been accepted for the supply of tar-macadam to Cheam and Worcester Park Stations at 16s. 3d. per ton; that of Hall & Co., Limited, for gasworks clinkers to Cheam and Oxshott at 4s. 8d. per ton; and that of H. Artiss, of Worcester Park, for destructor clinker on rail in London at 4d. per ton. The tender of Mr. Artiss has also been accepted for supplying, for a year, a man, horse, and harness for road watering in Cheam at 9¾d. her hour.

HORBURY.—For the construction of sewage disposal works, for the urban district council.—Mr. J. H. Drew, engineer and surveyor:—

| | |
|---|---|
| Playfair & Toole, Southampton | £11,384 |
| Lambrick & Co., Burton | 10,907 |
| J. Garrett & Son, London | 10,706 |
| Hobrough & Co., Gloucester | 10,566 |
| Holloway Brothers, London | 10,500 |
| Kavanagh & Co., Surbiton | 10,210 |
| Liverpool Ferro-Concrete Company, Limited, Liverpool | 9,803 |
| E. Nuttall & Co., Manchester | 9,774 |
| J. Wilson & Sons, Birmingham | 9,683 |
| Yorkshire Hennebique Contracting Company, Limited, Leeds | 9,544 |

Engineer's estimate, £9,966.

POOLE.—For the supply of carting and various materials and appliances, for the corporation:—

General Carting.—G. T. Budden, J. Mitchell, G. Maidment, H. Rose, H. W. Gale, and F. H. Welch, and that of H. W. Gale for district A, and that of F. H. Welch for district B at 10d per hour, and of C. Maidment for districts C and D at 10d. per hour were accepted.
Carting Materials.—G. Maidment, H. Rose, G. T. Budden, F. H. Welch, H. W. Gale and J. Mitchell. The tender of G. Maidment for items No. 1 at 2s., No. 3 at 2s. 6d., and No. 12 at 2s.; H. Rose for items No. 2 at 2s., No. 4 at 1s. 6d., No. 7 at 1s., No. 8 at 1s. 6d., No. 9 at 3s., and No. 10 at 2s.; G. T. Budden for items No. 5 at 2s., No. 6 at 3s. 3d., No. 11 at 1s. 9d., No. 13 at 1s. 9d., No. 14 at 10d., and No. 19 at 3s. 3d.; F. H. Welch for items No. 15 at 1s. 6d., No. 16 at 2s., No. 17 at 2s. 2d., and No. 18 at 2s. 7d.; and of H. W. Gale for item No. 20 at 1s., were accepted.
Gravel.—G. Maidment, H. C. Brixey, G. T. Budden and H. Hooper, and that of H. C. Brixey for districts 1, 6, 8 and 9; G. Maidment for districts 4 and 5; and G. T. Budden for districts 3, 7, 10, 11 and 12, were accepted.
Portland Cement.—J. Blanchard & Sons, and Hooper & Ashby, Limited, and that of J. Blanchard & Son at 37s. 6d. per ton, for "Hilton Anderson" Brand, and 44s. per ton for the "Victis" brand, were accepted.
Tenders for supplying 16 oil skin coats for carters were received from J. Young, W. E. Loader, J. E. Tydeman, J. Warn and H. Bennett, and that of Mr. Tydeman at 11s. 9d. each, was accepted.
Shand, Mason & Co., and Merryweather & Sons tendered for supplying fire brigade appliances for the equipment of the Canford Cliffs Fire Station.

KIRKCALDY.—For work of road making, for the corporation.—Mr. J. S. Lumsden, burgh surveyor:—

| | |
|---|---|
| Stark & Dobbie, Glasgow | £88 |
| A. Braxton, North Queensferry | 80 |
| A. Adamson, Cowdenbeath | 79 |
| A. Gray & Co., Kirkcaldy | 70 |
| R. J. Morrison, Kirkcaldy | 66 |
| A. Frazer, Kirkcaldy * | 62 |

Sewer Extension at William-street.

| | |
|---|---|
| Stark & Dobbie, Glasgow | £60 |
| A. Fraser, Kirkcaldy | 37 |
| A. Adamson, Cowdenbeath | 30 |
| T. Menzies, Kirkcaldy | 26 |
| A. Gray & Co., Kirkcaldy | 26 |
| W. Crichton, Kirkcaldy * | 24 |
| R. J. Morrison, Kirkcaldy * | 24 |

RICHMOND (Surrey).—Accepted for supplies of various articles, for the town council:—

Highways.

Portland cement and lime.—Manley & Co., Brentford.
Thames ballast and gravel.—Brown and Mansell and Steven Brothers.
Iron foundry.—Pontifex & Co.
Road materials. Various firms according to class of material wanted.
Cartage.—Bates & Stevens.
Tar.—Richmond Gas Company and Catchpole & Sons, Rotherhithe.
Forage.—S. Bowyer, Twickenham (six months).
Wheelwright.—G. Marchman, Richmond.
Brass brooms.—W. & F. Archer, Upper Edmonton.
Tools and ironmongery.—S. Flowers, Richmond.
Harness and stable requisites.—Rowe & Son, Blackfriars road.
Hired team labour.—Bates and Stevens Brothers.
Oils and paints.—Reynolds & Co., Richmond.

ROMFORD.—The tender of Messrs. Chalmers & Co., at £48, has been accepted by the urban district council for the supply of a dust van; and that of Messrs. Rowe & Son, at £42, was accepted for a "Middlesex" water sprinkler. A tender for the supply of "Tarvia" at 4½d. per gallon has also been accepted.

SCUNTHORPE.—For the construction of sewage disposal works, for the Joint Sewerage Board:—

Lane Brothers, Mansfield, £18,496.

SOUTHAM (Warwick).—For the supply of stone and slag, for the rural district council:—

The Highways Committee recommended the acceptance of the following tenders for stone and slag:—Stone: E. J. Foster & Son, Limited, London, for stone delivered at Fenny Compton Wharf and Station, Marston Doles, Long Itchington Station, Cuttle Wharf and Marston Station. Judkins, Limited, Nuneaton, for stone delivered at Burton Dassett siding, Spirn Hill Bridge, Woods Bridge, Spurtond Bridge, Napton Wharves, Bascote Wharf, Fosse Wharf, Stockburgh Station and Wharf, Stockton Station, Gibraltar Bridge, and Kineton, Byfield and Canwelton Stations. Mauland Quarry Company, Nuneaton, stone delivered at Harbury Station.

Slag.—Judkins, Limited, for delivery at Burton Dassett siding, and at Fenny Compton, Long Itchington, Harbury and Kineton Stations.

STAINES.—For the supply of road stone and Kentish flints, for the rural district council.—Mr. G. W. Manning, surveyor:—

Griff.—Brodenbergs & Co., 12s. 2d.
Penmaenmawr.—British Macadams, Limited, 15s.
Cue Hill.—British Macadams, Limited, 14s. 4d.
Clee Hill Dhu.—Clee Hill Dhu Stone Company, 14s. 4d.
Cliffe Hill.—Cliffe Hill Granite Company, 12s. 11d.
Clee Hill.—H. L. Cooper & Co., 14s. 4d.
Carregey-Lhan.—H. L. Cooper & Co., 14s. 9d.
Croft.—Croft Granite Company, 12s. 8d.
Dosthill.—Dosthill Granite Company, 13s.
Bardon Hill.—Ellis & Everard, 14s.
Enderley.—Enderley & Stoney Stanton Granite Company, 12s. 8d.
Clee Hill.—Pearl & Mackay, 14s. 4d.
Groby.—Groby Granite Company, 12s. 7d.
Quenast.—Hudson's, Limited, 14s. 8d.
Quenast.—London Granite Company, 13s. 7d.
Mountsorrel.—Mountsorrel Granite Company, 12s. 9d.
Porthgain.—United Stone Firm, Limited (late), 15s.
Nuneaton.—J. R. White & Co., 12s. 8d.
Whitwick.—Whitwick Granite Company, 12s. 2d.
Jersey.—Croft Granite Company, 13s. 6d. *
Grandmont Moor.—Grandmont Moor Quarry Company, 13s. 2d. *
Guernsey.—A. F. Manuelle, 14s. 11d.
Rowsey Regis.—Rowsey Regis Granite Company, 12s. 9d. *
Flints.—Wills & Packham, 9s. per yard at Twickenham, and 6s. 8d. per yard at Laleham, Chertsey, Shepperton and Walton wharves.
Tarvia.—Brostowe & Co., 42d. per gallon, any station, in consignments of twenty barrels.

WING.—Accepted by the rural district council, for season 1912-13:—

Granite.—Ellis & Everard, 200 tons; Groby Granite Company, 300 tons; Whitwick Granite Company, 500 tons; C. Abell & Co., 500 tons.
Slag.—Evens, P. Phipps, 1,200 tons.
Gravel.—G. Garside, D. Cook & Sons.
Sand.—G. Garside.

## MEETINGS.

*Secretaries are asked kindly to oblige by sending early notice of dates of ordinary meetings.*

MARCH.

21.—Association of Engineers in Charge: Annual Dinner, Holborn Restaurant, 6.30 p.m.
26.—Institution of Municipal Engineers: South Eastern District Meeting: Discussion on "The Size and Design of Street Gullies and Weirs." Deptford Offices, 7 p.m.
26.—Royal Sanitary Institute: Annual Meeting of Associates: Mr. H. Peres Boulnois, A.M.Inst.C.E., chairman of council, on "Sanitary Legislation and Education." 7 p.m.
29.—Junior Institution of Engineers: Smoking Concert, Criterion Restaurant, Piccadilly Circus, 8 p.m.

APRIL.

2.—Royal Sanitary Institute: Mr. F. J. Osborne Smith, F.R.I.B.A., on "Sanitary Fittings." 7 p.m.
6.—Institution of Municipal and County Engineers: Meeting at Exmouth.
12-13.—Royal Sanitary Institute: Meeting at Cardiff. Discussion on "The Development of Cardiff Waterworks". visit to waterworks extension at Brecon Beacons.
17.—Institution of Municipal and County Engineers: Meeting at Stourbridge.
24.—Surveyors' Institution: Annual Dinner, Whitehall Rooms, 7 p.m.
25.—Institution of Municipal and County Engineers: Council Meeting.

MAY.

4.—Institution of Municipal and County Engineers: Meeting at Nuneaton.
4.—Lower Thames Valley District Surveyors' Association: Annual Meeting and Dinner.
24-29.—Institution of Municipal and County Engineers: Visit to Paris.

JUNE.

1.—Institution of Municipal and County Engineers: Council Meeting.
7-8.—Institution of Municipal and County Engineers: Meeting at Stirling.
15.—Institution of Municipal and County Engineers: Meeting at East Ham.
22.—Institution of Municipal and County Engineers: Meeting at Lowestoft.
29.—Institution of Municipal and County Engineers: Meeting at Bridlington.

JULY.

11-13. Institution of Municipal and County Engineers: Annual Meeting, London.

## APPOINTMENTS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No.* 1359 *Holborn), subject to later confirmation by letter.*

### BOROUGH OF DEVIZES.

Temporary Assistant (young Surveyor just out of Articles or sitting for Final Examinations) required in office of Borough Surveyor and Inspector of Nuisances, to help generally in work of office, and particularly to carry out inspections and keep records under direction of the Medical Officer of Health under Part I. of the Housing and Town Planning Act.

Salary £52 a year.

Applications to be in Candidate's own handwriting, stating age, and giving full particulars as to previous work and experience and professional examinations passed, and to be accompanied by copies of not more than three testimonials.

Applications to be directed to the Town Clerk, and to reach his office not later than mid-day on the 28th March instant.

Any canvassing of Members of the Council will be a disqualification.

JOSEPH T. JACKSON,
Town Clerk.

March 15, 1912.

The Car of Quality
INVINCIBLE
TALBOT
Specifications and Catalogue on request.
CLEMENT TALBOT, Ltd. (Dept. A 26) Automobile Engineers,
Barlby Road, Ladbroke Grove, London, W.
Telegrams: "Clental, London." Telephone: 3001 Paddington.

## BOROUGH OF PLYMOUTH.

The Corporation is prepared to receive application from suitable persons for the position of Building Inspector.

Applicants must have a thorough knowledge of the Model By-laws of the Local Government Board, and have had experience in the oversight of buildings and the construction of sewers and drains. They must also be competent to test drains, either by water or smoke test.

Applicants must state age, which must not exceed 40, and full particulars of past and present employment.

Applications, accompanied by not more than three recent testimonials (original testimonials will not be returned if forwarded), to be sent to me not later than the 10th April.

Canvassing Members of the Council, either directly or indirectly, will be deemed a disqualification.

The salary will be £100 per annum.

Printed forms of application and list of duties may be obtained on applying to the undersigned.

JAMES PATON,
Borough Engineer and Surveyor.

Municipal Offices.
March 19, 1912.

## BOROUGH OF CLITHEROE.

### NUISANCE INSPECTORSHIP.

The Council of the Borough of Clitheroe intend, at a meeting to be held after the expiration of seven days from the publication of this notice, to appoint an Inspector of Nuisances for the District of the Borough of Clitheroe at a yearly salary of £104.

The appointment will be made (subject to the approval of the Local Government Board) for a term of three years, and particulars of the duties can be obtained from the Town Clerk.

The person appointed will have to devote his whole time to the duties of the Office, and he must possess a Meat Inspector's Certificate and the Certificate of the Royal Sanitary Institute or other similar body.

Applications (endorsed "Nuisance Inspectorship"), accompanied by copy of not more than three testimonials, must be delivered at the Town Clerk's Office, 4 Duck-street, Clitheroe, not later than Saturday, the 30th March, 1912.

Canvassing Members of the Council is strictly prohibited.

Dated this 19th day of March, 1912.

WM. SELF. WEEKS,
Town Clerk.

## PONTYPOOL RURAL DISTRICT COUNCIL.

### SURVEYOR.

The above Council invite applications for the appointment of Surveyor from persons between the ages of 25 and 40 years, at a salary of £100 per annum.

The person appointed will be required to devote his whole time to the duties, live at or near Usk, and to provide his own means of travelling throughout the district, the area of which is 30,527 acres, and population 5,047. The mileage of roads under the control of the Council is about 98 miles. An allowance of £5 per annum will be made in lieu of providing an office.

The appointment will be determinable by a month's notice on either side.

Applications, in Candidate's handwriting, stating age, experience, qualifications and present occupation, and when at liberty to take up his duties, accompanied by copies of three recent testimonials, must reach me before 12 noon on the 30th instant.

T. WATKINS,
Clerk.

Club Chambers,
Pontypool.
March 16, 1912.

DIBDIN'S BIOLOGICAL SLATE BEDS

FOR

SEWAGE PURIFICATION.

47 Victoria Street,
London, S.W.

TELEPHONE:
2211
VICTORIA.

PREVENTS SLUDGE NUISANCE

SEND FOR PARTICULARS

Contractors to H.M. Government.

ESTIMATES FREE.

# The Surveyor

And Municipal and County Engineer.

Vol. XLI. MARCH 29, 1912. No. 1,054.

## Minutes of Proceedings.

**The Rural Housing Problem.**

The Housing of the Working Classes Bill, the second reading of which was recently moved by Sir A. Griffith Boscawen, is being widely discussed, and has undoubtedly succeeded in drawing public attention once more to the results of existing legislation on the subject, and more particularly to the housing problem in rural districts. The four main proposals of the Bill may be stated as follows:—

(1) To set up a Special Housing Commission to act under the Local Government Board, and to devote itself exclusively to housing.

(2) The provision of a Government grant of £500,000 in aid of housing, so that the whole burden shall not fall on the local ratepayers.

(3) The substitution for mandamus, which is now the only coercion the Local Government Board can use on a recalcitrant local authority, of a power of acting in default similar to that already exercised by the Board of Education under the Education (Defaulting Authorities) Act.

(4) Various amendments to the existing law in order to cheapen and facilitate housing operations.

It is exceedingly interesting and instructive to compare the main outline of this Bill with the proposals contained in a paper on "Rural Housing" which was read in December last by that indefatigable housing reformer Alderman W. Thompson at a joint conference of Rural and Housing Societies in London. In the first place it is common ground that rural housing in England is at present in a very parlous condition indeed, and that so far from existing legislation meeting the pressing need which exists, the sanitary clauses of the Act of 1909 have operated to close or demolish a large number of insanitary dwellings without providing any better ones in substitution. There has, however, been an undoubted speeding up on the part of rural authorities as regards the provision of cottages since the passing of the Act of 1909. During twenty years prior to that date only eight rural councils took action in this matter, whereas no fewer than thirty-five have moved since the Act was passed. Even the present rate of progress, however, is slow when the magnitude of the evil is considered. The chief points of divergence between the policy outlined by Alderman Thompson and that contained in the Bill are (1) as to the Government department to which the Special Commissioners should be linked, and (2) as to the application of the Government grant. The Bill proposes that the Special Commissioners shall work under the Local Government Board, but Mr. Burns, in the course of his speech on the motion for the second reading, did not suggest a very warm welcome for them. He said: "The day the Housing Commissioners come into my Department, that day I walk out." This emphatic attitude on the part of the President of the Board was based on his opinion that existing legislation has not yet had a fair chance, and that if any more officials are to be appointed they should be additional inspectors and not Special Commissioners. Alderman Thompson, on the other hand, favours the appointment of Special Commissioners, but proposes that they should be entirely independent of the Local Government Board, being linked up not with that department, but with the Board of Agriculture through the Development Commission and the Road Board. This view appears to us to be based upon the true conception that the rural housing problem is not an isolated question, but is merely one factor in the problem of rural development with which the Development Commissioners are directly concerned.

In regard to the application of the proposed Government grant, we again see considerable differences of opinion. Under the Bill part of the money would be expended in compensation for clearing a site if the owner were willing to undertake never to build again on the site without the consent of the local authority. Alderman Thompson, on the other hand, would devote any sum which may be granted to cheapening rents, and so to solving directly the financial difficulty which prevents so many authorities from acting at the present time. The President of the Local Government Board was not at all enthusiastic about a State subsidy, and said that during the eighteen years he was chairman of the Labour Party in the London County Council the line he and his colleagues took was that "charity rents" from rates or taxes were a bonus in aid of low wages, and would be exploited by employers to that end. Having regard to the undoubted importance of the question, and to the differences of opinion among expert authorities, we are glad to observe that the Bill has been referred to a Standing Committee, so that, however remote may be the chances of the measure becoming law, the difficulties of the whole subject may be fully discussed and public opinion on the question may be kept alive.

* * *

**A Whirling Table for Testing Road Crusts.**

Our readers will find, on another page, an abstract from the annual report of the National Physical Laboratory, giving a brief account of the apparatus already installed for the testing of road materials and a description of the "whirling table" which is to be erected in order to test the behaviour of different kinds of road crust under wheel action at different speeds and with various loadings. By consulting SURVEYOR indexes more detailed descriptions of some of the apparatus, and of the methods usually adopted in using them, can, of course, be traced, and as we hope to be in a position to give a full account of the equipment and working of the laboratory as soon as operations are in full swing we need not now discuss the matter. It may, however, be suggested in passing that a welcome addition to the list of machines would be an abrasion machine, identical with that used by Mr. Lovegrove, by means of which the Road Board could preserve continuity with work which has been done in England as well as with that done elsewhere with the Deval machine.

C

As regards the "whirling table," the particulars given have formed the basis of some calculations which we have made, these calculations pointing to the probability that the centrifugal forces set up will be insignificant as regards the theory of the apparatus, though it may turn out that to overcome their effects in matters of detail may take some little time and attention. As regards the main effects of centrifugal force, we do not find that it is likely to produce any effect at all corresponding to that produced when a motor car is driven round a bend at a high speed, though the machine could, no doubt, be adjusted so as to imitate this effect if desired. Any downward or upward component introduced by depressions or bumps in the wheel path would, we believe, be quite insignificant. As regards the value of tests such as those which can be carried out with this machine, it is difficult to believe that they can be made representative of actual traffic conditions, especially if they are carried out at an only slightly varying temperature in the case of tar-bound crusts. With water-bound crusts it will be impossible to put the materials through even a few of the phases of dryness and moisture which would occur with the lapse of the corresponding period of time on the road. If, however, the machine be regarded as in the same category as an abrasion machine, it ought not to be impossible to obtain results which would compare with one another and give valuable information.

On the whole, we are inclined to think that the whirling table, which to some extent reproduces the wheel effects of vehicles, will be more useful in giving us information about the direct effects of wheel loads, wheel diameters, tyre widths, and speeds of vehicles than it will be with respect to the ultimate effects upon roads as indicated by the state of the greenhouse path on which these wheels will run. In this matter the time element is, perhaps, the greatest difficulty of all. It is probably intended to test chiefly tar-bound crusts, but even these require time for setting. Road crusts are often subjected to traffic as soon as they have been put down; but not to the normal traffic multiplied by 365. The statement that the whole width of 2 ft. will be covered in one revolution of the arms does not call for criticism now, since the procedure suggested can obviously be modified in the direction of a practical experiment, and with a path 4 ft. or 5 ft. wide rut experiments could be made very interesting.

* * *

**Oil-bound Roads: Lessons from California.**

In another part of this issue we have given the chief technical points of an American criticism of certain oil-bound road crusts in California which failed a very short time after they had been made. It is remarkable that the making of a road crust 16 ft. wide, with 7-ft. shoulders merely oiled and covered with chips, should have cost over £2,000 per mile, the thickness being only 7½ in. Probable causes of the failure are said to be: Insufficient rolling, an excess of oil, and the use of oil in the lower course where it did not harden properly. We have recently expressed the opinion that bituminous-bound roads in this country are often insufficiently rolled, the temptation to jam the materials lightly together in order to get a perfect surface being apparently an irresistible one in many cases. We have also laid stress on the importance of the smaller solid binder and the smallest solid binder, and lack of these may have been one cause of the failure of these Californian roads. The bituminous stuff may play the part of the cement of a road concrete, but it cannot by itself play the part of the mortar. The average crust thickness seems to have been very small, unless the subsoil was a very hard one almost throughout the whole length of these roads.

In the case of timber—to take a fair analogy—the value of a cheap and weak material, compared with that of a stronger and more costly wood, is not a matter of simple proportion, for mass in itself has a value in absorbing shocks, both *quâ* mass and *quâ* size, and the strength of a beam varies as the square of its depth, its stiffness as the cube of its depth. In a road crust mass, *quâ* mass, has a distinct value, and so has mere bulk, whether we take it out in depth or in width. Costly materials may be necessary for the top course, and they *may* be the best for the whole crust, but a 6-in. or 7½-in. crust of costly materials with no foundation course does not strike one as likely to be economical. A very weak point in the design of these roads seems to have been the method of treating the shoulders. The shoulders of a 16-ft. carriageway will, occasionally in some districts and frequently in others, be subjected to wheel loads, and in such cases it is desirable to adopt one of the methods which either give adequate support or admit of easy repair and at the same time save the edge of the crust proper. To make an earth margin look like the road crust is to tempt the drivers of vehicles to use it far more than is necessary or expedient. We have used this Californian case as a stalking horse, in order the better to approach our own readers, some of whom work in climates somewhat like that of California, and all of whom work under the sway of natural laws.

* * *

**Sanitary Legislation and Education.**

The annual meeting of Associates of the Royal Sanitary Institute, which was held on Tuesday, was made the occasion of a most instructive address on "Sanitary Legislation and Education" by Mr. H. Percy Boulnois, M.Inst.C.E., the chairman of the council. Mr. Boulnois commenced with an exceedingly interesting historical survey of British sanitary legislation. It is difficult to believe, in view of the mass of laws and by-laws which exist to-day, that it is less than seventy years ago since sanitary legislation in this country may be said to have had its birth. In 1843 a Royal Commission was appointed to "inquire into the condition of towns and populous places," and following on its labours a good many Acts, including the well-known Towns Improvement Clauses Act, 1847, and the Public Health Act, 1848, were passed. Many other statutes followed, culminating in the great Public Health Act of 1875, which still forms the basis of our sanitary law. Mr. Boulnois suggested that the time has come when Parliament might give us a new comprehensive Public Health Act, in which the Act of 1875 and many others might be codified with the necessary amendments and alterations which experience has shown to be desirable.

The question of education was dealt with in the address from the point of view of the sanitary inspector, and also of the general public. In regard to the former, Mr. Boulnois paid a fitting tribute to the immense improvement which has taken place—largely owing to the action and influence of the Royal Sanitary Institute—in the educational standard required of and obtained by the sanitary inspector. One of the chief difficulties, however, with which the inspector, in common with every other official or voluntary worker in the realm of hygiene, is confronted is the ignorance which exists on matters of health science among the mass of the people. If public health administrative work is to be carried on to any purpose, this barrier of public ignorance must be broken down. We cordially agree with Mr. Boulnois that the projected National Health Week will be a valuable aid in this respect, and, as we have urged in former issues, this movement is deserving of support from all who have the public welfare at heart. If sanitary legislation is to be effective it must be intelligently and sympathetically administered, and those for whom it is intended must receive such instruction as will convince them of its practical benefits to themselves.

**Worcestershire Assistant Surveyors' Remuneration.**

The case of the assistant county road surveyors of Worcestershire has been under the consideration of the Highways and Bridges Committee of the county council as a consequence of their request for an increase in their salaries. The improvements carried out under the Road Board have caused extra work to the officers, a fact which is apparently not disputed. The committee reported that they could not see their way to recommend an increase in salary, but "as more frequent inspections by the surveyors were necessary," they proposed an allowance of £40 towards the purchase of a motor bicycle and its maintenance during the first year, and £25 a year afterwards. While one councillor described this recommendation as an "underhand way of increasing salaries," another expressed a doubt "whether the council were going to get value for the expenditure." The value of these criticisms may be judged from the fact that the cost of a suitable motor bicycle is about £55, and that each surveyor has to cover about 8,000 miles a year, at an average cost of a penny a mile. Thus it appears that the Spartan economy of the Highways and Bridges Committee will entail a considerable deficit to each officer upon the purchase and the first year's maintenance of the machine, while every subsequent year he will be several pounds out of pocket in the matter of upkeep. If to this is added the additional fact that the officer is to continue to carry on the extra work for which he is not to be remunerated on an improved scale, it is easy to perceive that neither as regards conditions of employment nor remuneration have his interests been in any respect advanced; on the contrary, they would seem to be prejudiced rather than benefited by the new order of things. In the circumstances, seeing that the county council is manifestly getting the best of the bargain, it is not surprising to find that by a considerable majority the members cheerfully accepted the proposal of the Highways and Bridges Committee.

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**The Merthyr Surveyorship.**

Considerable local feeling has been aroused by the action taken by the Merthyr Town Council in the appointment of a successor to Mr. T. P. Harvey, who recently resigned the office of borough engineer and surveyor in order to devote his time to the waterworks. The difficulty appears to have been caused by reason of the fact that the deputy borough surveyor and the assistant surveyor were both applicants for the post, and that the appointment was given to the junior of these officers. Moreover, the appointment of the deputy borough surveyor was terminated, and he was offered the position of borough architect. We have not sufficient information before us to enter into the merits of the discussion which has ensued on this arrangement—even if we had the desire to do so. We assume, however, for the purposes of our present argument, that in passing over the senior official against his wish the council were acting unjustly towards that gentleman. At all events, Mr. A. D. Greatorex, the president of the Institution of Municipal and County Engineers, appears to be convinced of this, inasmuch as he has addressed to the Merthyr Town Council in his official capacity a letter asking them to reconsider their decision. It is very encouraging to find the Institution taking up the cudgels on behalf of a member who is aggrieved by the treatment he is receiving, and Mr. Greatorex is to be congratulated on having assumed the responsibility of addressing the Merthyr Council in his capacity of president. As we have already stated, we are not in a position to enter into the merits of this particular dispute, but we welcome any indication that the Institution is prepared to protect its members in cases where they consider that the facts justify their active intervention.

**The Combined Drain.**

The chief clerk of the Public Health Department of the St. Pancras Borough Council has presented to his committee an exhaustive report on the decision on the subject of combined drainage which was given last year by the Divisional Court in the case of the *House Property and Investment Company* v. *Grice*. The surveyor to a metropolitan borough is only too familiar with the attempts which are made from time to time to cast upon the ratepayers the burden of repairing pipes which are alleged to be sewers because of the absence of proof of the making of an order for drainage by a combined operation. In recent years the evidence necessary to enable the Court to presume such an order has in succeeding cases been gradually whittled down, and this process seems to have been completed in the case above referred to. The evidence there consisted merely in the production of a written application to the vestry to connect to the main sewer, and an entry in a cash-book of payment to the vestry of the cost of making the connection. The judgments show that the Court strained to find evidence of the making of an "order," but, as we pointed out in our issue of September 1st, we are satisfied that justice was done. It is to be hoped that the result may be a considerable diminution in the number of attempts which are made by property owners to take advantage of a legal technicality and to saddle the general body of ratepayers with an expense which morally they ought themselves to bear.

* * *

**A Specification and a Report.**

We have received from Messrs. E. & F. N. Spon copies of two publications which are the result of very laudable enterprise on the part of the Institution of Municipal and County Engineers in two different spheres. The first (published at 2s. 6d. nett) is the standard specification for concrete flags which has been prepared by the Institution's Standardisation Committee after considerable inquiry among engineers and conference with representatives of a number of the leading manufacturers. This specification is the result of considerable labour and research, and will no doubt be much appreciated by the general body of the members. The other publication to which we refer is the report (price 10s. 6d. nett) of the proceedings at the recent Housing and Town Planning Conference at West Bromwich. This report has been ably edited by Mr. Thomas Cole, ASSOC.M. INST.C.E., the secretary of the Institution, and contains *in extenso* all the papers which were read at the conference, together with a full report of the discussions. It is a veritable mine of information in regard to the practical side of town planning and housing questions, and is of special value as containing the results of members' experience in those matters. The Council are to be commended for having rendered so much information available in such a handy form and at so moderate a price.

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**Institution of Municipal and County Engineers' Meetings.**

Several important changes in the dates of meetings arranged by the Council of the Institution of Municipal and County Engineers are notified by the secretary of that body, Mr. Thomas Cole. The meeting at Exmouth, originally fixed for April 6th, has been postponed for a month, and will take place on May 4th, and the one which it had been intended to hold at Stourbridge a week later will not take place until July 6th. The Nuneaton meeting will be held on May 11th instead of May 4th, and another change in date is that of the Lowestoft meeting, which will now take place on June 27th—a week later than first arranged, and, it will be noted, only two days before the gathering at Bridlington. Other fixtures remain unaltered.

# Testing of Materials Used in Reinforced Concrete.*

By A. ALBAN H. SCOTT. M.R.SAN.I.

The following is an outline procedure I would suggest should generally be adopted with regard to the testing of materials for reinforced concrete work:—

All tests to be made at an independent testing and experimental works.

TESTING OF CEMENT.

The cement to be tested from samples taken from the bulk, such samples being taken from various positions of the bins at the makers' works. After the cement has arrived on the job, samples again taken from various bags, thoroughly mixed and again tested. Further tests made from time to time as the material is being used in the works, the number of these tests being regulated by the quantity of the consignment, and the time taken in using same. All tests on cement should be made in accordance with the latest specification of the British Standard Specification for Portland cement, with the further test for ascertaining resistance to thrusting stress of both neat cement and also cement and sand, in the same proportions used for the tensional briquettes.

AGGREGATE OF COARSE MATERIAL.

A sample in bulk to be delivered on to the works, a sample taken and tested: (1) For freedom from loam and other foreign matter; (2) for the proportion of the various sizes of the crushed material; (3) for the amount of voids; (4) for specific gravity. Tests repeated on the material being used in the works from time to time as may be considered desirable.

SAND.

Sand to be treated in exactly the same way as aggregate, and in addition a test for the amount of material that will pass a sieve of 1/50 in. by 1/50 in. apertures should be ascertained; this, which can be called "flour," should be rejected.

Water is tested to see that it contains no unusual or injurious properties.

Steel to be first inspected at the makers' works with a view to ascertaining: (1) Whether welds have been made; (2) for surface defects; (3) correctness of diameters.

Every rod over $\frac{3}{8}$ in. diameter must be stamped with a die as having been inspected. Sample lengths are taken from the actual rods, which are duly stamped and sent to the testing works for the purpose of ascertaining: (1) Their ultimate strength; (2) their elastic limit; (3) their elongation and contraction of area: (4) to observe the structure of the metal at fracture, whether the same is silky, granular, or fibrous; (5) bending test. All these tests to apply to rods and wire from and including $\frac{3}{16}$ in. diameter and upwards.

CONCRETE.

The test specimens of concrete should be of a standard size of 6 in. cube. Six specimens made for each test, three made in the laboratory and three on the works. The cement for each six sets of specimens to be taken from the same consignment. The laboratory test specimens should be made as far as possible on practical lines, so that the result should be such as can be reasonably expected from concrete in the actual work.

All specimen pieces made on the works should be made from concrete taken from the actual mixing platform. All such specimens should be made in metal moulds, and the concrete worked in by punning and tamping to the same degree as has actually taken place in this structure. Six test cubes should be used for each test, and the minimum tests should be made at the following periods: Seven days, twenty-eight days, fifty-six days, ninety days, and one year.

For the purpose of record and research work, such tests should be carried out at the following periods: Seven days, twenty-eight days, fifty-six days, ninety days, six months, nine months, twelve months, two years, three years, four years, and five years.

CENTERING.

No mechanical tests are required for this, but when the shuttering is being placed into position rough calculations should be made to see if any undue deflection or movement is likely to take place during the process of placing the moist concrete into position, and inspection made to see that the joints have been properly filled up by rubbing with hard bar soap or other material to prevent dripping of the cement and sand.

We might now consider whether the tests mentioned above are reasonably required, and before proceeding to do so a few remarks on the work the material is called upon to do may not be out of place. In reinforced concrete the concrete takes compression and shear, the steel taking *all* the tension and assisting for shear and compressional strains. The concrete being stressed to not more than 600 lb. per square inch in compression, and 100 lb. per square inch in shear; the steel in compression in beams not more than nine times per square inch that of the adjoining concrete, and in columns not more than fifteen times that of the adjoining concrete and steel in tension 15,000 lb. per square inch, and the adhesion of the concrete to the steel 100 lb. per square inch of actual contact.

These figures being subject to various conditions, such as the efficient tying in of the steel in compression to prevent bulging of the rods, proper proportion of metal to the concrete and spacing of the steel. In the case of columns the effective area of concrete is only taken as that part which is hooped in by the ties to the vertical steel members.

If we are working to a factor of safety of a fourth of the ultimate, the ultimate resistance to thrusting stress of the concrete should be not less than 2,400 lb. per square inch, the resistance of concrete to shear 400 lb. per square inch, and the steel 60,000 per square inch ultimate tensile.

These figures show that all the materials are called upon to be of high efficiency, and to work in harmony and simultaneously together, and have been adopted in consideration not only of their ultimate resistance, but also the relative coefficient of elasticity.

The work is designed on the assumption that the materials actually used in the construction are capable of resisting these stresses.

The following are a few reasons why the author considers the tests necessary:—

*Aggregate and Coarse Material.*—It has been found that most aggregates (unless washed) contain loam and other foreign matter. A sample of river aggregate recently tested gave as much as 7 per cent of loam; and most loams have a surprising covering power, being of the very finest of "flour," and consequently when the cement is added there is a thin film between the cement and the actual silicious material, thus preventing the cementing together of the particles.

Some time ago it was advocated in certain quarters that the presence of loam in aggregate did not decrease, but rather increased, the strength of concrete; a slight mistake was made there—the material which was mistaken for "loam" actually contained certain cementing properties which had the effect of making the concrete a richer mixture.

With aggregates which are practically uniform in size, or if the various sizes are not properly graded, proper bond is not obtained between the various materials, as the mortar is concentrated, and thus a portion of the mixture is deficient in cementing materials; therefore it is most desirable that the grading and voids should be worked out very carefully, and with certain exceptions it is found, within limits, that the grading which gives the smallest amount of voids in the aggregate and sand results in concrete of greater strength. With aggregate and sand containing a high percentage of voids, a greater proportion of cement is required.

It is possible to arrange these results in various ways, and the method in Table I may be found convenient.

In this connection it should be remembered that as the number of particles increase, so the proportion of the cement to the whole should be also increased owing to the greater covering power required. A test cube made with a very small amount of aggregate and a large amount of sand, with the usual proportions of cement, gave an ultimate resistance to thrusting stress of only about 600 lb. per square inch. Such low result was entirely owing to the fact that the usual amount of cement in that case was not sufficient to properly cover each particle of the sand and aggregate, and a perfectly cemented and homogeneous mass was not obtained.

The ultimate resistance of any material is its strength at its weakest point, and the actual area of

* Paper read at a meeting of the Society of Architects on March 7th.

the concrete is the gross area minus the area of voids at any section; it is therefore necessary that the ascertained percentage of voids in the aggregate and sand should be entirely filled up with cement, with an additional allowance for completely surrounding each particle. The usual rough and ready means of determining the exact proportion of the cement to the sand and aggregate has resulted in many cases of disaster.

The specific gravity of sand and cement should be taken in order to compare with the weight of the test specimens, as such weight is materially affected by the original weight of the aggregate and sand. There are at least two methods of ascertaining the amount of voids: one is by ascertaining the specific gravity of the material used, and secondly by allowing the aggregate

STEEL.

In no part of the steel for reinforced concrete should welds be allowed. Welds can be made in various ways, but it is impossible to test each weld, and in these joints it is not an exaggeration to say that not one weld in 500 would be of equal strength to the rest of the bar, and it has been ascertained, with most disastrous results, that the strength at the point of the weld was so low as 30 per cent of the bar adjoining. This is caused not so much by the lack of amalgamation of the material itself, but generally by the fact that large voids are left right in the centre of the joint.

Surface defects in steel are often found in the ordinary commercial bars, being indicated by most minute

TABLE 1.

| — | Size. | ¾ | ⅝ | ½ | ⅜ | ¼ | ⅛ | 1/16 | 1/32 | 1/50 | Not graded. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Thames sand ... | Parts | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| | Perc. of voids | — | — | — | — | 3·9 | 39·0 | 35·5 | 34·5 | — | |
| 2. Sea sand on shore 26 years ... ... | | — | — | — | — | 26·7 | 29·5 | 32·0 | — | — | |
| 3. Ordinary Thames sand ... .. | | — | — | — | — | — | — | — | — | — | 23·3 |
| 4. River sand ... | | — | — | — | — | — | — | — | — | — | 32·0 |
| Sand from crushed rock ... ... | | — | — | — | — | — | — | — | — | — | 33·2 |
| 5. Crushed rock ... | | 40·1 | — | 44·1 | — | — | — | — | — | — | |
| 6. Thames ballast graded ... ... | | 48·2 | 44·5 | 43·5 | 42·5 | — | — | — | — | — | |
| 7. Sea ballast ... | | 41·8 | 42·3 | 41·8 | 42·0 | | | | | | |
| 8. Ballast and sand as from bank to pass only and not retained on apertures ... ... | | 37·0 | 38·0 | 37·6 | 35·6 | | | | | | |
| 10. Thames sand and ballast not crushed | Parts | — | | — | — | 1 | 1 | 2 | 2 | | |
| | | — | — | — | | | 32·0 | | | | |
| | | — | — | — | — | | 28·7 | | | | |
| | Parts | 1 | 2 | 3 | 4 | 1 | 1 | 2 | 2 | | |
| | | | 42·3 | | | | | | | | |
| | | | | | 29·3 | | | | | | |
| | | | | | 25·1 | | | | | | |
| 11. Sea sand & ballast | Parts | 1 | 1 | 4½ | 3½ | 1½ | 3 | | | | |
| | | | | 29·6 | | | | | | | |
| | Parts | 1 | 1 | 4½ | 3½ | 1½ | 1½ | 3 | | | |
| | | | | | 23·9 | | | | | | |
| 12. Standard sand ... | | | | | 34·5 | | | | | | |

and sand to absorb moisture, then to dry the surfaces without extracting moisture from the material, and then in the test tubes to add water until such time as the level of the aggregate and the water is at the same point.

WATER.

The water usually obtained from town supplies can be taken as of proper quality for use in concrete work, but in country districts water obtained from wells and reservoirs often contains foreign matter—such as peat and other vegetables—and it has been found that by using peaty water it retards the setting of the cement; in one case the concrete did not set for a period of three weeks, at which stage the concrete was still very soft and was taken up.

cracks, generally starting in the shape of a "V." Although such defects are in themselves perhaps almost innocent, immediately the material is subject to any stress they develop in a most alarming manner.

It has been found that the diameters of bars vary from that specified, resulting in one case of a loss of 12 per cent in the area; excess diameter is also often met with, and as the final measurements are taken on a basis of the correct diameter, such excess of diameter will often be the solution of the difference found between the surveyor's measurements and the weight alleged to have been used by the contractor. Reinforced concrete work being designed on the assumption that the whole of the materials employed

are exactly in accordance with the specification, a reduction in area of the bars is most serious.

(*a*) The ultimate strength should be taken at not less than 60,000 lb., and not more than 72,000 lb. per square inch.

According to the diagrams, I think you will admit that it is necessary to keep a very careful watch upon every piece of steel that is brought on to the site.

Table 2.—Result of Grading of Sand.

| Sand. | Retained on 30×30. | Passed 30×30 retained on 50×50. | Passed 50×50. | Total. |
|---|---|---|---|---|
| Sample 1. | 29·0 p.c. | 15·5 p.c. | 55·5 p.c. | 100·0 |
| Sample 2. | 48·2 p.c. | 14·0 p.c. | 36·8 p.c. | 100·0 |

(*b*) The elastic limit is also of the utmost importance, as, although steel might have a high ultimate resistance, the elastic limit might be so low that in case an accidental load is placed on the work a sudden collapse might take place; whereas by use of material with a proper elastic limit proper warning would be given before its sudden failure.

Table 3.—Test on Cement used for Tensile Tests.
Briquettes 1 in. by 1 in.

| Neat cement. | 3 parts standard sand to 1 part cement. |
|---|---|
| Lb. | Lb. |
| 572 | 196 |
| 527 | 238 |
| 570 | 206 |
| 551 | 192 |
| 556 | 191 |
| Mean of 5 tests 555·2 lb. per sq. in. | Mean 204·6 lb. |

(*c*) It is essential that steel should be of such properties as will enable it to take a gradual and uniform extension, thus indicating a uniformity of quality; and the contraction of area at fracture should not be less than 45 per cent. which will confirm the properties of equal extension.

(*d*) A silky fracture indicates a uniformity, and a good mild steel so far as the metal, as metal, is concerned. Granular or fibrous grain indicates brittleness and unequal quality.

CONCRETE.

I think it is safe to say that of all materials used in the building trade, concrete is liable to and does vary more than any other material. Even if every care has been taken to see that each unit is of its proper quality and strength, we have in the finished concrete to reckon with a very large amount of human element. With a good machine mixer the possibility of human errors is considerably decreased, but at the same time an improperly designed mixer is, in my opinion, more dangerous than mixing the concrete by hand.

Concrete which has its setting somewhat retarded by sprinkling with water gives generally higher results than concrete which was allowed to dry under normal conditions. The question arises here, however, as to the consistency of concrete, not only from the point of view of the strength of the concrete itself, but rather as to what consistency will give the best results in actual practice from the point of view of contact with the metal, resistance to crushing and shear, and although it is essential that as little water as possible should be used to prevent airholes occurring after the water has been evaporated, I would feel inclined to use a concrete slightly wetter than the average practice in France, but certainly much drier than the general present use in England.

Comparatively wet concrete will not allow of it being rammed or "tamped," whereas, to get a drier concrete into its correct position, tamping and gentle ramming is essential. As the whole of the strength of reinforced concrete depends upon proper adhesion of the concrete to the steel, it is an essential factor that the concrete is gently rammed at every point.

The architect has therefore a much better chance of making sure that the concrete is properly placed in position and properly worked between the reinforcing metal, and the greatest trouble has been found to be with contractors wishing to make the concrete wetter than is desirable owing to the fact that a wet concrete is more easily placed in position with much less labour than a dry concrete.

The usual period of the first test on concrete has until recently been at twenty-eight days, but with important structures, to obtain tests at twenty-eight days after the concrete is made is not going to be of very much use for early correction when the work is being rapidly pushed forward; therefore a seven-day test is essential, so as to be able immediately to detect any error in any of the materials.

At the present moment there are few tests at seven days, so that for the present the reasonable resistance of concrete at this period has not been definitely ascertained. Such tests in connection with the twenty-eight days' tests will also give most useful information with regard to when it is safe to strike the centering, and when one considers the failures that have taken place owing to the centering having been removed too quickly, a seven-days' test will undoubtedly become a recognised factor very shortly.

The fifty-six days' and ninety days' tests are desirable, as they show what is actually taking place in the work with regard to the increase or decrease in the strength of the structure.

The concrete up to about six months of age increases in strength fairly rapidly, but it is curious that from about six to nine months the increasing resistance to thrusting stress is very trifling, but after nine months the strength of the concrete again continues to increase at a more rapid rate, although not so rapid as during the first six months.

Table 4.—Result of Experiments to Ascertain the Resistance to Thrusting Stress of Cubes of Standard Sand and Cement.

| Description. | Dimensions. | Base area. | Crushed. | |
|---|---|---|---|---|
| | | | Total. | Per square inch. |
| From bin No. 22. | Inches. | Square inches. | Lb. | Lb. |
| | 3·00 3·00 × 3·01 | 9·03 | 41,440 | 4,589 |
| | 3·00 3·00 × 3·00 | 9·00 | 43,480 | 4,831 |
| Neat cement. | 3·00 3·00 × 3·00 | 9·00 | 42,240 | 4,693 |
| Age 7 days. | | | | |
| | 3·00 3·00 × 3·01 | 9·03 | 41,320 | 4,576 |
| | 3·00 3·00 × 3·02 | 9·06 | 41,000 | 4,525 |
| | Mean | 9·02 | 41,896 | 4,643 |
| | 3·00 3·00 × 3·00 | 9·00 | 10,420 | 1,158 |
| 3 parts standard sand. | 3·00 3·00 × 3·00 | 9·00 | 11,080 | 1,231 |
| 1 part cement (by weight). | 3·00 3·00 × 3·01 | 9·03 | 12,080 | 1,338 |
| | 3·00 2·00 × 3·01 | 9·03 | 10,440 | 1,156 |
| Age 7 days. | 3·00 × 3·00 × 3·01 | 9·03 | 11,400 | 1,262 |
| | Mean | 9·02 | 11,084 | 1,229 |

For the purpose of research work, and where the importance of a job will allow it, it is most desirable that specimen pieces should be made in sufficient number, so that each series of specimens are tested up to at least ten years of age. A number of specimens should always be kept, so that if anything should ever happen to any structure, or part of same, one is in a position to test the concrete, and the steel, of course, could be tested from samples obtained from the actual work.

Many things are to be learnt from an excellent series of tests carried out by Mr. Kirkaldy to ascertain the resistance of the thrusting test on sixty-four cubes made under various conditions at his works.

Table 5.—Test on Briquettes Cement and Sand Samples 1 and 2 for Tensile Strengths.

Briquettes 1 in. by 1 in.

| Sand sample no. 1. Lb. per sq. in. | Sand sample no. 2. Lb. per sq. in. |
|---|---|
| 112 | 178 |
| 108 | 180 |
| 102 | 170 |
| 103 | 191 |
| 100 | 168 |
| Mean 105 lb. per sq. in. | Mean 177·4 lb. per sq. in. |

Proportions ... 3 sand 1 cement.
Age ... ... 7 days.

At twenty-eight days the highest result obtained was an average of 2,225 lb. per square inch, and at ninety days the highest result was 3,554 lb. These two results can be taken as being the greatest amount of resistance that can be obtained from concrete made under the most favourable conditions, and it should be compared with the lowest results obtained, which is 1,026 lb. per square inch in twenty-eight days, and 1,787 lb. per square inch in ninety days, with varying results between these two extremes; and the question arises as to which is the most probable result that would be obtained from work in actual practice.

We have heard that in certain concrete works 2,000 lb. per square inch is invariably obtained on days' aëration, expansion 1 mm.; weight of cement per cubic foot.

| | | |
|---|---|---|
| 1. | 86·56 | |
| 2. | 86·28 | |
| 3. | 85·11 | Various methods of filling cubic measure. |
| 4. | 85·80 | |
| 5. | 94·10 | |
| 6. | 95·25 | |

Not sufficient quantity of material of "sample sands."

Nos. 1 and 2 to make comparative experiments to ascertain the resistance to thrusting stress.

It will be observed from these tests that the average strength of briquettes with standard sand and cement gave a mean of 204·6 lb. at seven days, whereas the sand (sample No. 1) gave only 105 lb. per square inch, and sand (sample No. 2), which contained a less amount of flour, gives an average result of 177·4 lb. per square inch.

On Table 3, the extraordinarily different weights per cubic foot of cement are given. The same cement was used, but different methods of filling were adopted. It certainly confirms the necessity of most carefully considering whether the cement for all work should not be measured by weight and not by cubic measure.

Another test made as shown on Table 6, shows that with standard sand we get 182·2 lb. at seven days and 234·6 lb. at twenty-eight days, whereas with the test on "flour" sand, as described on the table, we only get 53·2 lb. at seven days and 104 lb. at twenty-eight days.

The rock dust used was that which passed through the 30 by 30 sieve. The standard sand was passed through 20 by 20 sieve, and retained upon 30 by 30 sieve.

The tensile strength of the cement used in making the above briquettes was 480·0 lb. per square inch at seven days, and 583·0 lb. at twenty-eight days.

Residue upon sieve 50 by 50, 0·0; upon sieve 76 by 76, 0·9; and upon sieve 180 by 180, 15·9 per cent.

A word with reference to the testing of the finished structure may not be out of place.

Specifications often provide for the work to be tested with one and a-half times the load for which the work has been designed to carry, a factor of safety of four is taken in the calculations to provide for inequalities of workmanship and materials, for allowance for fatigue of material under strain and for isolated, accidental excess loading. Considering that with one and a-half times the safe load the concrete in compression is working up to 900 lb. per square inch; adhesion, 150 lb. per square inch; 200 lb. in shear, and steel varying up to 22,500 lb. per square inch in tension, by the application of such loads the parts so tested may be permanently injuriously affected.

If the materials are tested as suggested in this paper, and professional supervision is given to the work, tests on the finished structure are not necessary; if it is desirable, then only the safe load should be applied, and if no undue deflection takes place no further loading can serve any useful purpose.

I have confined myself to giving you this evening to all of tests which have been made from works I was associated with, and can vouch for all the information placed before you.

Table 6.—Results of Experiments to ascertain the Tensiles Strength, &c., of Cement and Rock Dust, and Cement and Sand.

Twenty specimens moulded here, immersed in water and tested at the ages of 7 and 28 days.

Briquettes, sectional area 1 square inch.

Cement and Rock Dust.

(3 parts Rock Dust to 1 part Cement, by weight.)

| Age 7 days. Test No. QQ. | lb. | Age 28 days. Test No. QQ. | lb. |
|---|---|---|---|
| 4586 | 64 | 4591 | 135 |
| 4588 | 56 | 4590 | 100 |
| 4587 | 50 | 4593 | 100 |
| 4584 | 48 | 4589 | 97 |
| 4585 | 48 | 4592 | 88 |
| Mean of 5 tests | 53·2 | Mean of 5 tests | 104·0 |

Cement and Sand.

(3 parts Standard Sand to 1 part Cement, by weight.)

| Age 7 days. Test No. QQ. | lb. | Age 28 days. Test No. QQ. | lb. |
|---|---|---|---|
| 4603 | 194 | 4606 | 264 |
| 4599 | 184 | 4605 | 259 |
| 4602 | 183 | 4604 | 243 |
| 4600 | 177 | 4607 | 208 |
| 4601 | 173 | 4608 | 199 |
| Mean of 5 tests | 182·2 | Mean of 5 tests | 234·6 |

concrete twenty-eight days old, but I hesitate to accept this figure, and such high results are possibly accounted for by the fact that the tests ought to be made on a machine such as one which is used in conjunction with a mercury column, whereby a high result can be obtained if the load is put on suddenly. In all tests a sudden load will give a much higher result than a gradually increasing load.

### Effect of "Flour" in Concrete.

The question has often arisen as to the effect of very fine sand or so-called sand on concrete, and we have had two series of tests carried out on materials of this nature. Table 2 shows the result of the grading of sand. Table 3 shows the test on cement used for the specimen pieces. Table 4 shows the result of tests to ascertain the resistance of thrusting stress on standard sand and cement. Table 5 shows the result of tests on the briquettes containing the very fine materials.

Age, seven days.

Residue upon sieve 50 by 50, 0·0; upon sieve 76 by 76, 0·0; upon sieve 180 by 180, 10·5 per cent. Time of initial set 25 per cent. watery, three hours set hard, nine and a-half hours. Pats remained sound in air and cold water, also in water kept at a temperature of 115-120 deg. Fahr. for forty-eight hours.

Le Chatelier test for soundness. Cement soaked in twenty-four hours, expansion 3·0 mm., after seven

---

**Road Work in Northamptonshire.**—The estimate for tar-binding the roads of Northamptonshire during the ensuing year is £2,975, and for surface tarring £1,250. The policy of the Roads and Bridges Committee is to extend tar-binding and to do less surface tarring.

## ESTIMATING.

By J. Eastwood, Assoc.M.Inst.C.E.

Squared paper is now in such common use, that its application to estimating prices where one factor varies, while others remain fairly constant, is now general. The following are some instances which are of interest to the road engineer, and serve to illustrate the principles involved, and the prices are such as occur in actual practice.

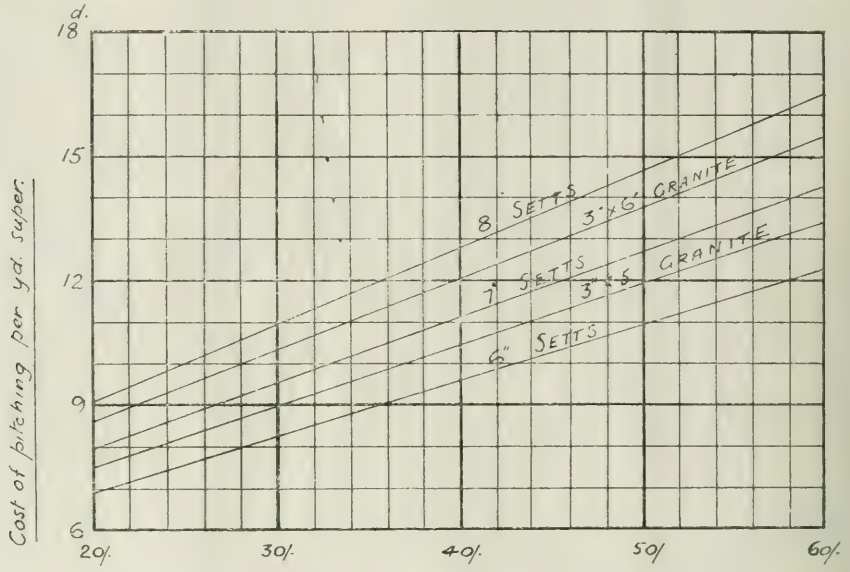



Fig. 1.—Pitch Grouting Paving.

### PITCH-GROUTING PAVING.

The table on the next page shows the cost of pitch-grouting paving, including all labour and materials, and the provision of chippings for racking up the joints.

Of the various items in this table, pitch has within the past few years varied in price from £1 to £2 10s. per ton, and creosote oil, though it has been fairly steady upon the whole, has varied at times from 2d. to 3½d. per gallon. The other items may be looked upon as constant.

Assuming all constant except pitch, Diagram 1 shows how the price of pitch-grouting will vary with the price of pitch, the price of oil being taken at 3d. per gallon. If the price as shown on the diagram be altered 3d per yard for each alteration of 3d. per gallon in the price of creosote oil, the greatest difference between this and the actual cost will not exceed about 3d. per yard, so long as the price of oil fluctuates between 2d. and 4d. per gallon.

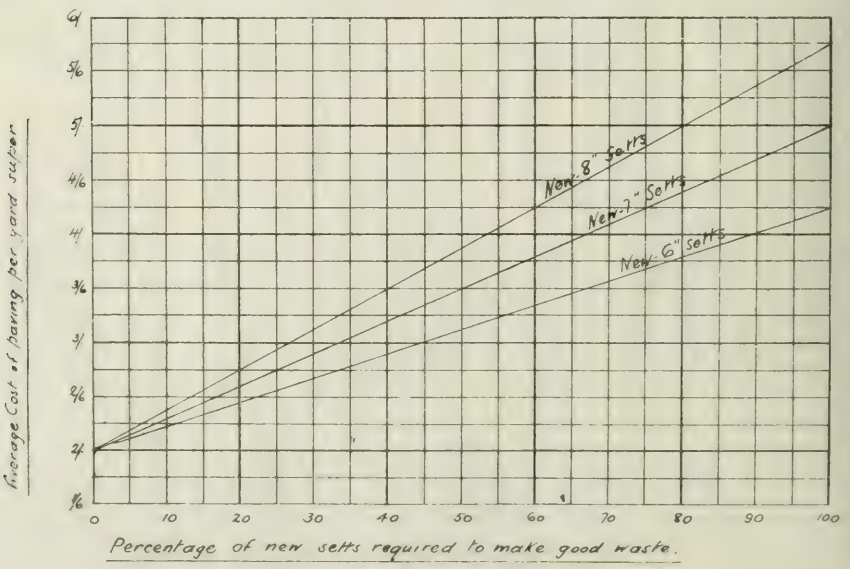



Fig. 2.—Paving.

COST OF PAVING.

In repaving a street where the old setts can be redressed on the works, and used again as far as they are suitable, the chief cause of difference in price between one street and another is the proportion of old setts which can be re-used. The following are typical prices:—

| Depth of setts | Cost, pence per yard super. | | | | |
|---|---|---|---|---|---|
| | Gritstone setts. | | | Granite setts. | |
| | 6 in. | 7 in. | 8 in. | 6 in. | 5 in. |
| Pitch at 25s. per ton at depôt | 3·39 | 3·99 | 4·68 | 4·34 | 3·69 |
| Creosote oil at 3d. per gallon | 1·13 | 1·33 | 1·56 | 1·45 | 1·23 |
| Limestone chippings at 6s. per ton at depot | ·63 | ·70 | ·75 | ·78 | ·72 |
| Labour at 6d. per hour | 1·13 | 1·24 | 1·35 | 1·28 | 1·18 |
| Carting at 1s. per hour | ·57 | ·69 | ·80 | ·75 | ·63 |
| Fuel | ·20 | ·22 | ·25 | ·24 | ·22 |
| Use of pitch boiler and oil barrel at 3s. per day | ·54 | ·58 | ·60 | ·60 | ·56 |
| Total | 7·59 | 8·75 | 9·99 | 9·44 | 8·23 |

| | Per yard super. s. | d. |
|---|---|---|
| Taking up old setts, redressing and relaying, including grouting with pitch and carting away rubbish (the price of pitch being about 25s. per ton) | 2 | 0 |
| Providing and laying new setts, including grouting, &c., as above ... 6-in. setts | 4 | 3 |
| Ditto ... ... 7-in. setts | 5 | 0 |
| Ditto ... ... 8-in. setts | 5 | 9 |

Diagram 2 shows how the average price per yard over the whole street will vary with the percentage of new setts required to make up for waste, and with the depth of new setts used. Experience will enable one to estimate within 5 to 10 per cent the amount of waste, and the estimated cost per yard can then be read off from the diagram. If necessary, as in checking the cost of a street when completed, and the proportion of waste is therefore known exactly, this price can be adjusted with reference to the varying price of pitch and oil.

TAR-SPRAYING MACADAMISED ROADS.

The following are approximate prices:—

| | Pence per square yard. |
|---|---|
| Labour with tar-spraying machine and sweeping road and spreading chippings or sand, at 6d. per hour | ·140 |
| Horse hire with machine and carting chippings, sand and sweepings, at 1s. per hour | ·185 |
| Chippings or sand, at 6s. per ton at depot | ·047 |
| Tar, at 36s. per ton at depot | ·374 |
| Use of tar-spraying machine, including fuel for machine, at 10s. per day | ·054 |
| Total | 0·8 |

Diagram 3 shows the effect of variation in the price of tar (practically the only item which varies in cost) on the cost of tar-spraying.

PITCH-GROUTED MACADAM.

The following table shows the approximated cost of single-grouted pitch-macadam, the finished thickness of the coat being 3 in.:—

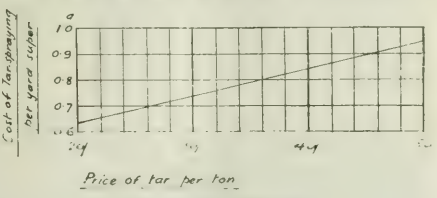



Fig. 3.—Tar Spraying.

| | Pence per square yard. |
|---|---|
| Labour | 5·0 |
| Steam rolling | 3·0 |
| Use of tar-boiler, &c. | 0·5 |
| Pitch, at 30s. per ton, delivered on works | 5·0 |
| Creosote oil, at 3d. per gall., „ „ | 1·0 |
| Granite, at 12s. 6d. per ton, „ „ | 18·0 |
| Chippings and sand | 2·5 |
| Sundries | 1·0 |
| Total | 36·0=3s. |

Diagram 4 enables one to see how the cost per square yard varies with the price of pitch, other things remaining constant.

Many other diagrams will suggest themselves in practice, and a collection of them in a handy pocket-book will be found very useful.

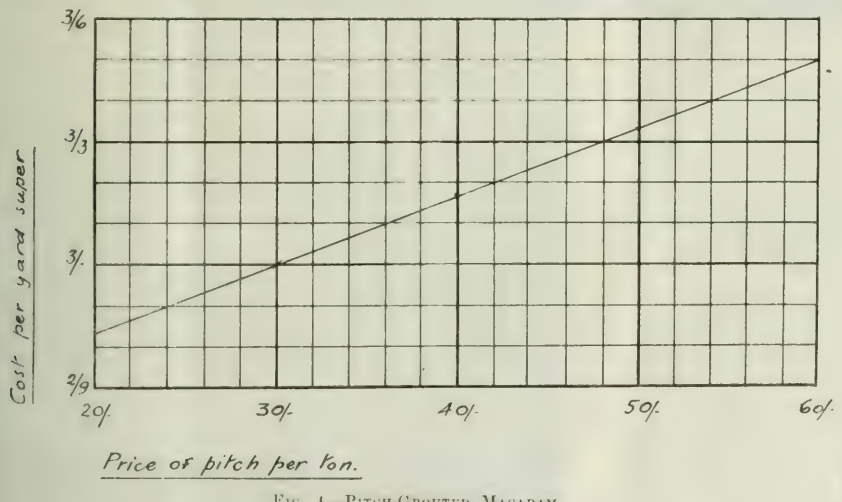



Fig. 4.—Pitch-Grouted Macadam.

**The Destruction of Vermin.**—Skanderborg (Denmark) Town Council have decided to take immediate steps to destroy the rats infesting the town. A campaign with this object in view was started in April, 1911, and was continued over a period of three months. It was decided to employ the services of the Ratin Laboratory, rat destruction specialists. In the first instance this company applied their bacterial culture, Ratin No. 1, which had the effect of considerably reducing the rats in numbers. It is a well-known fact, however, that certain rats are immune to bacterial cultures, and in order to kill off the remaining immune rats, a special preparation, Ratin No. 2, was applied, with the result that the district under treatment is now practically devoid of rats The Skanderborg authorities, in their testimonial, recommend all municipal authorities to use Ratin Nos. 1 and 2 for the destruction of rats. Ratin may be obtained in this country at the Ratin Bacteriological Laboratory, 155 Fenchurch-street, E.C.

## BURY WATERWORKS UNDERTAKING.

### THE OGDEN RESERVOIR.

The Ogden reservoir, the latest undertaking of the Bury and District Joint Water Board, was formally opened recently by the Mayor of Bury (Alderman Parkes), who is chairman of the Joint Water Board.

It was in the year 1901 that an extension of water storage for the district became necessary, and the Corporation of Bury, who were then the sole owners of the undertaking, turned their attention to the site upon which the work above referred to has been carried out, the result being that in the following year Mr. J. Haslam, the clerk to the corporation, and Mr. J. Cartwright, M.Inst.C.E., Bury, were instructed to report jointly as to the feasibility of proceeding with what became known as the Ogden scheme. Their report being favourable, the tender of Messrs. W. & J. Foster, of Bradford, was accepted, and April, 1903, saw the commencement of the first [illegible]. When, however, about one-third of the contract had been completed by Messrs. Foster, the senior partner of the firm died, and the work was carried on by Messrs. Phineas Drake & Sons, of Bradford, and completed by them.

Ogden Reservoir during Construction.

The new reservoir is situated in the Ogden Valley, about 8 miles north-west of the borough of Bury and [illegible] of the centre of the borough of Haslingden, at an elevation of 737·50 ft. above ordnance datum. It has a [illegible] gallons; it is 3,100 ft. in length, 1,650 ft. at the widest place, and measures a distance of over 1¼ miles round the top water level. The gathering ground to the reservoir is 928 acres, including the Calf Hey gathering ground of 872 acres, a total drainage area of 1,800 acres.

[illegible] and contains 36,140 cub. yds. of puddle and 1,100 cub. yds. of concrete. The puddle wall to the centre of the embankment has an additional maximum height of 60 ft., contains 17,120 cub. yds. of puddle, and [illegible] and 365 ft. at its greatest width at the base, and contains 243,000 cub. yds. of material. The inner slope [illegible] is being pitched with heavy masonry, surmounted by the storm wall 1,090 ft. in length and 4 ft. high, and the lower portion shingled. The outer slope has an inclination of 2½ horizontal to 1 vertical, and is benched and grass-sown.

The tunnel through the embankment is 330 ft. long, 8 ft. internal diameter, and built of brickwork and concrete, having stone facings at inlet and outlet bays. The supply pipes, 20 in. diameter, are laid in the outer tunnel, leaving the tunnel near its outlet and passing to the meter-house.

The valve tower is situate about midway of the tunnel, is constructed of masonry and concrete 84 ft. high, the lower portion being 12 ft. square and the upper portion 10 ft. diameter. It contains two 30-in. and six 20-in. sluice valves for regulating the supply, enabling the water to be drawn off at depths of 14, 36, and 58 ft. below top water level. It is surmounted by an octagonal valve house with castellated coping, and is connected with the embankment by a bow-string wrought steel bridge 61 ft. in length and 4 ft. wide.

The by-channels, of which there are two, are situated on the north and south sides of the reservoir respectively, and have a total length of 2,680 yds. The lower portions of the channels have side walls of concrete faced with block-in-course masonry, and the upper portions have sides and bottom of pitching set on a prepared bed of concrete. The intakes from the by-wash channels and streams to the reservoir are controlled by wall sluices.

The by-wash channels below the embankment are 580 yds. long, 15 ft. in width, with paved bottom and side walls of concrete faced with block-in-course masonry, and are broken up by a series of masonry steps. The two channels join into one 20 ft. wide, which empties into the Holden Wood reservoir.

The overflow weir is 80 ft. long on the crest, and is composed of curved ashlar steps, the ends being built into semi-circular bulkheads formed of concrete faced with masonry.

The Completed Work.

The road of access is constructed from the public highway to the reservoir embankment, is 310 yds. in length, and has a formation width of 12 ft.

The meter-house at the foot of the main embankment is constructed of block-in-course masonry, surmounted by castellated coping, with floor and roof of cement concrete, and contains a 15-in. Venturi meter with combined diagram and counter recorder. The water is discharged from the meter-house through a 15-in. diameter pipe, 6½ miles in length, into the Gin Hall reservoir.

The work involved in the construction of the reser-

voir—on the successful carrying out of which Mr. Cartwright, the engineer, was the recipient of well-deserved congratulations at the opening ceremony—comprises, in addition to that already mentioned, 177,170 cub. yds. excavation, 18,335 cub. yds. cement concrete, 21,035 super. yds. of dressed pitching, 20,011 super. yds. of random pitching, 129,073 super. yds. shingling, 71,908 super. yds. soil stripping, 77,880 cub. yds. soiling, 27,366 cub. yds. embanking, 32,134 cub. ft. ashlar, 14,301 cub. ft. coping, 5,385 super. yds. block-in-course masonry, 1,520 super. yds. rubble walling, 9,232 cub. yds. rubble drains, 528 cub. yds. of brickwork, 7,869 lin. yds. earthenware pipes, 2,882 super. yds. of roadways, 6,263 lin. yds. wrought-iron boundary fence, and 420 tons of ironwork.

Messrs. Wolstenholme & Son, of Radcliffe, supplied the valves and sluices, and the Stanton Iron Company, of Nottingham, the pipes.

**Bills in Parliament.**—The Liverpool Corporation Bill was read a third time in the House of Commons on Monday, and the Glasgow Corporation (Water) Bill a second time.

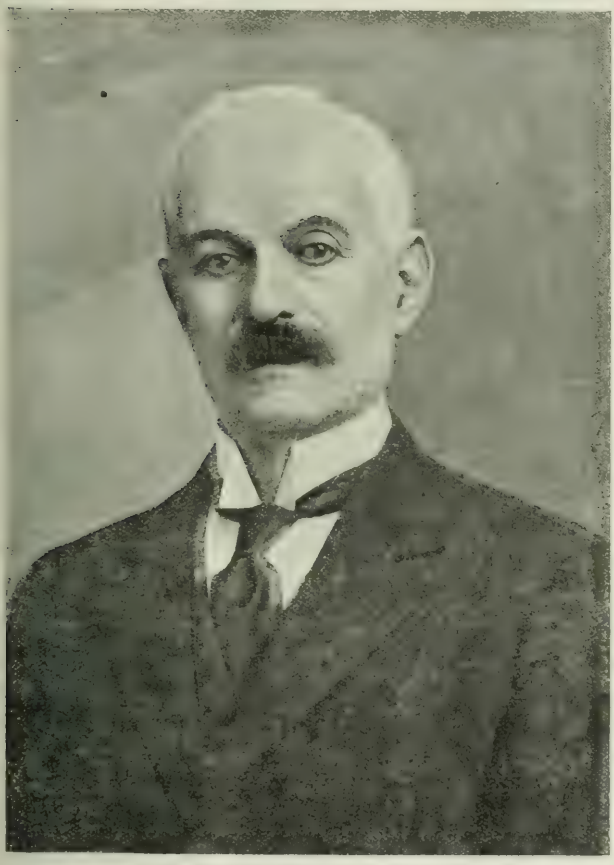
**Institute of Sanitary Engineers.**—The examination board of this institute, under the lead of their chairman, Prof. Henry Adams, M.INST.C.E., recently submitted to the council of the institute a report recommending the reorganisation of their examinations upon a broader basis. The council has now adopted the report, a new syllabus has been drawn up, and the board of examiners has been augmented. The new scheme will be in working order for the next examinations to be held in May, and particulars will gladly be forwarded by the secretary upon request, addressed to the offices, 120-122 Victoria-street, Westminster, S.W.

## THE ROAD BOARD PERSONNEL.

### 6.—MR. H. PERCY BOULNOIS.

This week we are able to present a short account of the professional career of another member of the Advisory Committee of Engineers to the Road Board—Mr. H. Percy Boulnois.

Mr. Boulnois, who is a past-president of the Institution of Municipal and County Engineers, is a member of the Institution of Civil Engineers and a Fellow of the Royal Sanitary Institute. He received his education at King's College, London, in the Applied Science Department, and was afterwards articled to the eminent engineer the late Sir Joseph Bazalgette, the chief engineer of the Metropolitan Board of Works.



Mr. H. Percy Boulnois, M.Inst.C.E.

Mr. Boulnois subsequently held an appointment as district engineer in Jamaica, and then became in rotation city surveyor of Exeter, borough engineer of Portsmouth, and city engineer of Liverpool. At all of these places he left behind many works which testify to his skill as an engineer, and numerous friends who bear tribute to his talents and personal charm. Subsequently Mr. Boulnois joined the engineering staff of the Local Government Board, under whom, towards the end of his service, he was engaged as deputy chief engineer. Mr. Boulnois has thus been associated all his life with municipal engineering, and there are but few municipal engineers in this country and abroad who do not know his name and hold him in high regard. In addition to a strenuous, active engineering life, he has written books on municipal subjects, and given very many lectures, and read a large number of papers on engineering subjects before scientific societies. He is a founder member of the Royal Automobile Club, and one of the oldest members of the Leander Club.

We are indebted to the Royal Sanitary Institute for the use of the block of the accompanying portrait.

**Surveyors' Institution.**—The annual dinner of this body will take place on April 23rd.

**Road Making in Devon.**—At the last meeting of the Plympton (Devon) Rural District Council, Mr. W. J. Crossing called attention to the fact that the county council had decided that the Main Roads and Bridges Committee should receive a report as to the cost of repair of main roads, and as to the general efficiency and uniformity in their management. Most of them knew that was with a view of taking the management of main roads from the district councils and taking charge of them itself. One thing would occur in that event—they would be very sure of a greatly increased expenditure. He thought the first thing the county would do would be to substitute gravel for binding in every case for road scrapings. Some time ago that council sent an estimate of approximately £600, to use gravel in every case, and it was scratched out. Since then the county had allowed them to use gravel partially, and in consequence the roads had greatly improved. If the county council would grant them the money it contemplated spending itself, they would have a better road than the county council would get. The council agreed to send to the county council supplementary estimates for the southern and northern districts, with a view to the substitution of gravel for road scrapings on the roads.

## ASSOCIATION OF ENGINEERS-IN-CHARGE.

### ANNUAL DINNER.

Dr. W. H. Maw, M.INST.C.E., M.I.MECH.E., the president, occupied the chair on Saturday evening last at the annual dinner of the Association of Engineers-in-Charge, held at the Holborn Restaurant. There was the customary large gathering of members and others, those present including Sir Ernest Shackleton, Judge Rentoul, K.C., LL.D., Capt. H. Riall Sankey, R.E. (ret.), M.INST.C.E., M.I.MECH.E., Dr. W. Cawthorne Unwin, F.R.S., president of the Institution of Civil Engineers, Messrs. Henry Adams, M.INST.C.E., M.I.MECH.E., F.S.I., H. Hirst, M.I.E.E., A. E. Penn (chairman of association), S. M. Singleton (hon. secretary), H. Swann (hon. treasurer), Mr. A. Davey, M.I.MECH.E., H. Capsey, H. E. Neale, R. Thorpe, and J. R. Manning.

Dr. Wm. Cawthorne Unwin, in proposing the toast of "The Association," commented on the satisfactory progress made by that body since its formation some sixteen years ago. The duties of the engineer-in-charge imposed on him very serious responsibilities, and his connection with such a society as theirs assisted him very materially in acquiring the knowledge necessary for the carrying on of their work—work which involved the care of machinery which was becoming more and more complicated as time went on, and which was being used for the most diverse purposes.

The President, in acknowledgment, alluded to the efforts of Dr. Unwin to put on a satisfactory footing the training of young engineers. Turning to the toast, he said it seemed to him that the association had a perfectly well-defined field of work—a field which was constantly increasing its area. Speaking of the desirability for placing properly qualified men in charge of modern machinery, he contended that economies in working costs and maintenance could be attained by employing only men who, besides possessing theoretical knowledge, had had the advantage of a workshop training. It was very regrettable that in large works there was still a want of appreciation of the benefits to be derived from the employment of really skilled supervision. That state of affairs was fast dying out; at the same time, a large amount of money was being lost every year from this cause, and one of the objects of the association was to band together the men who, by their special qualifications, were able to provide a remedy.

Mr. Arthur Davey, who proposed "Kindred Associations," made an eloquent appeal for the assistance of those bodies in helping the association to progress.

Captain H. Riall Sankey, in replying, suggested that one way in which this could be accomplished would be by an interchange of literature between the older institutions and the association.

Sir Ernest Shackleton, who also replied, after alluding to the debt which explorers owed to engineers, remarked that he noticed that the motto of the association was *Fides et Justitia*, but his impression was that they wanted no better motto than the words "engineers-in-charge"—which, to his mind, meant men at the head of things.

Mr. Henry Capsey, in giving the toast of "Our Guests and Friends," expressed the gratification that it gave him to find that, although their association was now gradually emerging from its extreme youthfulness, among those assembled there that evening there were many who were associated with them in their early history and had assisted materially in furthering their objects.

Mr. H. Hirst, replying, said the importance of the work engineers-in-charge had to perform lay in the fact that on them devolved the duty of rendering practical and perfect the crude things which were from time to time handed over to them.

Judge Rentoul, who also replied, made a characteristic speech. His Honour said the first words their president had greeted him with that evening were: "Here you are again." That was a sentence on which everything depended on the tone of the speaker. He recollected that in his school days the class master used occasionally to send him up to the head master, and the words which the latter invariably made use of were, "Here you are again." (Laughter.) Then took place some magnificent engineering, which was certainly not civil engineering, but which was to him electrical engineering. (Laughter.) To old acquaintances he had often to say, "Here you are again." Not only was he there again, but he intended to be there the next time also. (Hear, hear)—and as he did not drink any wine or alcoholic liquors, and ate nothing but fish, he suggested that if they were political economists they might contract for his dinner at a cheaper rate. (Laughter.) He had been looking down the list of guests at that evening's function, and several of the names had struck him as familiar—although he would not pledge himself to the initials. Sir Thomas Pile, whose name was included, was one Irishman, at any rate, who had never been at the Old Bailey—(laughter)—and Sir Ernest Shackleton was another, the explanation in his case, however, probably being that he had spent so many years of his life away from this country. (Laughter.)

The final toast, "Our President," was proposed in eulogistic terms by Mr. Alfred E. Penn, who said he considered they had much to thank Mr. Maw for what he had accomplished on their behalf.

The President having replied, the proceedings shortly afterwards terminated.

## OIL-BOUND ROADS IN CALIFORNIA.

### THE CAUSES OF SERIOUS FAILURE.

A very considerable mileage of roads in Los Angeles County, California, has been provided with new crusts of oil-bound macadam, and many of these roads have failed, and are now being resurfaced by the new Highway Commission. A criticism of some of the methods employed in making up the crusts of the roads which have failed appears in a recent issue of *Engineering and Contracting*, the most important of the mistakes made being, according to our contemporary: Insufficient rolling of the macadam; excess of oil used in binding; excess of broken stone; much work done by day labour, instead of by contract; and no adequate cost keeping system. As regards the first two of these our contemporary remarks:—

"Inadequate rolling has been the cause of much poor construction of water-bound macadam. That insufficient rolling may be equally fatal in oil-macadam construction is plainly to be seen by the failure of many stretches of road near Los Angeles. The writer noted some years ago, in Los Angeles County, that it was a not uncommon practice to permit contractors to compact several hundred tons of broken stone with one 10-ton roller in an eight-hour day. It may safely be said that when such a roller is permitted to compact much more than 100 tons per day, it should be only because an unusual abundance of water is used in puddling, or because a soft rock is being rolled.

"Perhaps the most serious single mistake made in the design of the work in question was the use of too much of the asphaltic oil. To begin with, it is questionable whether any oil should be used at all in the lower, or foundation, course of an oil-macadam road. Mr. Joyner (chief engineer to the Highway Commission) is of the opinion that the lower course should be made of water-bound macadam, and in this we concur. It is more expensive to use oil as a binder for macadam than to use screenings and water. Furthermore, a few inches below the surface the oil does not dry out or harden for a long time; and, prior to its hardening, it permits the stones to slide upon one another when subject to the pressure due to passing vehicles. In digging up sections of oil-macadam that had been in place several years, and had cut up into ruts, it was found that much of the oil was still in a very plastic condition, and, due to insufficient rolling of the stone before its application, the plastic oil was often found in masses of greater size than a walnut."

It seems that the use of an excessive amount of stone is regarded rather as a reason for the estimates being exceeded than as a cause of failure of the road crusts. The actual crusts were usually 16 ft. wide with 7-ft. earth shoulders, the shoulders being treated with a gallon of oil per square yard, and covered with screenings. The road crusts were supposed to average 6 in. in thickness, but, owing to the amount of stone used being in excess of the estimates, the average thickness was about 7½ in. The roads are described as having been "rolled into waves and cut into ruts by automobile and wagon wheels." The estimated cost was 11,560 dollars per mile, and the actual cost 14,800 dollars per mile, or a little over £3,000 per mile for the road, the cost of the crust, not including supervision, being 10,260 dollars, or £2,220 per mile.

**Fire Brigade for Gloucester.**—Steps are being taken for the establishment of a municipal fire brigade for Gloucester.

# Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, assoc.m.inst.c.e.

*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

## QUESTIONS.

This week answers are invited to the following questions:—

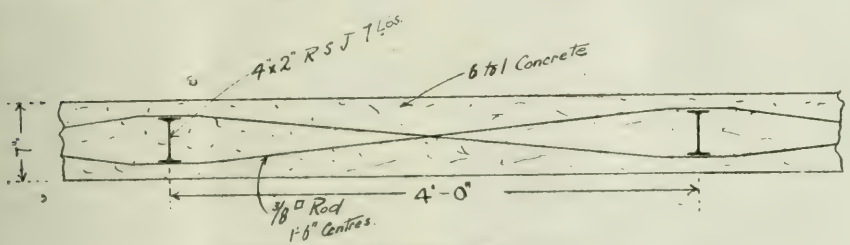
**230. Refuse Sorting.**—Describe, with sketches, a device for the mechanical sorting of house refuse.

**233. Tramways.**—Sketch a "turn out" or "passing place" on a single line of tramway; figure the leading dimensions, the angle of the crossings, and describe the length, position, and character of the "points" required for diverting the traffic. (M. and C.E.)

**234. Pumping Station.**—Sketch and describe a small pumping station capable of lifting 100,000 gallons of water from a borehole in the rock and delivering through a rising main 500 yds. long into a reservoir, the total vertical lift being 100 ft. After working out the theoretical horse power required, state the brake horse power and type of engine you recommend, and give your reasons. (M. and C.E.)

**235. Elasticity of Steel.**—A rectangular steel bar, 3 in. by 2 in., is placed on edge between bearings 3 ft. apart. What load placed at the centre will deflect the bar ¼ of an inch? Assume E=30,000,000 lb. per square inch. (M.R.S.I.)

**236. Reinforced Concrete Roof.**—Is the form of construction shown on Fig. 1 suitable for a roof for a one-storey building, 9-in. walls? The roof may be used for storage purposes, and would as such have to carry in addition to its own weight 2½ cwts. per foot super. The spans vary from 6 ft. 6 in. to 9 ft., and all the bays are 17 ft. long. Fall in roof 6 in. In order to reduce the thickness of concrete to, say, 6 in., would R.S. joists 3 in. in depth be sufficient? If any reader can suggest a better form of construction (cost being a consideration), I should be much obliged. ("Hotel de Ville.")




Reinforced Concrete Roof Construction.

**237. Egg-shaped Sewer.**—State a formula for obtaining the discharge of an egg-shaped sewer, also show how to obtain the hydraulic mean depth of same. (F. B., *Hereford.*)

## REPLIES TO QUESTIONS.

**227. Refuse Disposal.**—Describe, with illustrations, the most efficient and economical form of refuse destructor for a village of 500 inhabitants. (M.Inst.Mun. and C.E., *Seccondee.*)

If we assume that the refuse to be destroyed includes night soil, in addition to the usual garbage, ashes and refuse, the amount to be disposed of may be estimated at about 8 cwt. per annum per head of the population. The actual weight to be dealt with would therefore be as follows:—

500 inhabitants
8 cwt. per head per annum

20 ) 4,000

200 tons per annum.

A cell capable of burning 1 ton per day would therefore be ample for present requirements. Such a cell might be of a very simple type, consisting essentially of a chamber 10 ft. wide by 5 ft. deep by 8 ft. high, lined with firebrick. The grate should be raised about 2 ft. from the ground, with an ashpit underneath. It should be 4 ft. in width, and a sloped drying hearth, 3 ft. wide, should be provided on either side. Access is obtained to the grate, ashpit, and each drying hearth by doors in front, sliding in guides and counterbalanced by weights hanging over pulleys. The flue may be taken off the back of the cell, and if the site be at a good distance from houses, &c., a chimney of very moderate height will suffice. The cell should be started with a coal fire on the grate, the first refuse being placed on the right drying hearth. The next refuse is placed on the left drying hearth, and the dry refuse raked over the fire. By putting refuse in on the left and right sides alternately, dry refuse is supplied, and the fire kept constantly burning. This simple form of cell can easily be managed by one man. (T. R.)

## Notes.

### QUESTIONS AND ANSWERS IN BOOK FORM.

We are often gratified by receiving from readers of the "Assistants' and Students' Section" letters in appreciation of the information supplied through its medium, many of which have contained the suggestion that a selection of the questions and answers which have appeared should be republished in book form. We are glad to be able to announce that such a book has been prepared, and will be issued very shortly. The selected answers have been arranged under headings according to their subject-matter, and it is hoped that the book may have a wide circulation.

**Water Purification by Ozone at St. Petersburg.**—A large plant for the purification by ozone of water taken from the river Neva has been laid down in St. Petersburg. In this plant, which has a capacity of 11,000,000 gallons per day, the water is pumped direct from the Neva into a series of eight settling and mixing tanks, in which a small quantity of aluminium sulphate is added. From these tanks it passes to a series of thirty-eight Howatson rapid filters, in which the filtering medium is finely ground flint. Passing thence, the water is led through the emulsifiers, which are water pumps working on the injector principle. Here the ozone is added, and the mixture then goes into a series of five sterilising towers. The purification takes place partly in the emulsifiers and partly in the towers, the delivery from the top of which is by means of a cascade, so that the water as it makes its way to the storage tank may be deaërated. The ozonising battery consists of 128 ozonisers of the Siemens & Halske pattern. Electric current, at a pressure of 7,000 volts, is required to work this battery. A concentration of 2·5 grammes of ozone per cubic metre of air is employed. The power necessary to operate the installation is about 300 horse, and the cost of working, including that of the aluminium sulphate, is given as being from 17 to 19 cents a thousand gallons. It is stated that excellent purification results from the treatment, and that practically all the bacteria, including all those of a harmful nature, are eliminated. *The Contract Record* (Toronto).

## IMPORTANT POINTS IN REINFORCED CONCRETE WORK.

### MR. E. P. WELLS AT THE LONDON SCHOOL OF BUILDING.

An audience of over 100 persons listened to a lecture on the subject of reinforced concrete, delivered by Mr. E. P. Wells, J.P., Concrete Institute, on March 18th, at the London County Council School of Building, Ferndale-road, Brixton, S.W. A subsequent demonstration was given in the mechanics' laboratory of a new piece of apparatus which had been designed by the assistant principal of the school, Mr. Arthur R. Sage, and Mr. A. E. Everett, for the determination of the modulus of elasticity of concrete which is being used in connection with the class instruction in the theory and practice of reinforced concrete construction given by Mr. H. Kempton Dyson, secretary of the Concrete Institute, and assistants.

The practical side of reinforced concrete, Mr. Wells contended, was of the utmost importance in view of the poor quality of workmanship ordinarily employed. The increase in the use of reinforced concrete since 1900 had been greatly due to the fact that architects, engineers and others had become convinced of the possibilities of the material. It had been proved to be more economical than steel frame construction used in buildings, in some cases a saving from 15 to 20 per cent being effected. The design of reinforced concrete opened out a great field for efficient instruction therein which the London County Council School of Building was giving.

In reference to drawings, the lecturer advised the use of single lines, varying in thickness, for showing the reinforcement, the advantages being in preventing confusion, in being more quickly seen, in not tiring the eyes so readily as two lines, and in saving time.

MATERIALS.

Referring to materials, he stated that cement should be kept free from dampness, cold or damp air, and stored in airtight bins, and that it should be tested directly it was delivered on the site of the works, and then, if quick use was required, three-day tests should be made. For soundness the Chatelier tests were sufficient.

An instance was referred to of some church foundations where, the cement having been hydrated before use, the concrete showed dampness throughout its entire length, and was easier to excavate after being down twenty years than the clay underneath it. The present-day cement was more liable to hydration than that of twelve to fifteen years ago, owing to its greater fineness. The sand used in concrete should be absolutely clean and free from dirt, and the grains should not be the same size; this would result in the concrete being more homogeneous, impervious to moisture, and stronger.

Great care should be exercised in the selection of the water, which should be thoroughly clean and free from vegetable matter and salts that were deleterious to concrete; salt water itself did no harm, but it was advisable not to use it owing to its hygroscopic nature. The steel employed should conform to the British Engineering Standards Committee's specification, and tests should always be made periodically to ensure that the quality did not fall off.

It was advisable to have cubes of concrete made on a job and to test them, whatever the time of the year, keeping one set under laboratory conditions and another under the same conditions as those under which the work was carried out. That would form a gauge as to when the concrete on the works reached the strength required to take up the stresses for which it was designed, so that it should be known when it was safe to remove the centering.

The centering should not be made of light material, otherwise on removal it might be found that the sides would have bulged out and settlement taken place throughout the work. This was not only ugly, but required extra expense in plastering. Centering should be so constructed that it could be removed easily without having to cut out the timber. In some cases it was more costly to pull down than to put up. The area of the base plates under struts should be sufficient to carry all the loads on them, or settlement would occur, which would probably result in large shear cracks in the beams over the supports and destruction of the adhesion between the steel and concrete.

Once concrete was put into place it should on no account be disturbed. The centering should be left up for a minimum period of three weeks, except for floor slabs and the sides of beams, which might be removed within seven days; but should the compression tests disclose a low crushing the centering should be left in place from four to six weeks, or even longer.

SUPERINTENDENCE.

Efficient superintendents were essential if the work was to be carried out in the manner designed, lack of attention in this direction often resulting in serious accidents.

Referring to the placing of steel, the lecturer had sometimes employed small concrete blocks, slightly dovetailed in section and lightly reinforced, which were laid at the bottom of the beam casing, thus ensuring that the rods were the proper distance from the bottom and sides of the boxes, and preventing any displacement from the calculated positions required.

The concrete should be of a wet nature to enable it to flow readily round the reinforcement and to do away with excessive ramming and liability of damage to the reinforcement. An advantage of using dry concrete was that it attained its maximum strength at a much earlier period than that of a wet nature, but at the same time oxidation of the steel might set in owing to the concrete being too porous; also the adhesion in most cases would be weakened. If on removing centering large aggregate were found on the surface with an insufficient amount of sand, such portions should be covered with a wash of cement-grout, and a 1 to 1 sand and cement mortar forced into the interstices and finished off with a wooden float.

A mistake as regards floor finishing with granite or granolithic was to adopt too high a finish for the work, the consequence being that the initial set was broken up before the surface was completely finished. The remedy was to trowel the floor once and then leave it. But if a smooth surface were required it should be rubbed over with holystone and sand.

After the whole works were completed, final testing by loading over at least two bays to an excess of 50 per cent beyond that for which it was designed was often done. If the work had been carried out efficiently then the deflection of the floor noticed should, after the load had been taken off, be entirely recovered and return to its normal state.

## SOME RECENT PUBLICATIONS.*

Depreciation and Wasting Assets. By P. D. Leake, F.C.A. Price 10s. 6d. nett. London: Henry Good & Son.

This book, as its title indicates, makes its primary appeal to the professional accountant, but it will also be found of considerable value to those who may be responsible for the management and control of the various municipal trading enterprises which are so common a feature of the life of to-day. The duty which frequently devolves upon the municipal engineer of managing a trading enterprise in the soundest and most economical manner directly involves some knowledge of the maintenance of the capital value of the concern. It is also necessary for him to be able to compute the exact cost of production of his commodity in order to fix a low and yet economically sound selling price. For both these purposes the effects of depreciation and wasting assets must be taken into consideration, and in this connection Mr. Leake's book will be found of great value. The twelve chapters into which it is divided include among the subjects dealt with: Fixed and floating capital; Economic cost; The interest question; Industrial plant—measurement of depreciation; Record of depreciation; Purchased terminable annuities; and Purchased terminable concessions—leaseholds. It will thus be seen that the work is comprehensive in its scope, and, being at the same time concise and lucid in style, it will be evident that it is a valuable addition to the literature of a subject which has not hitherto received the attention which its importance deserves.

**Fire Hydrants.**—The London County Council have accepted the tender of Messrs. Ham, Baker & Co. for the supply of all the fire hydrants required for their area during the next three years. The same firm have contracts in hand in connection with sewage works at Eastbourne, Cairo, Toronto, and Rio de Janeiro.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

## INTERNATIONAL ROAD CONGRESS, LONDON, 1913.

### QUESTIONS FOR CONSIDERATION.

The questions to be considered and discussed at the Third International Road Congress (London, 1913) have now been settled by the Local Organising Committee with the concurrence of the Committee of the Permanent Association of Road Congresses.

It includes a list of the questions on which papers are invited, and on which discussions will take place at the congress in June, 1913, and a list of the subjects on which communications are invited, but on which no discussion will take place.

The questions have been arranged so as to continue the investigations from the point at which they were left by the congresses at Paris and Brussels. Subjects that were fully dealt with at the previous congresses have been omitted, and overlapping has been eliminated so far as possible. A new sub-section has been included to deal with "Administration, Finance and Statistics," subjects which were not discussed at previous congresses.

A committee, consisting of Messrs. H. Percy Boulnois, late of the Local Government Board; H. P. Maybury, county surveyor of Kent; A. D. Greatorex, president of the Institution of Municipal and County Engineers; R. J. Thomas, president-elect of the Institution of Municipal and County Engineers; T. B. Heslop, secretary to the County Surveyors' Society; and J. Walker Smith, chief inspector, Local Government Board for Scotland, has been nominated to select the authors of the papers for the first section (Construction and Maintenance of Roads); and a second committee, consisting of Messrs. Shrapnell Smith, honorary treasurer of the Commercial Motor Users' Association and the Roads Improvement Association; J. Willmot, county surveyor of Warwickshire; J. E. Jarratt, town clerk to the county borough of Southport; and Hampton Copnall, county clerk of Nottinghamshire, to select writers on the questions in the second section (Traffic and Administration). The chairman, Sir George S. Gibb, and the hon. secretaries, Messrs. W. Rees Jeffreys and G. Montagu Harris, are *ex-officio* members of both committees.

Engineers, surveyors and others engaged in public administration, who have made special studies of one or more of the subjects included in the questions, and who are in a position to communicate papers or memoranda giving data and results from personal investigation since the Brussels Congress in 1908, are invited to communicate with the hon. general secretary at the Road Board offices.

An exhibition of road construction machinery and appliances will also be held at the Royal Horticultural Society's Hall, Vincent-square, Westminster, S.W., and on adjoining ground during the week of the congress. Applications for space should be made, and copies of the special rules and by-laws of the exhibition and forms of application for exhibitors can be obtained, on application to Mr. W. Rees Jeffreys, honorary general secretary, the Road Board, Queen Anne's Chambers, Westminster, S.W.

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**Coast Protection in the Solway Firth.**—The Local Government Board have sanctioned a loan of £5,600 to the Holme Cultram Urban District Council for sea defence works on the North Cumberland coast.

**Porthcawl Water Supply.** The tender of Messrs. Parkinson & Hodges, of Swansea, has been accepted by the urban district council for the carrying out of the Porthcawl water supply improvement works. The amount of the firm's tender is £4,000.

**Registration of Architects.** A statement on the question of statutory registration and other matters has been issued by Mr. G. E. Bond, president of the Society of Architects. Mr. Bond recalls that in January last a general meeting of members of the Royal Institute referred back to their council certain proposals for fusion with the society and the promotion of a Registration Bill. The members of the society have severely criticised these proposals by correspondence, particularly the terms of fusion. Amalgamation was originally suggested because the representatives of the two bodies could not agree on the subject of registration. Mr. Bond observes that, though the society is ready to continue negotiations for a joint Bill, it is prepared, if necessary, to resume at any moment its independent propaganda.

## DEATH OF MR. LEWIS ANGELL.

### FOUNDER OF THE INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

With the deepest regret we have to announce the death, which took place at Eastbourne on Friday last, of Mr. Lewis Angell, M.INST.C.E., the founder and first president of the Institution of Municipal and County Engineers.

Sir James Lemon and Mr. Charles Jones, borough engineer of Ealing, are now the only survivors of the half dozen men which were responsible for the creation of a body which at the present time has a membership of over 1,200. It was on March 11, 1871, that a meeting took place at Mr. Angell's office to discuss the formation of an association for the promotion of the interests of surveyors to public authorities and of that branch of sanitary science falling within their official duties, those present on the occasion in addition to Mr. Angell being Mr. J. E. Greatorex, of Portsmouth—father of the present occupant of the presidential chair; Mr. Jacob, of Bromley; Mr. C. Jones, of Ealing; and Mr. Monson, of Acton. The Institution—or, as it was first styled, the Association of Municipal Sanitary Engineers and Surveyors—came into existence just two years later, the inaugural meeting, at which Mr. Angell was unanimously elected president, being held on May 2, 1873, at the Institution of Civil Engineers. In his inaugural address Mr. Angell said: "Municipal life demands sanitary precautions, public works and official supervision; in other words, municipal life involves those bugbears of the ratepayer, taxation and officials, and we, the officials, are here to-day in association assembled." Speaking of the methods adopted in selecting officials, he remarked that the election of a town surveyor was generally a free fight, and too frequently a farce—an observation which, in part at any rate, may be said to hold good at the present day. His opinions as to the inadequacy of the remuneration of municipal engineers were equally to the point. "So long," he said, "as the town surveyor is paid out of local rates I fear he must be content with small pay or seek some other market for his services. . . . The British ratepayer will willingly tax himself for beer, spirits, tobacco and other health-destroying agents—he will even pay his doctor—but he will not, willingly, be taxed for preventive sanitary measures."

Mr. Angell was re-elected president in 1874.

The professional career of the founder of the Institution of Municipal and County Engineers commenced in Cambridge, in which town he was articled to Mr. R. R. Rowe, M.INST.C.E., F.R.I.B.A., and he afterwards became assistant in the city surveyor's office, Norwich. He subsequently spent two years on the engineering staff of the London and North-Western Railway, a position he resigned upon being appointed surveyor for the Wandsworth district under the Metropolitan Board of Works. In 1863 he was appointed borough engineer of Portsmouth, and in 1867 borough engineer and architect of West Ham, a position which he held at the time the institution was formed. For several years Mr. Angell also engaged in private practice at Westminster, but the phenomenal growth of West Ham created such a demand for his services that he was eventually obliged to devote himself entirely to his municipal duties. He advised upon and carried out many works of magnitude in connection with public buildings, sewerage and sewage disposal, and was in 1874 awarded the first premium of 200 guineas offered by the Corporation of Margate for the best scheme of drainage for that borough. He was a Fellow of the Royal Institute of British Architects, and a member for more than fifty years of the Institution of Civil Engineers. In 1876 he was a vice-president of the Social Science Congress at Liverpool, and a member of the council of the International Congress of Hygiene and Demography held in London in 1891. He was eighty years of age.

The funeral took place on Wednesday at St. Peter's Church, Eastbourne, Mr. Thos. Cole representing the Institution of Municipal and County Engineers.

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**Important Sewerage Scheme.**—A draft agreement with respect to the terms upon which the London County Council is prepared to receive the sewage of the districts of Walthamstow, Leyton, Enfield, Edmonton, and Southgate into its main drainage system has been sent to the district councils concerned. The proposed trunk sewer is estimated to cost £242,000.

# Law Notes.

Edited by J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

*The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, one side only) should be addressed to "The Law Editor," at the office of* The Surveyor, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—*i.e.*, without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

Highway: Railway Company and Public Rights.—An interesting question as to the powers of a railway company to close a highway was decided in *Great Central Railway Company* v. *Balby-with-Hexthorpe Urban District Council*; *Attorney-General* v. *Great Central Railway Company* (Chancery Division, Mr. Justice Joyce, February 23rd). In 1862 the railway company under the powers of an Act of Parliament closed a strip (A) of a public highway crossing a coal yard belonging to the company. The strip thenceforth remained closed, being utilised for railway purposes. In 1875, under further statutory powers, the company acquired a further strip (B) adjoining A of the highway, but they had no power to extinguish public rights thereon. In 1891, by a further Act, the company were empowered to acquire a third strip (C) of the highway, the Act providing that all rights of way over any land which should be compulsorily acquired thereunder should be extinguished. The company purchased C, not under their compulsory powers, but by agreement, and used it as a railway siding. The urban district council having claimed a public right-of-way across the railway at A, the company applied for an injunction to restrain the exercise of such alleged right. The council, with the concurrence of the Attorney-General, in a cross-action claimed a declaration that the public right of way over B and C still existed. The company contended that the rights over C were extinguished by the last-mentioned Act, and that if A and C were closed, B must be closed also, as there would then be no public right of access to it. The council alleged that A had never been in fact closed as a public footpath, or in the alternative that it had been rededicated by the company. Mr. Justice Joyce held that A having been closed by the company under statutory authority, and the site having vested in the company for statutory purposes, the company had no power to rededicate it; but that C having been acquired by agreement and not compulsorily, the public rights of way thereon had not been extinguished, so that public rights over B and C still subsisted.

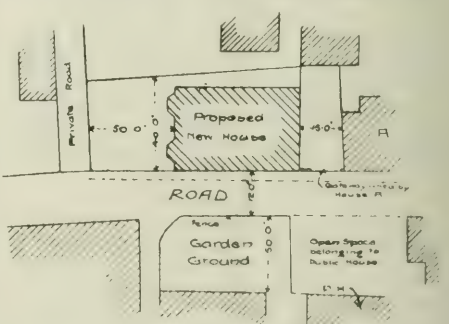
## QUERIES AND REPLIES.

*In order to avoid confusion querists are requested to use distinctive words as* noms de plume. *The letter* X, *combinations such as* X.Y.Z., *and words such as* "engineer" *and* "surveyor," *should never be used.*

Building By-laws: Stables, Earth-closets, &c.—"Bon Accord" writes: I shall be extremely obliged if you will kindly answer the following, giving the correct version. I enclose copy of by-laws in force in my district. (1) Stable Built with 9-in. Brickwork.—Being a domestic building, am I right in recommending my council to refuse their sanction to plans for stables which do not provide for the necessary air-space in the rear (vide by-law 52)? (2) Stable Built with Timber Framing and Weather Boarding.—Being as above, domestic buildings covered with weather boarding, it does not come under the partial exemptions provided for by by-law 3, which apply to buildings comprising not more than one storey, constructed or covered with sheet-iron. Should such a stable covered with weather boarding comply with the conditions laid down in by-law 4? You will note clause 2 of by-law 4 provides that the external framing shall be covered with impervious material (this we have allowed to be weather boarding). Clause 3 provides that the internal portions of the external walling shall be covered with plaster, &c. We have not enforced the latter with regard to stables. Do clauses 4 and 5 apply to such buildings? (3) Earth-closets and Privies.—By-law 72 provides that the above shall be at least 10 ft. from a dwelling-house or public building. Knight's annotated model series, defining thickness of wall for domestic buildings, adds a footnote, as follows: "Note. The thickness prescribed in this clause are applicable to the external walls and party walls of domestic buildings, and would accordingly apply to ordinary dwelling-houses, &c." Now, my contention is that if an earth-closet is 10 ft. distant from a dwelling-house or public building, or any building, &c., it need not comply with the by-laws with regard to thickness of walls, and that they may be constructed with 4½-in. work. Am I right? (4) Again, the by-laws provide that above shall be 10 ft. distant from a dwelling-house or public building, &c., and do not refer to "domestic buildings." Would plans be in order which show the required 10 ft. from the dwelling-house to the earth-closet? But adjoining this earth-closet, the opposite end to the house, it is proposed to erect a wash-house, with a copper and flue in it, the earth-closet being attached to the wash-house. Is this, in your opinion, in accordance with the by-laws? In mine it is, as the by-laws say 10 ft. from a dwelling-house, &c., which a wash-house used occasionally cannot be (in my opinion).

(1) Yes. (2) In my opinion a timber-framed weather-boarded stable, in order to be exempt from the operation of by-laws 12 to 31, must fulfil all the conditions specified in by-law 4, and the council have no power to waive any of those conditions. (3) The by-laws with respect to the structure of walls are not altogether consistent. By-law 12 permits the use of timber framing and 4½ in. brickwork in the case of a "domestic building" 5 ft. from adjoining premises and 10 ft from any adjoining building not being in the same curtilage. But by-law 20 requires the walls of every "domestic building" to be of brick, stone, or other incombustible material of a minimum thickness of 9 in. Presumably by-law 20 must be read as being qualified by by-law 12. If so, it would appear that an earth-closet or privy which complies with the conditions specified in by-law 12, and also with the requirements of by-law 72, may have its walls constructed as permitted by by-law 12. (4) Unless any person may be, or may be intended to be employed in the wash-house in any manufacture, trade or business, there would appear to be no contravention of by-law 72 in the erection of the earth-closet adjoining the wash-house.

Building By-laws: Air-space.—"Ayot" writes: Plans have been submitted for the erection of a new house, shop, and workshop on the plot of ground shown in sketch. The front door of the house will be between the bay windows shown; the back door, however, will be at the side further from the road, the shop front and door being on the side abutting the road, and the workshop and entrance thereto on the remaining side further from the front door. Am I right in requiring that 24 ft. clear space (by-law 9) should be provided from the fence on the opposite side of the road to the side of the house abutting on the road? The question arises as to whether I am justified in taking the side of the house (although the shop fronts thereon) for the purpose of by-law 9? The owner tells me he has been advised that the garden ground (private property) opposite the site should be considered in measuring the 24 ft. clear space required to comply with the by-law, and that this has been the subject of a recent decision, but I do not recollect having seen this. Of course, if the additional 12 ft. is taken off the building plot, it will be impossible to build as suggested; but, if I am not mistaken, the building may be moved along sufficiently to comply with by-law 10.




In my opinion, upon a reasonable interpretation of by-law 9, there must be an open space in that side of the building which abuts on the road, and the distance across the space from the building to the opposite side of the road must be 24 ft. I am not aware of any such decision as referred to by the owner, and I cannot think that any Court would so overrule the plain language of such a by-law as this, which distinctly requires a distance of 24 ft. measured "to the opposite side of any street which such building may front."

# The Surveyor

And Municipal and County Engineer.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Conversion of Privies.—"Steel" writes: The urban district council in 1908 adopted Part III. of the Public Health Acts Amendment Act, 1907, and up to the present notices for the conversion of insanitary privy-closets into water-closets have been served under sec. 36 of the Public Health Act, 1875. The question has now been raised as to whether notices should not be served under the Public Health Acts Amendment Act, 1907. (1) Is it compulsory to proceed under the Public Health Acts Amendment Act, 1907, if the work is not being carried out as a general scheme? (2) Sec. 39 of the 1907 Act states where any work is done by the local authority in default of the owner, one-half of the expense shall be borne by the local authority. In case the owner carries out the work in accordance with the notice, can the owner require the council to pay half the cost?

(1) Sec. 11 of the Act of 1907 provides that all powers given to a local authority under that Act shall be deemed to be in addition to, and not in derogation of, any other powers conferred by any other Act. Notices may still be given, therefore, under the Act of 1875, but a local authority cannot under that Act lay down a general rule requiring the conversion of privies into water closets, without reference to the particular circumstances of each case. See *Wood* v. *Widnes Corporation* (1896, 1 Q.B., 293). Under sec. 39, sub-sec. (4) of the Act, if there is a sufficient water supply and sewer, the local authority can require any privy to be converted into a water closet, irrespective of any question as to the "sufficiency" of the privy: and this would appear to allow the laying down of a general rule, since it is not necessary to consider the particular circumstances of each case. (2) There is no provision in the section enabling the owner who complies with the notice to require any payment to be made by the local authority.

Patent: Patentee's Rights.—"North Country Subscriber" writes: I should be glad to receive your opinion on a matter which, although it does not directly affect the practice of surveyors from an ordinary point of view, may be of much interest to surveyors in general. A person applies for, and is granted, letters patent for a certain article. Is it open to any other person or company to produce such article without licence from the patentee, provided that the article is produced by and for the use of such person or company that is to say, that such an article so produced is not sold to a third person or company?

No. The letters patent confer upon the patentee the sole privilege of making, as well as that of selling, the patented article.

**We have to draw the attention of querists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6 in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.**

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Alnwick U.D.C.** (March 22nd. Mr. A. A. G. Malet).—£4,000 for water supply works for the town.—There was no opposition. Mr. Robert Middlemas, clerk to the council, referred to the efforts that had been made to improve and augment the present supply, and said the council had been, during dry seasons, assisted by the Duke of Northumberland from springs in Alnwick Park, and now his Grace, in response to the council's application, had generously agreed to grant a lease of forty-one years at favourable terms to the council of the water from the springs in Alnwick Park, from which the districts would derive an available and sufficient supply of pure spring water, which, together with the supply from the excellent sources which the council proposed to retain, would fully meet the requirements of the district. Mr. H. Taylor, civil engineer, Newcastle, said the quantity of water required was about 210,000 gallons. Mr. W. Weston said that the council would like the repayment of the loan to be as long as possible, certainly not less than forty-one years. The inspector said he was afraid that there was no chance of getting that.

**Barnsley T.C.** (March 14th. Mr. Courtenay Clifton).—£6,664 for the extension of water mains, £2,400 for the purchase of Messrs. Robinson's wood-yard (Doncaster-road), and £600 for the erection of offices there for the highways department. The waterworks manager, Mr. Taylor, stated the amount asked for was expected to provide for the needs of the town for ten years hence.

**Blofield (Norfolk) R.D.C.** (March 6th. Mr. A. A. G. Malet).—£10,750 for the purpose of sewerage and sewage disposal for the parish of Thorpe St. Andrew.—Mr. Arthur J. Martin, M.Inst.C.E., stated that the proposed scheme, prepared by him for the council, included a complete system of sewers for the village and a complete set of purification works. The works were designed for 2,000 people, ample room being left for extension. The dry-weather flow was assumed to be 20 gallons per head per day, or 40,000 gallons per day from the prospective population. The sewers would range from 6 in. to 12 in. in diameter. Storm water would be excluded as far as possible. The drainage area was intersected by a number of valleys which made it impossible to bring the whole of the sewage to any one point by gravitation. Two pumping stations were therefore provided. The sewage would be purified on modern biological lines. The purification works were capable of dealing with 120,000 gallons a day, being three times the dry-weather flow.

**Bournemouth T.C.** (March 12th. Mr. W. O. E. Meade-King).—£6,350 for works of sewerage and surface-water drainage in the Southbourne and Moordown districts, and for £800 for other works of surface-water drainage.—The town clerk, Mr. H. Ashling, stated, in regard to the surface-water drainage, that the council had authority to do the work under the Public Health Act, and there was also a local Act of 1892, under which the corporation could call on any owner to put in surface-water sewers in those parts of the borough in which the corporation had provided or were providing some system of sewerage or surface-water drainage. It was under that Act that the council included certain cases that were taken before the magistrates, and it was owing to the magistrates' decision that the council had to apply for the loan. In other towns owners had to pay, and it seemed to him rather peculiar that in Bournemouth they should not have to do so.

**Dewsbury T.C.** (March 13th. Mr. Courtenay Clifton).—£1,503 for the provision of a fire brigade station.—The borough surveyor, Mr. H. Dearden, produced the plans for the new building, and explained them in detail to the inspector. The site of the proposed building is opposite the police station.

**Doncaster T.C.** (March 15th. Mr. H. Shelford Bidwell).—£33,000 for the purposes of the gas undertaking.

The amount which it was proposed to expend, it was explained, was £37,125, and deducting the £3,870 unexhausted borrowing powers, this left the £33,000 now asked for. The proposed expenditure was made up as follows: Extension of the house and stores, building chimney, retort bench, additional coal conveyer, hop-

pers and elevators, £8,350; condensers and connections, £800; additional boiler and foundation, £600; exhauster, £400; tar extractor, £200; scrubbing plant, £1,000; purifier, connections, &c., £1,400, gas holder, £9,600; district extension of mains, meters, &c., £4,000 per year for three years, £12,000; total £22,950; plus 10 per cent for contingencies, £3,375; grand total, £37,125.

**Esher and the Dittons U.D.C.** (March 22nd. Mr. F. O. Stanford).—£6,094 for additional works for purposes of sewage disposal—namely, the provision of new tanks and percolating filters.—The engineer and surveyor, Mr. H. C. Fread, explained the scheme in detail, and the clerk, Mr. E. A. Everett, stated that as regarded £3,000 for a certain portion of the work, the council thought they might reasonably ask that the repayment should be spread over ten years, and as regards £3,094 that it should be spread over twenty-five years. Those figures were suggestions as being the least burdensome to the area.

**Harrington (Cumberland) U.D.C.** (March 12th. Mr. H. R. Hooper).—This was an inquiry relative to the proposed purchase by the council of the undertaking of the Harrington Gas Light Company, Limited.—It was stated that the council proposed to borrow £8,500. The purchase price was £7,100, and the additional legal expenses brought it up to about £7,400. The council were asking for thirty-five years to pay it in. They would want £300 for meters and stoves and £600 for working capital. It would not be necessary to extend the mains at the present time. A sum of £200 would be required for a new tank, and they were also wanting a sinking fund of £630.

**Hipperholme (Yorks) U.D.C.** (March 15th. Mr. H. Shelford Bidwell).—This was an inquiry relative to the application of the council for a Provisional Order to take over the undertaking of the Bailiffe Bridge Gas Company and to supply gas for all purposes within a part of their district. Mr. G. W. Thompson, clerk, said that the willingness of the Halifax Corporation reasonably to discuss the boundary of the proposed area so far as the corporation was concerned had resulted in a limit being agreed upon, and that with respect to that portion which was in the Bradford Corporation gas area no rights of gas supply by any statutory authority had ever been exercised. The inspector also informally heard the evidence with respect to the council's application for a loan of £750 for the purchase of the undertaking.

**Leicester T.C.** (March 21st. Mr. Edward Leonard).—This was an application to borrow a further sum of £3,500 for the purpose of the extension of the town hall.—The town clerk explained that the accommodation provided for the various officers in the town hall buildings was quite inadequate. Three years ago the council obtained sanction to a loan of £8,500 for this purpose, but as the work had progressed further additions were discovered to be essential, and for these the additional loan of £3,500 was required. There was no opposition.

**Selby U.D.C.** (March 20th. Mr. Edward Leonard).—£2,000 for the purpose of making loans for the purchase of small dwellings.—Mr. Mark Scott, chairman of the council, said he supported the application most strongly because there was in Selby a considerable number of working men of the better class, earning good wages, who could afford to buy their own houses, and if the fact became known that the council were in a position to advance money these men would apply. Dr. Stedman and the surveyor (Mr. R. B. McG. Gray) spoke of the scarcity of houses in Selby. There was no opposition.

**Wallasey T.C.** (March 21st. Major C. E. Norton).—£6,120 for the purchase of land in Belvidere-road for the purpose of a recreation ground.—The mayor (Dr. Oldershaw) and Mr. W. H. Travers, borough surveyor, gave evidence in support of the application. The latter stated that the land proposed to be acquired was already used as a recreation ground, because there was no tenant in possession. Open spaces were most essential, and he thought that the existence of so many such spaces in Wallasey accounted for the low death-rate of the borough. They could not embark on too many open spaces.

**Walthamstow U.D.C.** (March 11th. Mr. Edgar Dudley).—£5,082 for the purchase of part of the Aveling Park estate for the purposes of an addition to Lloyd Park, and the provision of a depot and fire station, and for the appropriation of a site in Lloyd Park for council offices. The money, it was explained, was to be allocated as follows: Fire station, £151; tramway depot, £605; depot for works department, £605; nursery and greenhouses, £453; addition to playing field, £3,198.

**Wellington (Somerset) U.D.C.** (March 14th. Mr. W. O. E. Meade-King).—£1,900 for purposes of water supply and £2,000 for street improvement at the town hall corner.—The loan was asked for a period of thirty years. With respect to the water supply scheme, it was explained by the clerk, Mr. W. H. Ham, that it was proposed to purchase a spring at Payton, which would give an additional supply of 90,720 gallons per day, being at the rate of about 63 gallons per minute extra. The water would be pumped direct to a new service tank adjoining the old ones at Westford, the pumping main to be 4 in. diameter and cast-iron. It was proposed to provide oil engines (in duplicate) of 3½-horse power, and vertical treble ram pumps for the pumping. For the town hall scheme it had been found necessary to purchase certain properties for building and widening purposes.

### APPLICATIONS FOR LOANS.

**Abergavenny T.C.**—£17,000 for the extension of the waterworks.

**Bentley-with-Arksey U.D.C.**—£12,000 for sewerage and sewage disposal purposes.

**Carmarthenshire C.C.**—£4,194 for a new school.

**Cirencester R.D.C.**—£1,000 for a new fire engine and appliances.

**Dover T.C.**—£600 for improved machinery at the sea baths.

**East Westmorland R.D.C.**—£5,185 for a sewerage scheme for Kirkby Stephen.

**Egremont U.D.C.**—£2,000 for the gas undertaking.

**Exeter T.C.**—£7,070 for the purpose of the Rougemont estate and Castle-street Buildings.

**Harrogate T.C.**—£2,700 for the erection of a glass and iron structure at the Royal Pump Room.

**Llanrwst U.D.C.**—£5,000 for the new sewage disposal works.

**St. Helens (Isle of Wight) U.D.C.**—£1,900 for sewerage purposes.

**Wem R.D.C.**—£600 for water supply purposes.

### LOANS SANCTIONED.

**Aberavon T.C.**—£300 for street-making purposes.

**Chorley R.D.C.**—£850 for a water supply scheme.

**Finchley U.D.C.**—£15,750 for a school in the Great North Road.

**Poplar B.C.**—£69,626 for electricity purposes.

**Prescot (Lancs) U.D.C.**—£1,200 for a boathouse and offices at Taylor Park.

**Rawtenstall T.C.**—£250 for market and paving purposes.

### FORTHCOMING INQUIRIES.

| | £ |
|---|---|
| MARCH. | |
| 30.—**Bootle.** For the purposes of the electricity undertaking (Mr. H. R. Hooper) ... | 43,755 |
| APRIL. | |
| 1.—**Wood Green.** For street works (Mr. M. K. North) ... ... ... | 593 |
| 2.—**Croydon.** For sewerage purposes and the construction of a subway (Mr. F. O. Stanford) ... ... ... ... | 5,450 |
| 2.—**Durham.** For the provision of a ladies' lavatory (Mr. R. H. Bicknell) ... ... | 425 |
| 2. **Penzance.** For street widening purposes (Mr. Edgar Dudley) ... ... ... | 1,025 |
| 2. **Spalding.** For the purposes of the gas undertaking (Mr. A. A. G. Malet) ... | 4,000 |
| 3.—**Abercarn.** For the provision of a recreation ground (Major J. Stewart) ... ... | 1,425 |
| 3.—**Bosmere.** For water supply purposes (Mr. A. A. G. Malet) ... ... | 1,600 |
| 3.—**Cosforth.** For private street works (Mr. R. H. Bicknell) ... ... | 1,794 |
| 3.—**Lewes.** For works of sewerage (Mr. F. O. Stanford) ... ... ... ... | 290 |
| 3.—**St. Austell.** For street improvement purposes (Mr. Edgar Dudley) ... ... ... | 1,050 |
| 4. **Brighton.** For works of sewerage (Mr. F. O. Stanford) ... ... | 19,500 |
| 4.—**Paignton.** For new road purposes (Mr. Edgar Dudley) ... ... ... ... ... | 1,173 |
| 4. **Whitley.** For wood paving works (Mr. R. H. Bicknell) ... ... ... ... | 1,250 |
| 10. **Enfield.** For street improvement purposes (Mr. R. H. Bicknell) ... ... | 2,000 |

# Municipal Work in Progress and Projected.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Birmingham £30,000, Partick £8,225, Pembroke (co. Dublin) £12,000, Rhyl £5,000; housing and town planning—Stirling £15,000; roads and materials —Battersea £2,075, Dundee £15,000, Southampton £9,500, Southwark £8,300; sewerage and sewage disposal—Goole £32,035, Surrey £45,000; water, gas and electricity—Northampton £8,000.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

## ADMINISTRATION.

**Armagh C.C.**—The council have approved of the county surveyor procuring a motor car, and that his office expenses be altered to "office and travelling expenses," the county surveyor to indemnify the council against all accidents arising out of the use of the car. The County Surveyor's Committee recommended the procuring of motor bicycles for five assistant surveyors, and this was agreed to by the council.

**Deptford B.C.**—It has been agreed that the wages of the council's sweepers should be increased from 25s. to 26s. per week, and that those men who approve themselves to the Works Committee for industry and regularity should receive a further increment of 1s. per week at the end of one year from the date of the passing of the resolution.

**St. Colomb (Cornwall) R.D.C.**—A letter has been received from the county surveyor, Mr. A. E. Brooks, with reference to the keeping of the surveyor's main roads accounts. He asked that all accounts should be included in the statement rendered on March 31st in order to facilitate auditing, and so forth. The wages books should be kept on a uniform system, irrespective of parish boundaries, and a register book should be kept showing the exact amount of metalling put on each road every year. Other regulations were also suggested. Mr. Searle remarked that the surveyors would soon have to keep a clerk. Mr. Gilbert said the regulations were not so formidable as they looked. The chief change was with regard to including all the accounts up to March 31st. However, that difficulty could be got over. He thought they could estimate the last two weeks' expenditure up to a pound. The register book was a splendid idea. By means of it they would have a complete record of all the work done on any given road, and as the years went on would be able to turn it up and see the cost of the roads. On the motion of Mr. Searle it was agreed to reply to Mr. Brooks, stating that the surveyors were already acting up to some of the suggestions, and would endeavour to carry out the rest.

## BUILDINGS.

**Birmingham T.C.**—The Health Committee have decided to recommend the expenditure of about £30,000 upon the extension of the present sanatorium for consumptives. The Watch Committee recommend the purchase of the necessary land for the provision of new fire stations at Aston and Erdington.

**Brighton T.C.**—A bathing shelter for men is to be provided at a cost of £90.

**East Cowes U.D.C.**—The council are asking the Local Government Board to sanction a loan for an apron to strengthen the sea-wall.

**Edinburgh T.C.**—The council have confirmed the recommendation to erect a town hall for Portobello.

**Hove T.C.**—The tender of Messrs. McKellar & Westerman, Church-road, Hove, at £989, has been accepted for the erection of boundary walling and shedding at Erroll-road depot, and that of the same firm, at £84, for the erection of a greenhouse at St. Ann's Well Gardens.

**Partick T.C.**—Public baths and wash-houses are to be provided at an estimated cost of £8,225.

**Pembroke (Co. Dublin) U.D.C.**—A scheme, estimated to cost £12,000, has been proposed for the provision of public baths and wash-houses, and also for the extension of the pier and the purchase of ground for a recreation ground.

**Rhyl U.D.C.**—The plans of the surveyor, Mr. A. A. Goodall, for the Lower East Promenade extension, estimated to cost £5,000, have been adopted.

**Sutton U.D.C.**—The surveyor, Mr. W. H. Grieves, has received instructions to prepare an amended scheme for a shelter at the recreation ground, at a cost not exceeding £120.

**Yeovil U.D.C.**—The tender of Mr. Doddimead, of Shepton Mallet, at £194, has been accepted for adapting and fitting up a swimming bath that has been offered to the council by the Anglo-Bavarian Brewery Company.

## HOUSING AND TOWN PLANNING.

**Deptford B.C.**—Knott's-terrace, which belongs to the council, has produced a clear profit of £1,983, or an average of 5·9 per cent on the original loan over the 6¾ years during which the council have possessed it. This was after spending over £500 in repairs.

**Finchley U.D.C.**—The sanction of the Local Government Board is to be asked for the preparation of a town planning scheme.

**Glasgow T.C.**—It has been referred to a special committee to consider and report on the propriety of setting apart and utilising certain land belonging to the corporation for the erection of houses of the cottage type for the working classes.

**Kingston (Surrey) T.C.**—The necessary preliminary steps are to be taken to provide a town planning scheme under the Act of 1909 affecting Ham and the portion of the borough contiguous thereto, and it is to be suggested to the Ham Urban District Council that a conference be arranged between the two bodies and that a preliminary plan be submitted to the Local Government Board.

**Middlesbrough T.C.**—The Joint Committee of the Streets, Sanitary, and Plans Committee have approved the town planning proposals placed before them by Mr. S. E. Burgess, the borough engineer. These were previously embodied in a special report of some length, and at the committee meeting the borough engineer explained his scheme for dealing with important areas of the borough. The matter, as we have previously reported, had also been considered by a conference of property owners and other interested parties.

**Stirling T.C.**—It has been referred to the Public Health Committee to formulate and report on a scheme for the improvement of the slum area on both sides of St. Mary's-wynd. It is estimated that the scheme would cost £15,000, and that it could be carried out by an addition of 2d. per £1 to the rates.

**Yeovil T.C.**—The tender of Messrs. Moggridge & Sons, of Taunton, has been accepted for the erection of 100 workmen's dwellings.

## PARKS AND OPEN SPACES.

**Greenock T.C.**—It has been agreed to proceed with the work of completing the laying-out of Lady Alice Park, including the provision of a bowling green, to cost £1,700.

**Preston T.C.**—The council are to be recommended to apply to the Local Government Board for permission to borrow £5,450 towards the cost of laying-out the Haslam Park, the gift of Miss Haslam, who has also given £4,000 towards the cost of laying-out the park. The total estimated cost of landscape construction is £10,647.

## REFUSE COLLECTION AND DISPOSAL.

**Plymouth T.C.**—The tender of Messrs. T. Battishall & Sons, at £468, has been again accepted for the removal of house refuse in the added areas.

## ROADS AND MATERIALS.

**Basingstoke T.C.**—The tender of Messrs. Wallis & Stevens, Limited, at £489, has been accepted for a steam roller and scarifier.

**Battersea B.C.**—A portion of St. John's-road is to be paved with wood, at an estimated cost of £2,075.

**Brighton T.C.**—Tenders are being invited for laying wood paving in North-street, West-street, Duke-street, and St. James's-street.

**Devonport T.C.**—The plans for the widening of the top of Fore-street have been approved and ordered to

be sent to the War Department. The proposed improvements include taking down the wall on each side of the street, and substituting dwarf walls with railings.

**Dewsbury T.C.**—Consent has been given by the county council to the paving of portions of the Wakefield and Halifax main roads, at a cost of £2,347.—Victoria-road, from Bradford-road to Low-road, is to be paved with granite, and the surveyor, Mr. H. Deardon, has been instructed to prepare an estimate for a further street improvement.

**Dundee T.C.**—The city engineer has submitted a proposal that a sum of £15,000 should be spent on the improvement of roads on the outskirts of the city.

**Ealing T.C.**—The tender of Messrs. Clements, Knowling & Co., at £627, has been accepted for laying indurated Victoria stone in Midhurst-road.

**Epsom U.D.C.**—An Aveling & Porter steam roller, with Morrison scarifier attached, is to be purchased at a cost of £500.

**Greenock T.C.**—Arrangements are being completed for the acquisition of property to widen Dalrymple-street.

**Hove T.C.**—The tender of Messrs. J. Parsons & Sons, Church-road, Hove, at £99, has been accepted for executing street works in Davigdor-road.

**Huntly T.C.**—The burgh surveyor reported at a recent meeting that, in accordance with instructions from the council, he had been in correspondence with the agents for Rocmac, and from that correspondence, and information received personally from surveyors who have tried it, he was of opinion that it would be worth trying on Gordon-street. The council decided to proceed with the work from Nelson-street to Upperkirkgate.

**Kingston (Surrey) T.C.**—For the year ensuing the tender of Messrs. J. & C. Stickley has been accepted for the supply of horse, harness and driver for watering the roads or carting purposes at 8s. per day, 5s. per half-day; or for the above, including cart or trolley, 9s. and 5s.—The wages of the road foreman have been increased (by 5s. per week) to £2 15s.

**Melton Mowbray U.D.C.**—Improvements of the pathways of the town are to be carried out on an extensive scale.

**Norwich T.C.** It has been agreed to purchase for £100 a strip of land for the purpose of a widening scheme at the junction of Dereham-road and Barn-road.

**Paignton U.D.C.**—The surveyor, Mr. C. O. Baines, has been asked to prepare a scheme for the widening of the road near the Torquay gasworks.

**Peterborough T.C.**—Jarrah wood blocks are to be laid down in Narrow-street, at a cost of £350.

**Plymouth T.C.**—The tender of Mr. T. Doney, at £777, has been accepted for making up Rosslyn Park-road, and tenders have been invited for paving Endsleigh Park-road-lane.

**Southampton T.C.**—A proposal is under consideration to spend a sum of £9,500 in making up various roads with asphalt, tar and macadam. Last year the council spent a sum of £9,000 upon road improvement.

**Southwark B.C.** — Among the recommendations which the Works and Depot Committee make with regard to street improvements in the borough is one having reference to the repaving of Blackfriars-road. The cost of repaving it with wood is estimated at £8,300. As it has been stated that London motor-buses and cabs furnish the Road Board with at least £70,000 per annum in the shape of petrol tax, it is suggested that a portion of this sum should be applied to street improvements within the areas of the metropolitan borough councils. The committee recommend that application should be made to the board for a grant of £12,000, for the purpose of asphalting Hillingdon-street and of repaving with wood Blackfriars-road.

**Surrey C.C.**—At their last meeting the council agreed to furnish the Road Board with certain statistics at an estimated cost of £140, and it was decided to call the attention of the board to the expense of furnishing them with the statistics so frequently demanded.

**Taunton R.D.C.** The chairman, at the recent meeting of the council, stated that one of their rolling contractors had come to him in great trouble. He had contracted for coal to cover himself for twelve months, but now, owing to the strike, he could not get coal, and therefore could not proceed with the rolling. The only coal he could get was 13s. a ton above the contract price. There seemed to be only two courses open to them, and those were to stop rolling or to agree with Mr. Burch to pay the extra cost of the coal. It would mean 4s. a day extra for each of their rollers. The matter was left in the hands of the chairman to arrange for the ensuing fortnight.

**Tonbridge R.D.C.**—The council have given an order to Messrs. Aveling & Porter, Rochester, for a 5-ton steam tractor with two trucks.

**West Riding C.C.**—A report of the Highways Committee has been adopted with respect of the contributions made towards the maintenance of non-main roads, which are annually made under the provisions of sec. 11 (10) of the Local Government Act, 1888 (and which are wholly within the discretion of the county council. These have been hitherto for the most part distributed according to the number of through vehicles using the roads. The committee recently revised such of the contributions as had been in force for the past five years or more, on the basis of the tonnage carried along the roads by through traffic, which in their view was a more equitable standard of user. They were of opinion that no contribution should be made unless the proportion of through tonnage was substantial, and they fixed 16 per cent as the minimum, no payment to be made in respect of the first 15 per cent. Consequently several local authorities who had hitherto received grants will cease to do so, and a considerable saving would, it was reported, be effected annually.

## SEWERAGE AND SEWAGE DISPOSAL.

**Droitwich R.D.C.**—At the meeting last week a letter was received from the Local Government Board in reference to the application of the council to borrow £1,702 for draining Ashwood-road, Blackpole, and Bilford-lane, portions of the parish of Claines, near Worcester, the sewage from which it was proposed to carry into the Worcester city sewers. At the inquiry by their inspector the board found the council and the city council were not agreed on the question of the surface water, and they accordingly regarded the proposed scheme as impracticable. The information obtained also clearly showed that there were other portions of Claines parish in need of drainage, and it was suggested that the council should prepare a general scheme for the parish. The chairman said that meant beginning all over again, and the committee who had had the matter in hand were instructed to consult with the engineer.

**Goole U.D.C.**—The new sewerage scheme has received official sanction, and the repayments of the borrowed money have been arranged as follows: Estimated cost of sewerage works, £32,035, thirty years allowed; estimated cost of machinery, £320, forty years allowed; purchase of land for pumping station, £285, sixty years allowed.

**Kingston (Surrey) T.C.**—The tender of Messrs. Peter Spence & Sons to supply about 200 tons of alumina for the sewage works, at 24s. per ton, has been accepted, as well as that of Messrs. G. Palmer & Sons for about 80 tons of charcoal, at 30s. per ton.

**Norwich T.C.**—It has been agreed to provide, at the Trowse pumping station, a coal store, an overhead light runway, with hoisting gear, a house for the foreman engineer, store for dry materials, and three pairs of cottages at Whittingham Farm, at a total cost of £2,430.

**Standish (Lancs) U.D.C.**—Tenders have been accepted for the construction of the sewage outfall works and pipes for the eastern portion of the district.

**Surrey C.C.**—The Highways Committee have been authorised to engage a qualified engineer to advise them with respect to a surface-water drainage scheme. It is proposed by the Croydon Rural District Council to lay surface-water sewers for the portion of the rural district lying to the east and south of the borough of Croydon, which area includes the Eastbourne and Brighton main roads. The proposal is to convey the surface water from this area by means of a large concrete tube sewer under Russell Hill, and to discharge it into the river Wandle at Beddington. The scheme is one of very considerable magnitude, involving an expenditure estimated at from £45,000 to £60,000, according to the amplitude of the provision made.

## WATER, GAS, AND ELECTRICITY.

**Abergavenny T.C.**—A waterworks extension scheme is to be carried out at an estimated cost of £1,750.

**Chelmsford R.D.C.**—Mr. J. Dewhirst, the engineer, has presented a scheme in connection with the Broomfield water supply for a second borehole 320 ft. deep adjoining the completed one, a pump to be fixed in each capable of lifting 5,200 gallons of water per hour, two treble ram pumps to be provided for lifting the water to the tank on a water tower. For motive power it is proposed to put down two gas engines, each of about 20-horse power when working on suction gas. The whole of the pumping and power plant will thus be in duplicate. Adjoining the engine-house, and on the same site, it is proposed to erect a brick water tower 106 ft. high, on the top of which would be a cast-iron storage tank of 25,000 gallons capacity, designed so that it could be extended to a capacity of 37,500 gallons. The estimated cost of the scheme is £5,414. The loan sanctioned for preliminary works was £850, of which £470 has been spent.

**Evesham R.D.C.**—The seal of the council has been affixed to an agreement with Lord Elcho for the acquisition of important springs at Titcombe Wood by the Joint Water Committee. The maximum daily supply from this source is 250,000 gallons and the minimum 100,000 gallons. This will greatly augment the supply of water to villages supplied under the villages water scheme.

**Haltwhistle (Northumberland) R.D.C.**—Consideration is being given to a water supply scheme for Henshaw and Thorngrafton, estimated to cost £3,000.

**Northampton T.C.**—It has been decided to lay down additional pumping machinery at Ravensthorpe, and erect new buildings at a cost of £8,000.

**Sheffield T.C.**—A proposal to delete the electrical fittings clause in the Corporation Parliamentary Bill, consequent upon the recent decision in the High Court, has been defeated in the council by 33 against 19, and the clause will therefore be retained. The town clerk stated that if Parliament sanctioned the clause in the Bill the council's appeal against the court's decision would be dropped.

**Wem R.D.C.**—A water supply scheme for Whixall, estimated to cost £600, is being considered by the council.

**Wigan R.D.C.**—It has been decided to proceed with a gravitation scheme of water supply, which is to cost £13,000. The existing supplies are derived mainly from shallow wells, and the medical officer of health has stated that most of these sources are polluted.

**Worcester T.C.**—The tender of Messrs. Hardy & Padmore, Limited, at £982, has been accepted for putting in pumps and motors at the waterworks.

**Worksop U.D.C.**—The total cost of the purchase by the council of the waterworks undertaking has been £73,404.

## MISCELLANEOUS.

**Eastbourne T.C.**—Two Leyland motor-buses are to be purchased at an estimated cost of £1,500.

**Greenock T.C.**—A sub-committee has been appointed to consider and report on specifications for a Dennis-Gwynne 6-cylinder petrol motor turbine fire engine, of not less than 65-horse power, with appurtenances. The scope of the sub-committee on tramways has been extended to consider the advisability of obtaining tramway facilities in the upper districts of the town, with special reference to the adaptability of the trackless trams now in use in other large towns and cities.

**Hythe T.C.**—Mr. W. T. Douglas, M.INST.C.E., who was recently instructed to report on coast erosion, states in his report that Dungeness has been growing seaward during the last thirty years at the rate of 9 ft. a year. This growth, he says, is entirely due to the hauling action of the tide on the shingle. A large proportion of this increase comes from the beach at Hythe. On account of this erosion Mr. Douglas recommends the expenditure of £10,400 on a timber groyne and a timber revetment with hard chalk filling.

**Plymouth T.C.**—The surveyor, Mr. J. Paton, has been instructed to submit an estimate of the cost of providing additional dressing houses at the Hoe for ladies; a diving platform, and a "shower" bath; a "trolley" for the use of children in the large basin; and also to report as to the suggested provision of separate dressing houses for adults and children, to be charged for at the rate of 1d. per person.

**Rowley (Staffs) U.D.C.**—Fifteen and three-quarter acres of land are to be purchased at Blackheath for the purpose of a public cemetery.

## PERSONAL.

Mr. W. Dengate, surveyor of roads to the Horsham Rural District Council, has been voted £10 for extra services.

Mr. D. G. Macdonald, surveyor to the Rugby Urban District Council, has resigned his position owing to continued ill-health.

Mr. A. W. Callaway, assistant surveyor at Foots Cray, has been appointed surveyor to the Nailsworth Urban District Council.

Mr. Gerald O. Case will read a paper on "Ligno-Concrete" at a meeting of the Society of Engineers on Monday evening next.

Mr. J. Vickers Edwards, architect to the West Riding County Council, has had his salary increased from £700 to £800 per annum.

Mr. T. Shield, of Barkisland, Halifax, has been appointed surveyor to the Denby and Cumberworth (Yorks) Urban District Council.

Mr. R. Boothway Herd, of the borough engineer's department, Accrington, has been appointed assistant surveyor to the Urban District Council of Skegness.

Mr. H. Pritchard, surveyor to the Burnley Rural District Council, has had his salary increased from £240 to £270 per annum, with a further increase of £15 per annum till £300 is reached.

Captain George Swinton, Mr. John A. Brodie and Mr. Edwin Lutyens, members of the Delhi Town Planning Committee, were received by the King last week before their departure for India.

Mr. Ernest Collins, engineer of the New River district under the Metropolitan Water Board, has been presented with a silver salver by his colleagues on his retirement from the service of the board.

Mr. W. F. Owsley, assistant surveyor of Lewisham, is recommended by the General Purposes Committee for an increase of salary from £300 to £350 per annum by three annual instalments of £15 and one of £5.

Councillor Tongue, of the Kingston (Surrey) Town Council has been elected as the representative of that body to attend, at his own expense, the National Conference of the National Housing and Town Planning Council to be held in London next month.

Mr. F. E. P. Edwards, F.R.I.B.A., city architect of Sheffield, recently presented to the members of the Sheffield Society of Architects and Surveyors a report on the International Congress of Architects which he attended last autumn in Rome. A lecture descriptive of some of the principal Italian cities, given later, was greatly appreciated by his audience.

Mr. James E. Edgcome, the borough electrical engineer of Kingston (Surrey), has been authorised to attend the annual convention of the Incorporated Municipal Electrical Association to be held from June 18th to 21st next at Harrogate, Leeds, and Middlesbrough, and is to be allowed the sum of five guineas towards his expenses.

Mr. R. H. Jeffes, surveyor to the Maldens and Coombe Urban District Council, last week read, at a meeting of the local branch of the Church of England Missionary Society, an interesting paper on "Church Architecture," dealing in particular with Norman and Saxon buildings. The vicar—the Rev. W. A. Challacombe, M.A.—presided.

Mr. Harry Davenport, of the surveyor's office, Prestwich, has been appointed surveying assistant in the city surveyor's office, Manchester, at a salary commencing at £100 a year. Mr. Davenport was articled to Mr. Sydney H. Morgan, ASSOC.M.INST.C.E., the engineer and surveyor to the Prestwich Urban District Council, and on the completion of his articles on January 1st last was appointed special town planning assistant.

Mr. T. Salkield, the city engineer of Delhi, leaves Bombay this month by the "City of York," due at Liverpool about May 22nd. Mr. Salkield has had for 6½ years an uninterrupted spell of work in India, culminating in the great Delhi Durbar and royal visit, with its months of incessant preparation and attendant anxieties, so that it may well be imagined that a restful sea voyage and change of vocation for a time will be not unacceptable to him.

Mr. Francis E. Jones, M.INST.M. AND CO.E., M.R.SAN.I., engineer and surveyor to the Irlam Urban District Council, has been appointed engineer and surveyor to

the Tyldesley Urban District Council, at a salary of £200 per annum. Mr. Jones was for ten years assistant surveyor to Mr. John Atkinson, Assoc.M.Inst.C.E., borough surveyor of Stockport, having previously served his articles as a civil engineer with the borough engineer of Rawtenstall.

## FOR OTHER ADVERTISEMENTS

See End of Paper.

## HORSHAM RURAL DISTRICT COUNCIL.

PRIVATE STREET WORKS.

TO ROAD CONTRACTORS.

The Council invite Tenders from experienced Contractors for the Making Up of Victoria-road, Albany-road and Princess-road, Crawley. Copies of the Specification, Bills of Quantities and Form of Tender may be obtained of Mr. W. Dengate, 58 Park-street, Horsham, the Surveyor to the Council, on payment of £1, which amount will be returned on receipt of a *bonâ-fide* Tender, and the Plan and Sections may be seen at his office by appointment. Sealed Tenders, endorsed "Tender for Roads, Crawley," must reach me, at my office, not later than 5 p.m. on Monday, May 6th. The Council does not bind itself to accept lowest or any Tender.

A. C. COOLE,
Clerk.

9 Carfax, Horsham.
March 26, 1912.

## RURAL DISTRICT COUNCIL OF MAYFIELD, STAFFORDSHIRE.

MAYFIELD WATERWORKS.

The Council invite Tenders for the Supplying and Laying of about 3,900 yards of Cast-Iron Water Mains, with Valves, Hydrants, &c., and the Erection and Construction of a Pumping Station and Reservoir, including the Supplying and Fixing of all necessary Pumping and other Machinery.

The plans and the Site of the Works may be seen and inspected by arrangement with Mr. Luther Adams, Surveyor to the Council, Stanton, near Ashbourne, from whom Forms of Tender and Specification and Quantities may be obtained on deposit with him of Two Guineas, which will be repaid on receipt of a *bonâ-fide* Tender and the return of the Specification and Quantities within two months.

The lowest or any Tender not necessarily accepted.

Sealed and endorsed Tenders must be sent in to the undersigned on or before the 17th day of April, 1912.

(By order)
WM. RICHARD HOLLAND, Solicitor,
Clerk to the Council.

Union Offices, Ashbourne.
March 25, 1912.

## MERTON URBAN DISTRICT COUNCIL.

ROLLER DRIVER.

The above Council require the services of a thoroughly competent Steam Road-roller Driver, with wages at the rate of 32s. 6d. per week. Applicants must be capable of doing Smith's Work.

Applications, stating age and experience, with copies of two recent testimonials, to be sent to the undersigned not later than the 6th April, 1912, endorsed "Roller Driver."

G. JERRAM,
Surveyor.

The Council Offices,
Kingston-road,
Merton, Surrey.

BUSINESS NOTICE.

ROAD SWEEPING MACHINES. No. 13,861. of 1909.

The Patentee is desirous of arranging, by licence or otherwise, on reasonable terms, for the Manufacture and Commercial Development of the Invention in this country.—Herbert Haddan & Co., Patent Agents, 31-32 Bedford-street, Strand, London, W.C.

DRAUGHTSMAN, temporary employment, Civil Engineer's Office, Westminster. £2 a week. State experience.—Box 1145, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

## GLASGOW MUNICIPAL BUILDINGS EXTENSION.

### ARCHITECTS' PROTEST.

The Corporation of Glasgow, on the 21st inst., the *Glasgow Herald* reports, received a deputation on behalf of the Glasgow Institute of Architects regarding the question of the extensions of the City Chambers.

Mr. Alex. N. Paterson, A.R.S.A., speaking on behalf of the deputation, said that they had approached the corporation regarding the employment of officials in carrying out works of architecture, and in particular on the present occasion, with respect to that policy as it affected the proposed extensions, a work which from its extent and situation must form one of the architectural features of the city. They desired to enter their protest against such a course being followed, to some extent, naturally, in their own interests, but mainly in those of the community. In doing so they had no wish to make too much of their own importance or to belittle the merits of others, but they came before the council as having, through their professional training and experience, a well-grounded knowledge of the subject in question in the hope that they would not lightly set aside such information and advice as could be provided by the institute. That it was not only the duty but the desire of each member of the council to secure the best results from the expenditure of public money on its buildings might be taken for granted, and such best results they believed—or rather he might say they knew—could not be achieved if architectural work of an important nature such as the building in contemplation was entrusted to the city engineer, who was necessarily much engrossed in administrative work, and consequently unable to devote the undivided attention which the inception and completion of such an important building absolutely required. Quite apart from the question of individual ability the employment of an outside architect for all but routine work was to be preferred in the public interest, because, among other reasons, the corporation with an independent architect employed and a competent official to advise it was not deprived of the value of expert criticism on the design of buildings to be erected for it as it was when the official was also the designer. He concluded by adverting to the manifest injustice and hardship involved to the architects in Glasgow who paid rates and were therefore of necessity contributing to the upkeep of a departmental office which in such a case as the present threatened to become a favoured competitor.

**A Good Engineer.**—"A good engineer must be of inflexible integrity, sober, truthful, accurate, resolute, discreet, of cool and sound judgment, must have command of his temper, must have courage to resist and repel attempts at intimidation, a firmness that is proof against solicitation, flattery or improper bias of any kind, must take an interest in his work, must be energetic, quick to decide, prompt to act, must be fair and impartial as a judge on the bench, must have experience in his work and dealing with men, which implies some maturity of years, must have business habits and knowledge of accounts. Men who combine these qualities are not to be picked up every day. Still, they can be found. But they are greatly in demand, and when found they are worth their price; rather, they are beyond price, and their value cannot be estimated by dollars."—Chief Engineer Sterling's Report to the Mississippi Levee Commissioners.

**Road Making and Railway Engines.**—The Great Eastern has eighty locomotives which can be run with oil fuel, which is used in conjunction with coal, a layer of red-hot coal always lying at the bottom of the fire-box, over which the oil is driven through a nozzle. The oil readily ignites. The engines use about half as much coal as an ordinary coal-burning locomotive over the same distance. They are convertible from one form to the other in two or three hours. Unfortunately, at present only two of the eighty are being driven by oil fuel, the reason being that such fuel is now more expensive than coal. Various kinds of oil have been experimented with, and of late years that used most successfully has been an oil derived from the waste tar from gasworks. Its price has, however, increased so rapidly, owing to its use in road making, that the company found it did not pay them to give the prices paid by road making firms.

## GREASE TRAPS.

### BRAZILIAN ENGINEER'S INVENTION.

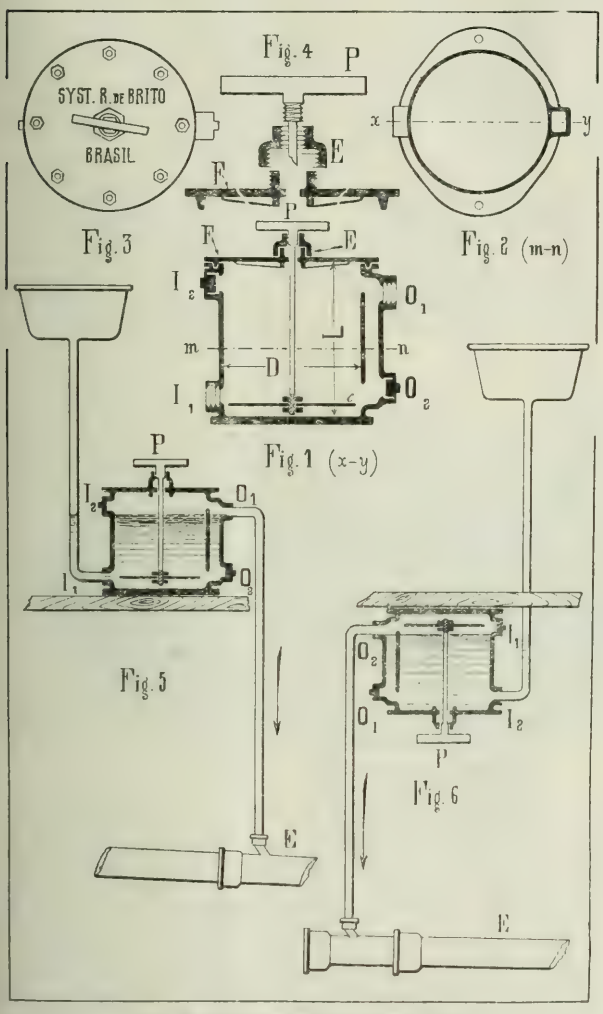
We have received from a Brazilian engineer, Dr. F. Saturnino R. de Brito, the accompanying illustration of a patent grease trap which he has invented, and which will, no doubt, be of interest to our readers.

The device consists (Fig. 1) of a tank with a movable rod P, which is attached to the piston C formed by two discs of iron with a rubber washer in the centre; these pieces may be replaced by a simple piston of galvanised iron. The piston has a diameter a little less than that of the tank, and has the object of agitating the liquid contained in the tank, breaking up the coagulated grease and sending it into the sewer. The rod P passes into a stuffing box E (containing packing and oil), in order to ensure a hermetic seal and to prevent the escape of sewer gas; for this same purpose, and as a greater guarantee, the handle of the rod forms actually a plug which screws into the upper part of the brass cap of the stuffing box. (Fig. 4.)

To prevent the escape of gas, the flange F, or cover of the trap, fits into a groove, where melted grease, a rubber ring, or any other packing material may be filled. The internal diameter of the tank is 12 in., and the height L varies from 12 in. to 24 in.

Figs. 5 to 10 show how the traps may be installed in different cases, either in a vertical or horizontal position, with the cover upwards or downwards. In ordinary cases and in the vertical position (Figs. 5 and 6) they can be fixed by any plumber, but in any of the other positions the apparatus can only be fixed by those who have a perfect knowledge of the principles of sanitation.

It is to be noted that the apparatus must have two plugs for the four 1½-in. orifices (see Fig. 1). The apparatus must be made with a plug fixed in the upper inlet $I_2$, and the lower outlet $0_2$, but, according to the position, the plugs may be moved for the other orifices.




Dr. Brito's Grease Trap. Figs. 1–6.

*First Position* (Fig. 5).—The grease trap is placed close to the kitchen sink in a direct vertical or normal position. In this case it works actually as a self-vent trap, and replaces any of the other traps which are generally fixed close to the sink. The seal of the cover must be hermetic, because the upper part of the trap contains the sewer gas, and this necessitates the adoption of some kind of official cachet to prevent tampering with the cover.

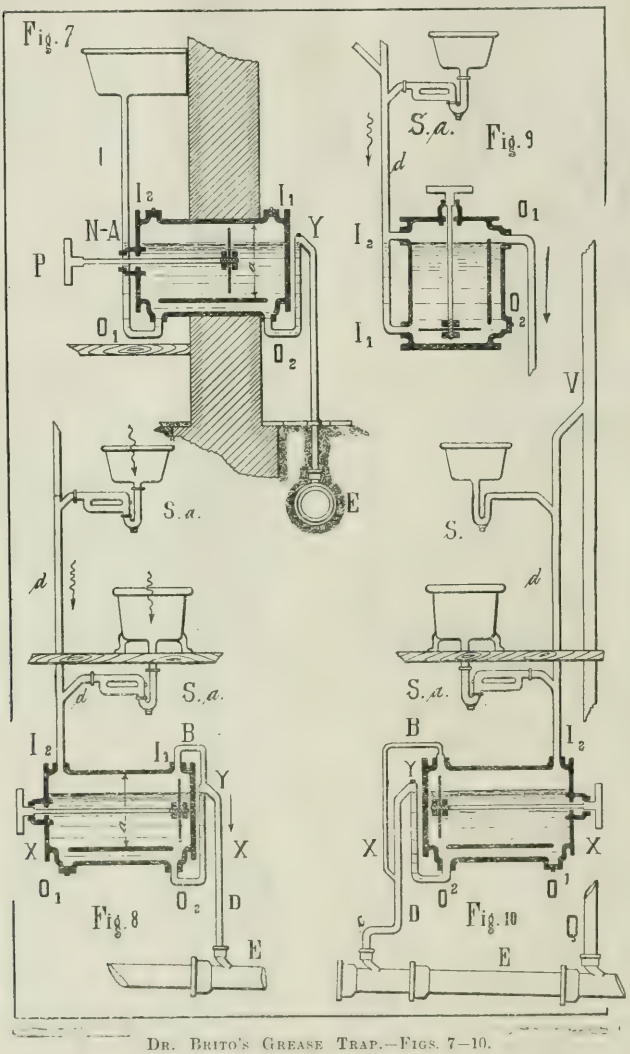
*Second Position* (Fig. 6).—The grease trap is placed underneath the floor. In this position it will be necessary to place the plugs at the points $I_1$ and $0_1$, instead of at $I_2$ and $0_2$. The working is the same as for the preceding position. The official cachet can be dispensed with, as the water will prevent escape of gas.

*Third Position* (Fig. 7).—The grease trap as shown here is in a horizontal position close to the sink, either above or below the floor. The handle P of the piston may remain at the inlet side or the outlet side, the position of the trap being inverted. The wrought-iron discharge pipe may be fitted so that the level of the water NA corresponds to the height of water a = 10 in. The working of the apparatus in this position is the same as in the preceding; it is always an anti-syphon trap.

*Fourth Position* (Figs. 8 and 9).—The grease trap as shown here is at a distance from the sink, and must have an ordinary interceptor trap with a ventilator on top, or an anti-syphon trap, as represented by Fig. 8; in this case the grease trap cannot work as an anti-syphon trap, because the inlet and outlet tubes would occupy the previous positions, each discharge would compress a large quantity of air contained in the pipes D, and this air would escape through the sink pipes and the fittings connected to same. The best solution is to connect the discharge pipe D of the sink, lavatories and bath to the orifice $I_2$; the other orifice $I_1$ will be connected by the pipe B of 1 in. diameter to the T or Y outlets of the trap, this Y-piece being at the level of the water NA—that is, at the height a = 10 in.; this pipe B is provided to obviate air pressure in the pipes D. If the sewer pipe E is far enough below the level XX of the bottom of the trap, the heaviest discharges will provoke suction in D; then the compressed air will escape through the sink, passing through the self-vent traps (producing in the latter a gurgling noise), then passing through B, and feeding the suction in D, without allowing the trap to empty itself. Fig. 9 represents the same application, but with the grease trap in the vertical position. It must be noted that in this case also the orifice I, must be connected to the tube D to avoid compression of the air. This application (Fig. 9) of the system connects various sinks distant from the grease trap, and is different from the case in which the grease trap works as

an anti-syphoning trap, and replaces the trap of the sink. (Figs. 5 and 6.)

*Fifth Position* (Fig. 10).—This is similar to the fourth position, with the difference that the grease trap works also as a flushing syphon. It is thus necessary to consider not merely the air which enters through the self-vent traps, and it will be advisable to join the principal pipe D to the ventilating shaft V, as is done in the ordinary sanitary system of anti-syphonage ventilation, to avoid syphonage. The pipe B, instead of connecting with Y, must descend a little below the level XX to connect at D. It is advisable to make a bend at C to facilitate the action of the syphon O Y D. This application has the advantage of permitting self-cleansing.




Dr. Brito's Grease Trap.—Figs. 7—10.

**Profitable Gasworks.**—Mr. Mark Scott, the chairman at a meeting of the Selby Urban District Council last week, mentioned that he had signed a cheque that night for £1,427 for the last payment of the £20,000 borrowed twenty years ago for the purchase of the gasworks. Mr. Scott said he never signed a cheque with more real pleasure. Twenty years ago there was bitter opposition to the purchase from certain quarters, but the project had paid handsomely. Mr. Bowe remarked that the gasworks had been a "gold-mine" to the town, and the rates could not have been kept down but for the help from the gas undertaking.

## ASSOCIATION OF KENT SURVEYORS.

### ANNUAL MEETING AT MAIDSTONE.

The annual meeting of the Association of Kent Surveyors was held at the Sessions House, Maidstone, on the 23rd inst, Mr. H. P. Maybury presiding, and others present including Messrs. T. F. Bunting (Maidstone), T. A. Busbridge (Maidstone Rural), H. W. Longdin (Penge), W. Lawrence Bradley (Tonbridge), J. L. Redfern (Gillingham), Alfred Goldfinch (Whitstable), W. Banks (Rochester), R. L. Honey (Chatham), F. W. Pullen (East Ashford), F. G. Sargent (Dover Rural), J. Marshall (Malling), J. A. Mitchell (Northfleet), W. Powell (Chislehurst), and F. Harris (Tonbridge Rural). Letters of apology for non-attendance were read, the principal cause of absence being the restricted railway service.

Mr. H. P. Maybury was unanimously re-elected chairman for the ensuing year, and Mr. A. E. Nichols (Folkestone), vice-chairman, with the following committee: Messrs. Busbridge (Maidstone), Butterworth (Thanet), Banks (Rochester), Longdin (Penge), and Bradley (Tonbridge Urban); hon. secretary and treasurer, Frank Harris.

The balance-sheet was presented, and showed a very satisfactory financial position.

It was resolved to send a telegram to Mr. J. A. Brodie, city engineer, Liverpool, congratulating him on his recent appointment, and wishing him God-speed and a safe return.

The question of the election of a district representative on the council of the Institution of Municipal and County Engineers was discussed, and it was decided to support Mr. Redfern, of Gillingham.

An interesting discussion took place in regard to the Sidcup road trials, the meeting afterwards terminating with a vote of thanks to the chairman. The next quarterly meeting to be held at Folkestone, by the kind invitation of Mr. A. E. Nichols.

**Smoke Abatement Exhibition.**—The opening took place on Saturday last of an International Smoke Abatement Exhibition, organised under the auspices of the Coal Smoke Abatement Society. The exhibition, which is being held at the Royal Agricultural Hall, is divided into seven sections—(1) Smokeless fuels; (2) domestic heating, including coal fire-grates, gas fires and stoves, and electrical heating appliances; (3) furnaces for heating rooms and buildings; (4) boiler furnaces; (5) testing appliances; (6) fans and appliances for ventilation and the removal of dust; and (7) apparatus to prevent the emission of dust or grit from chimneys. A series of conferences and lectures on various aspects of smoke abatement has been arranged in connection with the exhibition.

**Drainage Works and Sanitary Fittings.**—A third edition, revised and brought up to date, particularly as regards the questions of concrete sewers, sewer ventilation and flushing, and the Public Health Acts Amendment Act of 1907, still further evidences the success of this little manual,* which manifestly deserves the attention and confidence of all concerned in the important subject with which it deals.—*The Bookseller*.

* "Drainage Work and Sanitary Fittings." By Wm. H. Maxwell. Price 2s. nett. London: St. Bride's Press, Ltd., 24 Bride-lane, E.C.

## SANITARY FITTINGS.

### "STONITE" PRODUCTIONS AT MANCHESTER.

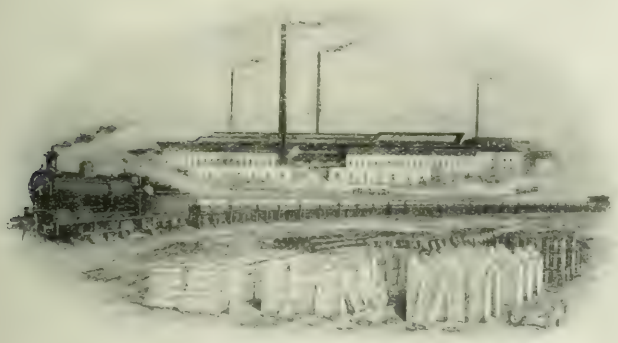
One of the largest exhibits and most attractive stands at the recent Building Trades Exhibition in the City Hall, Manchester, was that of Messrs. W. R. Pickup & Co., Limited, sanitary fireclay ware manufacturers, of the Pearl Brook Works, Horwich.

A large number of samples of this firm's productions, suitable for both domestic buildings and public institutions and schools, were on view, together with samples of the well-known stoneware pipes which are made (up to 36 in. diameter) at the Horwich works of the John Crankshaw Company, Limited, with whom Messrs. Pickup are allied.

The wide popularity of enamelled fireclay, and more especially of Messrs. Pickup's leadless glazed "Stonite" ware in connection with sanitary requirements of all kinds, was amply demonstrated by this varied and interesting exhibit. Messrs. Pickup do not confine themselves to the fireclay ware alone, but supply all requisites in the way of metal fittings and accessories that may be desired, and their staff includes sanitary engineers of considerable experience.

Housing experts were particularly attracted by the numerous descriptions of combination and other sinks on view, as well as baths, closets and lavatories of various kinds, suitable for domestic work of all classes, while the exhibits also included what was probably the largest variety ever shown of urinal ranges designed for public conveniences, hotels and theatres, and double lavatories in one piece, largely supplied to the Continent.

Up-to-date design, careful attention to details (both of the ware and fittings), and superior finish are noticeable throughout this firm's manufactures, and coupled with the enterprising management (of which this exhibition afforded unmistakable evidence) and well-equipped modern works, Messrs. Pickup are enabled to justify the confidence of their customers to the fullest extent.



Messrs. W. R. Pickup & Co.'s Works.

We understand that all "Stonite" productions are guaranteed impervious and non-crazing, and that Messrs. Pickup invite and welcome visitors to their works at Horwich (by appointment for preference)—of which privilege we feel sure it would well repay any of our readers who may be interested to avail themselves at the first opportunity.

**Hospital Rebuilding.**—In the course of the last meeting of the Metropolitan Asylums Board a report on the subject of fire prevention at the board's small-pox hospitals was presented by the Hospitals Committee. The Committee were of opinion, bearing in mind the present conditions of the Long Reach Hospital (which was erected ten years ago and was of wood), that its gradual rebuilding in permanent material was the most desirable course to adopt. A resolution was adopted approving the proposals embodied in the report relative to the rebuilding of two wards at Long Reach Hospital in permanent material.

## TRAVERSE SURVEYING.

The computation of a traverse survey is a matter of considerable complexity, requiring great patience and not a little mathematical skill. Such calculations are peculiarly liable to error, moreover, because the operator is apt after a time through sheer exhaustion to become mechanical in his work if the survey which is being reduced be of any magnitude. It will not be necessary, therefore, to commend to those who are experienced in this class of work the value of a thoroughly reliable series of tables which enable one to find in the simplest and readiest manner the traverse for any bearing in degrees and minutes and for any distance in links and chains. It may not be generally known that such a series of tables is in existence—we refer to Shortrède's Traverse Tables—which give the traverses for every 2′, those for the intermediate minutes being readily found by taking the intermediate tabular values. A copy of this valuable book is now before us, and the care and industry with which it has been compiled lead us to draw the attention of our readers to a work which may be just what is wanted by those who may have in hand traverse survey operations of any magnitude.*

## LOWER THAMES VALLEY DISTRICT SURVEYORS' ASSOCIATION.

### INSPECTION OF SURBITON SEWERAGE WORKS.

The Lower Thames Valley District Surveyors' Association met at Surbiton on Saturday last for the purpose of inspecting the Surbiton sewerage works now in course of construction. The members were met by Mr. H. T. Mather, the engineer to the urban district council, who is also engineer to the scheme. After explaining the plans, Mr. Mather conducted the party over the building works, and much appreciation was evinced at the courteous and lucid manner in which the various points raised were replied to. Altogether, a most enjoyable and instructive afternoon, although the weather was not all that could be desired. The president, Mr. E. Willis, engineer and surveyor to the Chiswick Urban District Council, descended the pump well and inspected the intake of the low-level sewer, some 50 ft. below the surface. No difficulties with water, it was stated, had been met with in sinking this well.

The president proposed a vote of thanks to Mr. Mather for his kindness in allowing the association to inspect the works and for the trouble he had taken in pointing out the features of interest. Mr. Ottway, the engineer to the contractors, was also thanked for the assistance given to Mr. Mather in making the afternoon a success.

Members are reminded that the annual dinner of the association will be held at the Town Hall, Chiswick, on Saturday, May 4th. On the same day visits will be made to several works, notice of which will be given in due course as soon as arrangements have been completed.

**Railless Traction Bills.**—The House of Lords Committee on the Brighton Railless Traction Bills announced on Friday that they were of opinion that there should be railless traction to the western boundary of Hove, and passed the Brighton Railless Bill within the Brighton Boundaries and the Hove Railless Bill within the Hove boundaries. The Committee hoped that it might be possible to arrive at some satisfactory arrangement for working it as one system. The Committee were of opinion further that the Tramway Bill should not proceed.

* Copies can be obtained through the St. Bride's Press, Limited, 24 Bride-lane, E.C. Price 21s. nett; 21s. 6d. post-free.

## TESTS OF ROAD MATERIALS.

### APPARATUS AT THE NATIONAL PHYSICAL LABORATORY.

A section of the annual report of the National Physical Laboratory, as pointed out in our issue of last week, contains some interesting information with regard to the new testing division of the engineering department of the laboratory which has been inaugurated with the object of carrying out mechanical tests of road materials and endurance tests on specimen roads. The new buildings consist of two rooms (machine-room and road-testing room), so arranged that the building previously used by the metallurgy department as a foundry has been converted into a small store for road materials. This is connected on its south side by a double door to the larger of the two new rooms, which measures 45 ft. by 45 ft., and is designed to hold the circular road-testing machine.

The work to be undertaken is classed as follows in the report:—

MECHANICAL TESTS ON ROAD MATERIALS.

These tests include impact, abrasion, cementation value and hardness tests. In order to preserve continuity with the work which has already been in progress in other countries for many years, it was decided to obtain the standard types of machines used by the United States Office of Public Roads. For this purpose the following machines were obtained from Messrs. Riehlé Brothers, of Philadelphia:—

(1) A Four-Cylinder Abrasion Machine (Deval Type).—In this machine the four cylinders, each 19 cm. diameter by 32 cm. in length, are mounted in a cast-iron rotating frame, with their axes inclined at 45° to the axis of rotation. A given quantity of road material is placed in each cylinder, and the amount of material worn away by the mutual abrasion of the pieces is measured after 10,000 revolutions.

(2) A Page Impact Machine.—In this the specimen of rock, 25 mm. diameter by 25 mm. long, is subjected to automatically repeated blows from a falling tup weighing 2 kilogs. By means of a screw the fall is increased by 1 cm. between each blow until fracture occurs.

(3) Hardness Machine (Dorey Type).—In this machine the specimens, two in number, are pressed against the surface of a cast-steel disc, rotating in a horizontal plane, with a force of 250 grammes per square centimetre of area. As an abrasive, crushed quartz is fed in through two small hoppers. The amount of material abraded is measured after 1,000 revolutions of the disc.

(4) For tests on cementation value of rocks three machines have been procured—*viz.*, a ball mill for grinding up the material, a forming machine for making the briquettes, and a Page impact machine for testing the endurance of the briquettes to repeated blows from a falling tup. This machine is provided with an automatic recording gear for measuring the height of rebound of the tup after successive blows. A standard penetrometer for indentation tests on samples of pitch, as used in the United States Office of Public Roads, has been obtained from Messrs. Howard & Morse, of Philadelphia.

ENDURANCE TESTS ON SPECIMEN ROADS.

In these tests the specimen road to be tested is laid in the form of a circular track 2 ft. 6 in. wide of a mean diameter of 34 ft. The endurance of the centre 2 ft. of this track is tested by the rolling on it of eight 3-ft. steel wheels, the wheels being at an angular distance of 45° from each other, and each wheel rotated by a separate 2 b.h.p. electric motor mounted on a steel arm, which revolves round the centre post. The radial distribution of the wheels is such that the whole width of 2 ft. is covered in one revolution of the arms, and as a further precaution to ensure uniform wear each wheel is moved backwards and forwards radially by a cam mechanism through a distance of 1 in. The eight arms are all hinged to a rotating boss on the centre post and at their outer ends are connected to spiral springs to eight corresponding cranks rigidly fixed to a second rotating boss, concentric with the former and immediately below it. By means of a regulating wheel on each spring the pressure of each wheel on the track can be adjusted to any desired value up to 1 ton. The armatures of the eight motors are connected in series, the maximum voltage across all the machine being 440 volts. The main current is supplied from a motor generator through two slip rings on the centre post, and the shunt-field coils of the motors are connected in series, and supplied direct from the supply mains through two smaller slip rings.

It is estimated that, in the case of a road of tar-macadam, by the use of solid steel wheels running at 10 m.p.h., twenty-four hours' continuous running would represent one year's wear on a typical heavily trafficked road. The machine will, of course, be available for endurance tests of rubber-tyred wheels at the higher speeds which can be attained up to 25 m.p.h.

**Cement Combination.**—An important combination of cement companies has taken place, under which the British Portland Cement Manufacturing Company of London have taken over the works of Messrs. Addison, Potter & Son, Wellington Quay; Messrs. Cameron, Swan & Partners, Jarrow; and Messrs. I. C. Johnson & Co., Gateshead, all old-established firms. Mr. Potter will join the board of directors of the London company, and Messrs. Johnson & Co. will be the Northern agents.

**Salt Water for Dunfermline Baths.**—The Carnegie Dunfermline Trustees have just completed an installation of machinery and plant for providing salt water for the swimming pond of the new baths, which were presented by Mr. Carnegie at a cost of £45,000. After the water is brought in from the street main it is conveyed in copper pipes, with the object of preventing corrosion, to the various concrete-lined tanks for salting and filtration. Thereafter it is forced to the aërator, which has been constructed on the roof of the building. There it is split into the most minute jets and exposed to sun and air before being delivered into the pond. The installation has cost £1,500.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President*—Mr. Albert D. Greatorex, M.Inst.C.E., Borough Engineer and Surveyor of West Bromwich.

### FORTHCOMING MEETINGS.

The appended list of meetings should be read in place of the one which appeared in last week's issue:

May 4th.—Exmouth.
May 11th.—Nuneaton.
May 24th—29th.—Paris.
June 1st.—Council meeting.
June 7th—8th.—Stirling.
June 15th.—East Ham.
June 27th.—Lowestoft.
June 29th.—Bridlington.
July 6th.—Stourbridge.
July 11th—13th.—Annual meeting, London.

Provincial members who propose to take part in the visit to Paris will, in cases where the journey exceeds a distance of 30 miles, be able to obtain return tickets to London at a single fare and a quarter.

Thomas Cole,
11 Victoria-street, S.W. *Secretary.*

## INSTITUTION OF MUNICIPAL ENGINEERS.

*President*—Mr. E. A. Stickland, Assoc.M.Inst.C.E., Borough Surveyor, Windsor.

### SOUTHERN DISTRICT MEETINGS IN LONDON.

A meeting of the Southern District will be held at the institution offices on Wednesday, April 3rd, at 7 o'clock, when a paper, "The Design and Planning of Working-class Dwellings," will be presented by Mr. Sidney Padmore (member for the district).

A further meeting of the district will be held on Wednesday, May 1st, at 7 o'clock, when the various bodies of the Southern District joining a local association for the purpose of becoming federated with the N.A.L.G.O. will be discussed.

E. W. Veale,
*Hon. District Secretary.*
Frensham,
Surrey.
March 19, 1912.

## ROYAL SANITARY INSTITUTE.

### PROVINCIAL SESSIONAL MEETING AT CARDIFF.

April 12 and 13, 1912.

A meeting of the Royal Sanitary Institute will be held on Friday, April 12th, in the Council Chamber, City Hall, Cardiff, when a discussion will take place on

The Development of Cardiff Waterworks,

to be opened by Mr. C. H. Priestley, M.Inst.C.E., waterworks engineer, Cardiff.

Among those who are expected to take part in the discussion are Prof. W. S. Boulton, B.Sc., Professor of Geology, University of Wales; Alderman C. H. Bird, J.P., chairman, Waterworks Committee, Cardiff; Councillor J. Robinson, J.P., L.R.C.P., chairman, Health Committee, Cardiff; Messrs. Herbert E. Allen, M.Inst.C.E.; W. Harpur, M.Inst.C.E., F.S.I., city engineer, Cardiff; B. E. Harvey, M.Inst.C.E., borough engineer, Merthyr; J. Howard-Jones, M.D., D.Sc., medical officer of health, Newport (Mon.); D. E. Roberts, M.Inst.C.E.; J. H. Sugden, M.Sc., F.I.C.; and E. Walford, M.D., D.P.H., medical officer of health, Cardiff.

The chair will be taken at 5 p.m. by Mr. W. Whitaker, B.A., F.R.S., F.G.S.

On the following day a visit will be paid to Cardiff reservoir in the Taff Fawr Valley, Breconshire.

## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

SURVEYOR.—March 30th.—Pontypool Rural District Council. £100 per annum.—Mr. T. Atkins, clerk.

SURVEYOR'S CLERK.—March 30th.—Teddington Urban District Council. £80—£100.—Mr. G. H. Salmons, clerk.

CLERK OF WORKS.—March 30th.—Corporation of Swansea. £2 5s. per week.—Mr. H. Lang Coath, town clerk.

NUISANCE INSPECTOR.—March 30th.—Corporation of Clitheroe. £104 per annum.—Mr. W. Self Weeks, town clerk.

CLERK OF WORKS.—March 30th.—Northamptonshire County Council. £3 3s. per week.—Mr. C. S. Morris, county surveyor.

CLERK OF WORKS.—March 30th.—Kidsgrove Urban District Council. £2 2s. per week.—Mr. F. C. Crimes, engineer and surveyor.

ROAD FOREMAN.—April 1st.—Drighlington Urban District Council. 26s. per week.—Mr. D. Cowling, clerk.

ASSISTANT ROADS ENGINEER.—April 1st.—Egba United Government, Southern Nigeria. £240—£300.—Mr. A. M. Buchanan, agent, Suffolk House, Laurence Pountney-hill, E.C.

GENERAL ASSISTANT.—April 1st.—Goole Urban District Council. £85 per annum.—Mr. C. G. Bradley, engineer and surveyor.

ENGINEERING ASSISTANT.—April 2nd.—Paignton Urban District Council. £4 4s. per week.—Mr. James R. Mill, clerk.

ROAD FOREMAN.—April 4th.—Corporation of Weymouth. £90 per annum.—Mr. H. A. Huxtable, town clerk.

INSPECTOR OF NUISANCES.—April 6th.—Coseley Urban District Council. £100–£125.—Mr. W. Lees, clerk.

HIGHWAY SURVEYOR AND SANITARY INSPECTOR.—April 8th.—Claydon Rural District Council. £180 per annum.—Mr. A. J. Franks, clerk.

INSPECTOR OF NUISANCES.—April 8th.—Kirkburton Park Rural District Council. £104 per annum.—Mr. J. S. Wivall, clerk, 66 Bridge-street, Wakefield.

CLERK OF WORKS.—April 10th.—Bamber Bridge Town Commissioners. £2 per week.—Mr. J. Coghlan, town clerk.

SURVEYOR.—April 10th.—Totnes Rural District Council. £120–£150.—Mr. T. K. Windeatt, clerk.

BUILDING INSPECTOR.—April 10th.—Corporation of Plymouth. £100 per annum.—Mr. James Paton, borough engineer and surveyor.

CLERK OF WORKS.—April 11th.—Hale Urban District Council. 50s. per week.—Mr. J. G. Whyatt, clerk.

SANITARY INSPECTOR.—April 13th.—Lewisham Borough Council. £150—£200.—Mr. E. Wright, town clerk.

LAND VALUER.—April 15th.—Board of Trustees for the Improvement of Calcutta. 1,250 rupees per mensem, rising to 1,500 rupees.—Mr. C. H. Bompas, chairman, 5 Clive-street, Calcutta.

ASSISTANT ENGINEERS.—May 1st.—Indian Public Works and State Railway Departments.—Secretary, Judicial and Public Department, India Office, London, S.W.

ASSISTANT ENGINEER.—Lagos Municipal Board in Southern Nigeria. £300—£400 per annum.—Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W.

ASSISTANT SURVEYORS.—Federated Malay States. £420 per annum.—Messrs. Gregory, Eyles & Waring, 12 Dean's-yard, Westminster, S.W.

## MUNICIPAL COMPETITIONS OPEN.

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PORTLAND.—April 4th.—Designs and plans for council offices, for the urban district council. Premiums of £50 and £10 are offered.—Mr. R. A. Colenutt, clerk.

WOMBWELL.—May 1st.—Designs for public swimming bath, for the urban district council.—Prizes of £40, £30 and £20 are offered.—Mr. W. Quest, surveyor.

HALE.—June 28th.—Designs for a town planning scheme for the urban district council. Premiums of £50 and £25 are offered.—The Clerk.

DUSSELDORF.—July 1st.—Plan for the extension of the city. Premiums of £1,000 and £375 are offered.—The Chief Burgomaster.

## MUNICIPAL CONTRACTS OPEN.

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### Buildings.

HOWDON-ON-TYNE.—March 30th.—For carrying out brickwork and concrete work, for the Tyne Improvement Commissioners.—Mr. N. G. Gedge, Newcastle-on-Tyne.

CLECKHEATON.—April 1st.—For the extension of stables, for the urban district council.—Mr. C. Lund, engineer and surveyor.

AMBLE.—April 1st.—For alterations to public hall, for the urban district council.—Mr. W. Gibson, surveyor.

GOWER.—April 1st.—For the erection of sea-wall, for the rural district council.—Mr. H. J. Ind, clerk, Fisher-street, Swansea.

TIPPERARY.—April 1st.—For the erection of twenty-four houses, for the urban district council.—Mr. T. Dawson, town clerk.

CHURCH.—April 2nd.—For the erection of new council offices, for the urban district council.—Mr. J. R. Reddish, clerk.

SUNDERLAND.—April 2nd.—For the erection of a greenhouse, for the corporation.—Borough Surveyor.

CARDIFF.—April 2nd.—For the erection of stores, for the corporation.—Mr. J. L. Wheatley, town clerk.

SALISBURY.—April 3rd.—For the erection of a new roof to engine-room, for the corporation.—Mr. W. J. Goodwin, city engineer and surveyor.

SOUTHEND-ON-SEA.—April 4th.—For the extension of enrolled at the pier, for the corporation.—Mr. H. J. Worwood, town clerk.

LINDSEY.—April 4th—18th.—For additions to a school, for the county council.—Mr. S. M. Grant, secretary, 286 High-street, Lincoln.

WEST RIDING.—April 5th.—For the erection of a school, for the Education Committee.—Education Architect, County Hall, Wakefield.

COVENTRY.—April 8th.—For the erection of thirty-two workmen's dwellings, for the Housing Committee. —Mr. J. E. Swindlehurst, city engineer and surveyor.

SHEFFIELD.—April 9th.—For the erection of public conveniences and other offices, for the corporation.—Mr. R. M. Prescott, town clerk.

RAWTENSTALL.—April 9th.—For alterations at generating station, for the corporation.—Mr. J. Whalley, town clerk.

ISLE OF WIGHT.—April 9th.—For the erection of cottage and outbuildings, for the county council.—Mr. J. Dufton, clerk, 20 Holyrood-street, Newport, Isle of Wight.

MARGAM.—April 10th.—For alterations at public baths and erection of caretaker's house, for the urban district council.—Mr. D. E. Jones, clerk, Port Talbot.

WEST RIDING.—April 12th.—For alterations at a council school, for the county council.—Education Architect, County Hall, Wakefield.

MANCHESTER.—April 13th.—For the erection of a school, for the Education Committee.—Accountant, Education Offices, Deansgate.

MANCHESTER.—April 18th.—For the erection of mess-room and lavatories, for the Gas Committee.—Mr. J. G. Newbiggin, engineer, Rochdale-road Station.

FINCHLEY.—April 19th.—For an installation to deal with house and trade refuse, for the urban district council.—Mr. E. H. Lister, clerk.

BOOTLE.—April 24th.—For the erection of brick chimney shaft, for the corporation.—Mr. J. Henry Farmer, town clerk.

DERBYSHIRE.—For alterations to a school, for the Education Committee.—Mr. George H. Widdows, architect, County Education Office, St. Mary's-gate, Derby.

## Iron and Steel.

PETERSFIELD.—March 30th.—For the supply of 4-in. and 5-in. iron spigot and socket pipes, bends, junctions, tapers, and, other specials, for waterworks extension, for the urban district council.—Mr. Percy C. Burley, clerk.

NOTTINGHAM.—April 1st.—For the supply of girders, steel pipes and specials, for the Water Committee.—Mr. J. A. H. Green, town clerk.

WEYMOUTH.—April 2nd.—For the supply of mooring shackles, for the corporation.—Mr. R. A. Ayles, Harbourmaster's Office.

SHEPTON MALLET.—April 3rd.—For laying water main with special fittings, for the rural district council. —Mr. A. E. Nalder, clerk.

BATH.—April 9th.—For the supply of cast-iron pipes and special castings, for the corporation.—Mr. E. D. Wardle, town clerk.

GOOLE.—April 10th.—For laying cast-iron water pipes, for the urban district council.—Mr. R. Tyson, clerk.

LONDON.—April 16th.—For the supply of 484 tons rolled-steel bar, special section, for magnetic brakes, for the county council.—The Clerk.

MARGATE.—April 17th.—For the supply of cast-iron fencing, for the corporation.—Mr. E. A. Borg, borough surveyor.

CHELMSFORD.—For laying water mains at Ingatestone, for the rural district council.—Mr. Arthur S. Duffield, clerk.

## Roads.

HAMBLEDON.—March 30th.—For the supply of road materials, for the rural district council.—Mr. S. B. Hasell, surveyor.

MAGOR.—March 30th.—For the supply of broken stone and gravel, for the rural district council.—Mr. A. H. Rees, clerk.

EAST DEREHAM.—March 30th.—For the supply of broken granite and granite chippings, for the urban district council.—Mr. B. H. Vores, clerk.

AMESBURY.—March 30th.—For the supply of picked flints, for the rural district council.—Mr. J. T. Huxham, district surveyor.

RAMSEY.—March 30th.—For the supply of road materials, for the urban district council.—Mr. R. F. Serjeant, clerk.

STRETFORD.—March 30th.—For asphalt paving and making good, for the urban district council.—Mr. E. Worrall, surveyor.

NORTH WITCHFORD (Isle of Ely).—March 30th.—For the supply of materials, for the rural district council.—Mr. A. W. Broker, Wimblington, near March.

EAST GRINSTEAD.—March 30th.—For the supply of granite, granite screenings, tarred granite macadam, hand-picked surface flints, Kentish ragstone and brick rubble, for the urban district council.—Mr. E. P. Whiteley Hughes, clerk.

GOOLE.—March 30th.—For the supply of stone, tar-macadam, asphalt and ashes, for the rural district council.—Mr. G. England, clerk.

ALTON.—March 30th.—For the supply of broken granite and steam rolling, for the rural district council.—Mr. A. F. M. Downe, clerk.

BULKINGTON.—April 1st.—For the supply of stone, for the urban district council.—Mr. E. Cuthbert, surveyor.

BLEAN.—April 1st.—For the supply of gravel, flints, and brick rubble hardcore, for the rural district council.—Mr. F. A. Ward, Eddington, near Herne Bay.

REPTON.—April 1st.—For the supply of broken granite, limestone, slag, broken boulders and local gravel, for the rural district council.—Mr. T. R. Sidgwick, surveyor, Wellington, Derby.

DROXFORD.—April 1st.—For the supply of granite or hard stone, for the rural district council.—Mr. H. Godfrey Pearson, clerk.

KINGSWINFORD.—April 1st.—For the supply of materials and haulage, for the rural district council.—Mr. W. Meredith, surveyor.

RUISLIP - NORTHWOOD.—April 1st.—For the supply of granite, for the urban district council.—Mr. E. R. Abbott, clerk.

EAST ASHFORD.—April 1st.—For the supply of flint, for the rural district council.—Mr. T. W. Pullen, Kennington, Ashford.

TEIGNMOUTH.—April 1st.—For making up certain roads, and erecting wall, for the urban district council. —Mr. F. W. Knight, surveyor and water engineer.

NORMANTON.—April 1st.—For the supply of flags, kerbs, channels, setts, granite, limestone and tar-macadam, for the urban district council.—Mr. J. W. Martin, clerk.

BRIDGWATER.—April 1st.—For the supply of broken granite, for the rural district council.—Mr. T. M. Reed, clerk.

MALDON.—April 2nd.—For the supply of broken granite, basalt, slag, Kentish rag, flints, gravel, picked stone, carting, and steam rolling, for the rural district council.—Mr. Edgar J. Ennals, surveyor.

PORTSLADE-BY-SEA.—April 2nd.—For the supply of road materials, for the urban district council.—Mr. A. T. Allen, surveyor.

EALING.—April 2nd.—For making up an accommodation road, for the corporation.—Mr. Geo. E. Brydges, town clerk.

SALFORD.—April 2nd.—For sewering, paving, and flagging, for the corporation.—Borough Engineer.

POOLE.—April 2nd.—For making up a road, for the corporation.—Mr. Samuel J. Newman, borough surveyor.

LLANDAFF AND DINAS POWIS.—April 2nd.—For carrying out private street works, for the rural district council.—Mr. M. Warren, clerk.

ST. MELLONS.—April 2nd.—For the supply of broken limestone and gravel, for the rural district council.—Mr. A. H. Rees, clerk.

SALTBURN-BY-THE-SEA.—April 2nd.—For the improvement of Saltburn Bank, for the urban district council.—Mr. Cecil E. Preston, clerk.

LIMERICK.—April 2nd.—For the supply of paving setts, for the corporation.—The Surveyor.

HAMMERSMITH.—April 3rd.—For the supply of creosoted wood-paving blocks, for the borough council.—Mr. T. C. Jarvis, acting town clerk.

LYDD.—April 3rd.—For the supply of tar-macadam and basalt, for the corporation.—Mr. T. Kettle, borough surveyor.

LANCASHIRE.—April 4th.—For the hire of steam rollers, for the county council.—Mr. Harcourt E. Clare, clerk.

HUNSLET.—April 4th.—For the supply of granite, limestone, dross, tar-macadam, kerbs, setts and flags, for the rural district council.—Mr. W. B. Pindar, clerk.

OUNDLE.—April 5th.—For the supply of granite and slag, for the urban district council.—Mr. G. Belson Chilvers, surveyor, St. O'Sythes-lane.

DEWSBURY.—April 6th.—For work of paving and flagging, for the corporation.—Borough Surveyor.

NEWARK.—April 6th.—For making up two streets, for the rural district council.—Mr. R. Oakden, junr., surveyor.

HEMSWORTH.—April 6th.—For the supply of whinstone, limestone, granite, and dross, for the rural district council.—Mr. T. H. Richardson, surveyor.

FAVERSHAM.—April 6th—9th.—For the supply of road materials, for the rural district council.—Mr. J. D. Chittenden, district surveyor, Ashford-road.

NORTON.—April 6th.—For the supply of materials and team labour, for the rural district council.—Mr. J. E. Moulding, clerk, The Edge, Sheffield.

BARROWFORD.—April 8th.—For works of paving and flagging, and the supply of road materials, for the urban district council.—Mr. A. T. Chandler, clerk.

SOUTHGATE.—April 9th.—For carrying out private street works, for the urban district council.—Mr. C. G. Lawson, surveyor.

CORNWALL.—April 9th.—For the supply of materials, hauling, team labour, and purchase of scrapings, for the county council.—Mr. Albert E. Brookes, county surveyor.

LEEK.—April 9th.—For making up two streets, for the rural district council.—Mr. J. M. Shaw, clerk.

RAWTENSTALL.—April 10th.—For carrying out road work in several streets, for the corporation.—Mr. J. Johnson, borough surveyor.

EAST SUFFOLK.—April 10th.—For the supply of road materials, carting, hauling, and tools, for the county council.—Mr. A. Townshend Cobbold, clerk.

HOOLE.—April 10th.—For the supply of tar-macadam, for the urban district council.—Mr. C. Atkin, surveyor.

HURST.—April 11th.—For making up several streets, for the urban district council.—Mr. R. Whitworth, clerk.

READING.—April 11th.—For work of making up, for the urban district council.—Mr. J. Bowen, borough engineer and surveyor.

MOTTRAM.—April 11th.—For the supply of rock setts, for the urban district council.—Mr. F. Thompson, clerk, 123 Stamford-street, Stalybridge.

HAVERHILL.—April 13th.—For the supply of granite, slag, tarred-macadam, and basalt, for the urban district council.—Mr. W. H. Eley, surveyor.

WANDSWORTH.—April 15th.—For flagging the footway of part of Upper Richmond-road, for the borough council.—Mr. Henry George Hills, town clerk.

BRIGHOUSE.—April 15th.—For the supply of granite setts, for the corporation.—Mr. S. S. Heywood, borough engineer.

CARSHALTON.—April 17th.—For making up a road and approaches, for the urban district council.—Mr. W. W. Gale, surveyor.

FINCHLEY.—April 19th.—For the supply of from 200 to 400 tons of gritting material, for the urban district council.—Mr. E. H. Lister, clerk.

HOUGHTON-LE-SPRING.—April 20th.—For the supply of road materials, for the rural district council.—Mr. D. Balfour, surveyor.

LEWISHAM.—For works of kerbing, channelling, and paving, for the borough council.—The Surveyor.

## Sanitary.

YORK.—March 30th.—For the construction of works of sewage disposal, for the corporation.—Mr. F. W. Spurr, city engineer.

KIRKCALDY.—March 30th.—For alterations to sewer, for the corporation.—Burgh Surveyor.

STANLEY.—March 30th.—For the removal of house refuse, for the urban district council.—Mr. J. Harris, sanitary inspector.

ROCHFORD.—April 1st.—For the removal of refuse, for the rural district council.—Mr. F. Gregson, clerk, Southend-on-Sea.

OSWESTRY.—April 1st.—For the construction of stoneware pipe sewers, manholes, &c., for the rural district council.—Mr. C. H. Bull, clerk.

GLASGOW.—April 1st.—For laying pipe sewer, for the corporation.—Mr. J. Lindsay, town clerk.

ST. MELLONS.—April 2nd.—For the construction of a system of sewerage, for the rural district council.—Mr. A. H. Rees, clerk.

DRIFFIELD.—April 2nd.—For the construction of sanitary pipe drain, inspection chamber and gullies, for the rural district council.—Mr. T. C. Beaumont, surveyor.

REPTON.—April 3rd.—For emptying cesspools and removing house refuse, for the rural district council.—Mr. C. F. Chamberlin, clerk.

LANARK.—April 3rd.—For the construction of sewers at Newton, for the Middle Ward.—Mr. J. T. T. Brown, 97 West Regent-street, Glasgow.

ATCHAM.—April 4th.—For the construction of sewage outfall works, for the rural district council.—Mr. H. Asher, surveyor, 24 St. John's-hill, Shrewsbury.

AYLESBURY.—April 6th.—For work of scavenging, for the rural district council.—Mr. F. H. Parrott, clerk.

SOUTHAMPTON.—April 6th.—For the collection of house refuse, for the corporation.—Town Clerk.

NEWARK.—April 6th.—For the extension of sewage disposal works, for the rural district council.—Mr. R. Oakden, junr., surveyor.

BILLERICAY.—April 8th.—For laying sewers, with manholes, flushing chambers and construction of sewage tanks, for the rural district council.—Mr. C. E. Lewis, clerk.

BIRMINGHAM.—April 10th.—For the construction of brick and concrete sewer, overflow chamber and manhole, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

CHINGFORD.—April 10th.—For alterations to sewage disposal works and laying sewers, for the urban district council.—Messrs. Tooley & Foster, Queen's-road, Buckhurst Hill.

WYCOMBE.—April 10th.—For the construction of sewage disposal works, for the rural district council.—Mr. B. L. Reynolds, clerk, 12 Easton-street, High Wycombe.

SALFORD.—April 10th.—For laying concrete tube sewer and manholes, for the corporation.—Borough Engineer.

RUNCORN.—April 12th.—For laying stoneware and iron pipes, and manholes, for the rural district council.—Mr. G. F. Ashton, clerk.

MATLOCK.—April 15th.—For the construction of main outfall and subsidiary sewers of earthenware, steel and cast-iron pipes, manholes, detritus tanks, percolating filters and effluent drains., for the urban district council.—Mr. R. Taylor, clerk.

LEITH.—April 15th.—For laying sewer, for the corporation.—Burgh Surveyor.

RAUNDS.—April 15th.—For extensions to sewage disposal works, for the urban district council.—Mr. W. F. Corby, clerk.

BRIGHTON.—April 26th.—For the construction of sewers and other works, for the corporation.—Borough Surveyor.

## Stores.

COLWYN BAY.—March 30th.—For the supply of drain pipes, ironmongery, disinfectants, pitch, tar and road materials, for the urban district council.—Mr. J. Amphlett, clerk.

SOUTHPORT.—March 30th.—For the supply of stoneware pipes, gullies, bricks, footway tiles, ironmongery, oils, Portland and Roman cement, road materials, iron castings, brooms, paving work, and team labour hire, for the corporation.—Mr. J. Ernest Jarratt, town clerk.

PARTICK.—April 2nd.—For the supply of electrical stores, for the corporation.—Town Clerk.

LIMERICK.—April 5th.—For the supply of electrical necessaries, for the corporation.—Mr. W. M. Nolan, town clerk.

DUNDEE.—April 6th.—For the supply of battens, cartage, cement, freestone rubble and metal, granite chippings, pavement and kerb, for the corporation.—Mr. W. H. Blyth Martin, town clerk.

KIRKCALDY.—April 10th.—For the supply of brass castings, brushes, tar, cartage, sand and waste, for the corporation.—Mr. O. F. Francis, burgh electrical engineer and tramways manager.

WALLASEY.—April 13th.—For the supply of coal, shovels, bolts, meters and cable, for the electricity works.—Mr. H. W. Cook, town clerk.

### Miscellaneous.

PENARTH.—March 30th.—For the supply of a steam or petrol motor wagon, trailer, and water van, for the urban district council.—Mr. George Wainwright, clerk.

BELFAST.—April 3rd.—For sinking trial pits and boreholes for water supply scheme, for the Water Commissioners.—Mr. R. Hamilton, secretary.

BIRMINGHAM.—April 10th.—For the supply of box carts, water vans, tip wagons and hand carts, for the corporation.—Mr. H. E. Stilgoe, city engineer and surveyor.

## TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

ABERDEEN.—For the construction of 8 miles of the Braemar-road, for the Deeside District Committee:—
W. Tawse, Aberdeen, £8,286.

GREENWICH.—The borough council accepted the tenders of the following firms:—
Middleton Brothers, St. George-street, for oils, paints, colours, &c.
W. G. Penfold, East Greenwich, for so many sets of 1 man, 1 cart, 1 cart horse and harness as may be required, at 9s 9d per set per day, at 5s. 6d. per set per half-day on Saturdays (till noon), and overtime at 1s. per hour; and so many sets of 1 man, 1 cart horse, and harness, as may be required at 9s. 3d. per set per day, at 5s. 6d. per set per half-day on Saturdays (till noon) and overtime at 1s. per hour.
Tilbury Contracting and Dredging Company, Limited, Westminster, for tar paving composition, and broken ragstone and ragstone chippings.
Dan & Stone, Limited, Strand, for broken flint.
T. Scholey & Co., Limited, East Greenwich, for good binding gravel, Thames ballast, river sand, and crushed grit.
Fry Brothers, Greenwich, for 2-in. and 1½-in. hand-broken Guernsey granite.
J. Mowlem & Co., Limited, Westminster, for broken Guernsey granite chippings rough, broken Guernsey granite chippings clean, and Guernsey granite spalls.
J. Hocking & Co., Charlton, for work required to be done at the mortuary chapels at Greenwich Cemetery, at a charge of £89.

HALLATON.—For the supply of broken granite, for the rural district council:—
Groby Granite Company, Leicester.*
Croft Granite Company, Leicester.
Botts Hill Granite Company, Leicester.
Bardon Hill Granite Company, Leicester.
Forest Rock Granite Company, Leicester.
Mountsorrel Granite Company, Loughborough.*
Mancetter Granite Company, Atherstone.
Cliff Hill Granite Company, Atherstone.

HAMPTON.—Accepted for the supply of materials, for the urban district council.—Mr. S. H. Chambers, surveyor:—
Clee Hill Granite (hand broken).—British Macadams, Ltd, Gravesend, 15s. 10d. per ton.
Flints.—Dan & Stone, Ltd., Strand, 5s. per cubic yard.
Granite Chippings.—Rowe & Mitchell, London Bridge, 12s. 1d. on roads, 10s. 5d. on draw dock, 12s. 2d. railway station.
Tarpaving Material.—Constable, Hart & Co., Ltd., Arthur-street West, ¾in. toppings, 17s. per ton; 1½in. bottoms, 15s. per ton.
Tarvia.—Bristowe & Co., Ltd., Westminster, 4½d. per gallon.
Bass Brooms.—A. B. Gray, Hampton-hill, 28s. 6d. per dozen.
House Coal and Coke.—S. Bowyer, Twickenham, best brights coal, 22s. 8d. per ton; coke, 12s. 6d. per chaldron.

HAYES.—For the erection of 51 workmen's dwellings, for the urban district council.—Mr. D. C. Fidler, surveyor:—

| | |
|---|---|
| C. F. Kearley, Uxbridge | £11,789 |
| Holloway Brothers, Limited, Belvedere-road | 11,500 |
| Wood Brothers, Forest-gate | 10,500 |
| C. Watts & Co., Finchley | 10 467 |
| A. Winch, Harlington | 9,977 |
| G. Porter, Hackney | 9,868 |
| C. Groom, Ealing | 9,808 |
| Y. J. Lovell & Son, Gerrard's Cross | 9,610 |
| A. E. Knight, Hendon | 8,930 |
| W. J. Wilkinson, West Drayton | 8,671 |
| C. J. Dungate, Hayes* | 8,455 |

Surveyor's estimate, £8,510.

KINGSTON-ON-THAMES.—For various works and supplies, for the corporation.—Mr. R. H. Clucas, borough engineer:—
Horse, harness and driver for watering or carting, 8s. per day, 5s. half-day; including cart and trolley, 9s. and 5s.—J. & C. Stickley.
Harness Requisites.—J. Lee.†
Wheelwright's Work.—J. Baker.†
Wood Paving.—

| | Main Roads. | Non Main Roads. |
|---|---|---|
| S. Kavanagh & Co. | £13,520 | £2,553 |
| Dick, Kerr & Co., Limited | 13,316 | 2,776 |
| Acme Flooring and Paving Company (1904), Limited | 12,700 | 2,648 |
| T. Cook Starkey & Co. | 12,291 | 2 564 |
| J. Mowlem & Co., Limited | 11,778 | 2,477 |
| Improved Wood Pavement Company, Limited | 11,574 | 2,370 |
| W. Griffiths & Co., Limited† | 11,495 | 2,370 |

Resconting Main Roads.—
Trinidad Lake Asphaltic Paving Company, Limited, 7s. 6d. per yd.
Tarmac Syndicate, Limited, 5s. 6d.
Tarmac, Limited, 6s. 2d. and 5s. 6d.
Constable, Hart & Co., Limited, 5s. 4d.
Roadament Company, Limited, 5s.†
British Trust Corporation, Limited, 4s. 3d. and 4s. 8d.†

Wood Paving, Non-Main Roads.—A letter was read from the Improved Wood Company, whose tender for wood-paving Church-street, Thames-street, and the Market-place was for the same price as that of the firm accepted, W. Griffiths & Co., Limited—viz., £2,370 stating that, as they noticed that the non-main roads referred to had no tramways, they would be prepared to enter into a contract for seven years' free maintenance of their work. The Highways Committee resolved that the resolution accepting the tender of W. Griffiths & Co., Limited, be rescinded, and that in lieu thereof the tender of the Improved Wood Pavement Company, Limited, be accepted.

LEWISHAM.—The following tenders have been accepted for the reconstruction of drains:—F. G. Rose at £15 for Brownhill-road; J. H. Fletcher at £50 for Embleton-road; J. T. Gloag at £33 for Engate-street, and £18 for Bertrand-street; and J. Dennett & Co., at £101, for Sydenham-hill-road.

PENYBONT (Glam.).—The tender of H. V. Smith & Co., Westminster, has been accepted by the rural district council for tar-spraying of a number of roads at 1½d. per superficial yard, the contract to include the provision of distilled tar and grit.

The following tenders were accepted for the supply of limestone:—St. Brides Major, A. Benjamin, 2s. 9d. per cubic yard: Coychurch Higher, E. J. Morgan, 6s. 6d.; Coychurch Lower, F. Raikes, 4s. 8d.; Ewenny, A. Benjamin, 3s.; Kenfig, D. Richards, 3s. 9d.; Laleston, Palmer & Smith, 4s. 5d.; Llangynwyd Lower, C. Gwatkin, 6s. 1d.; Llangynwyd Middle, C. Gwatkin, 7s. 2d.; Merthyrmawr, D. Llewellyn, 3s. 7d.; Newcastle Higher, J. Smith, 3s. 7d.; Pencoed, E. J. Morgan, 4s. 6d; Pyle, D. Richards, 3s. 9d.; Southerndown, A. Benjamin, 2s 9d.; Tythegston Higher, D. Richards, 4s. 3d.; Tythegston Lower, C. Davies, 3s. 9d.; Wick, A. Benjamin, 4s. With reference to Ynysawdre, St. Brides Minor, and Coity Higher, they were referred to the surveyor to see if he could get the stone cheaper; if not, to report to the council.

SHREWSBURY.—Accepted for laying pipe sewer and manholes, for the corporation.—Mr. W. C. Eddowes, borough surveyor:—
G. and W. Edwards, Shrewsbury.

TUTBURY.—Accepted for the supply of broken granite and limestone, for the rural district council.—Mr. H. S. Tebbitt, surveyor:—
Granite.—C. Abell Limited, Hartshill; Dosthill Granite Company, Dosthill; Ellis & Everard, Bardon Hill; Groby Granite Company, Leicester; Salisbury & Wood, Burton-on-Treat.
Limestone.—Bowne & Shaw, Wirksworth.
Gravel.—J. G. Shields, Breedon Hill.

WANDSWORTH.—For making up work, for the borough council.—P. Dodd, borough engineer:—
For paving Normanhurst-road, Streatham, it is recommended that the footpaths be paved with Aberdeen Adamant paving, and that the tender of T. Adams (£687 and schedule prices for extras or omissions) be accepted.
For paving that part of Upper Richmond-road, Putney, which lies between Dalesford-avenue and Roehampton-lane, it is recommended that the footpath be paved with Aberdeen Adamant paving, and that the tender of J. Mears (£230 and schedule prices for extras or omissions) be accepted.

WILLINGTON (Durham).—Tenders have been accepted as follows by the urban district council:—

Road Metal.

Whinstone.—Monkhouse & Peart.
Limestone. J. T. Monkhouse.
Slag.—Barker & Co.
Carting road metal, leading water, horse hire, &c.—T. Hutchinson.
Lamp Repairs. J. H. Stephenson, Wingate.
Mason work.—T. H. Robinson.
Sewerage works.—J. Raine.
Scavenging.—Oakenshaw, Strakers & Love; Pare Bank, H. E. Hope; Willington and Brancepeth Colliery, G. W. Hope & H. E. A. Hope.

## MEETINGS.

*Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.*

MARCH.

29.—Junior Institution of Engineers: Smoking Concert, Criterion Restaurant, Piccadilly Circus. 8 p.m.

APRIL.

1.—Royal Institute of British Architects: Mr. Edwin T. Hall on "Art Museums and Public Galleries." 8 p.m.
1.—Society of Engineers: Mr. Gerald O. Case on "Ligno Concrete," Institution of Electrical Engineers. 7.30 p.m.
2.—Royal Sanitary Institute: Mr. F. J. Osborne Smith, F.R.I.B.A., on "Sanitary Fittings." 7 p.m.
3.—Institution of Municipal Engineers: Meeting at Institution Offices: Mr. S. Palmer on "The Design and Planning of Working-class Dwellings." 7 p.m.
12-13.—Royal Sanitary Institute: Meeting at Cardiff; Discussion on "The Development of Card ff Waterworks"; visit to waterworks extension at Brecon Beacons.
23.—Surveyors' Institution: Annual Dinner, Whitehall Rooms. 7 p.m.
27.—Institution of Municipal and County Engineers: Council Meeting.

MAY.

4.—Institution of Municipal and County Engineers: Meeting at Exmouth.
4.—Lower Thames Valley District Surveyors' Association: Annual Meeting and Dinner.
11.—Institution of Municipal and County Engineers: Meeting at Nuneaton.
24-29.—Institution of Municipal and County Engineers: Visit to Paris.

JUNE.

1.—Institution of Municipal and County Engineers: Council Meeting.
7-8.—Institution of Municipal and County Engineers: Meeting at Stirling.
15.—Institution of Municipal and County Engineers: Meeting at East Ham.
27.—Institution of Municipal and County Engineers: Meeting at Lowestoft.
29.—Institution of Municipal and County Engineers: Meeting at Bridlington.

JULY.

6.—Institution of Municipal and County Engineers: Meeting at Stourbridge.
11-13.—Institution of Municipal and County Engineers: Annual Meeting, London.

## APPOINTMENTS OPEN.

BOROUGH ENGINEER AND SURVEYOR (A.M.Inst.C.E.) of large town in the Midlands (40,000) has vacancy for Pupil. Address Box 1,144, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

THE RURAL DISTRICT COUNCIL OF CLAYPOLE IN THE COUNTY OF LINCOLN.
APPOINTMENT OF HIGHWAY SURVEYOR, SANITARY SURVEYOR, AND INSPECTOR OF NUISANCES.

The above Council invite applications for the appointment of the combined offices of Highway Surveyor, Sanitary Surveyor, and Inspector of Nuisances for the Rural District of Claypole.

There are about 180 miles of roads and 26 parishes in the district.

The salary for the combined offices (which is in every respect inclusive) will be £180 per annum, made up as follows: Highway Surveyor £120, Sanitary Surveyor £40, Inspector of Nuisances £20. The person appointed must be fully qualified, and under the age of 28 years, and will be required to reside in the district and to devote the whole of his time to his duties, and to give approved security in the sum of £100 for the faithful discharge of the same.

Applications, marked "Highway Surveyor," in the candidate's own handwriting, stating age, qualifications, and previous experience, and when the candidate could commence his duties, and accompanied by copies of not more than three recent testimonials, must be delivered at my office not later than Monday, the 8th day of April next.

The appointments will be subject to the approval of the Local Government Board.

Canvassing Members of the Council, either directly or indirectly, will be deemed a disqualification.

(By order)
A. J. FRANKS,
Clerk to the Council.

24 Lombard-street, Newark.
March 26, 1912.

VALUER AND SURVEYOR, VALUATION OFFICE, IRELAND.
FORTHCOMING EXAMINATION.

Applications must be received at the Civil Service Commission, London, not later than the 18th April, on printed Forms, to be obtained, with particulars, from the Secretary, Civil Service Commission, Burlington-gardens, London, W.

## TENDERS WANTED.

HAVERHILL URBAN DISTRICT COUNCIL.
TO GRANITE, SLAG, TARRED MACADAM AND BASALT MERCHANTS.

The above Council invite Tenders for the Supply of all or any of the above. Forms of Tender and particulars to be obtained from the undersigned, to whom Tenders, with samples, must be delivered on or before April 13th, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

W. H. ELEY,
Surveyor.

Surveyor's Office,
Haverhill,
Suffolk.
March 25, 1912.

BOROUGH OF HAMMERSMITH.
SUPPLY OF WOOD-PAVING BLOCKS.

The Borough Council invites Tenders for the Supply of Creosoted Wood-paving Blocks for the year ending 31st March, 1913.

The Blocks must be supplied according to the Terms and Conditions of the Specification, copy of which, with Form of Tender, may be obtained on application to Mr. H. Mair, Borough Surveyor.

Sealed Tenders, endorsed "Tender for Wood-paving Blocks," must be delivered to me not later than 4 p.m. on Wednesday, 3rd April, 1912.

The Council does not bind itself to accept the lowest or any Tender.

T. C. JARVIS,
Acting Town Clerk.

Town Hall, Hammersmith, W.
March 25, 1912.

BOROUGH OF EALING.
PRIVATE STREET IMPROVEMENTS.

The Town Council of this Borough hereby invites Tenders for the Making Up of the following Road:—

Accommodation-road, rear of shops, Uxbridge-road (from St. James'-avenue to Melbourne-avenue).

The Drawings and Specifications may be seen, and Forms of Tender, together with Schedule of Quantities and other particulars, obtained from Mr. Charles Jones, M.Inst.C.E., Borough Engineer, Town Hall, Ealing, W., any day during office hours, upon payment of a deposit of 10s. 6d., which will be returned upon receipt of a *bonâ-fide* Tender.

Sealed Tenders, in the envelopes provided, endorsed "Tender for Making Up——," must be delivered at my office not later than 9.30 a.m. on Tuesday, the 2nd day of April, 1912.

The Council does not bind itself to accept the lowest or any Tender.

Dated this 19th day of March, 1912.

(By order of the Council)
GEO. E. BRYDGES,
Town Clerk.

Town Clerk's Office,
Town Hall, Ealing, W.

TO CONTRACTORS AND OTHERS.

THE COUNCIL OF THE METROPOLITAN BOROUGH OF WANDSWORTH is prepared to receive Tenders for Flagging the Footway of that part of Upper Richmond-road, Putney, which lies between Woodborough-road and Daylesford-avenue.

The Specification and Drawings may be seen, and Forms of Tender obtained, of the Borough Engineer, at the Office of the New Streets Department, No. 56 East-hill, Wandsworth, S.W., between the hours of 10 and 4 (Saturdays 10 and 12), upon payment of a deposit of Five Guineas.

Tenders, enclosed in sealed envelopes, and endorsed "Tender for Flagging Upper Richmond-road (3)," must be delivered at the Council House, East-hill, Wandsworth, S.W., and may be placed by the person tendering in the box provided for the purpose, not later than four o'clock in the afternoon of Monday, the 15th April next.

Persons tendering must, in the case of all workmen employed by them in and about the execution of the Contract, pay wages at not less, and observe hours of labour not greater, than the rates and hours recognised by the Associations of Employers and Employees and in practice obtained in the district where the work is to be executed.

No Tender will be received unless it be made upon one of the Forms provided for the purpose. The Council does not pledge itself to accept the lowest or any Tender.

If required the Contractor must provide two sureties for the due execution of the Contract.

HENRY GEORGE HILLS,
Town Clerk.

Council House,
Wandsworth, S.W.
March 21, 1912.

BOROUGH OF BOOTLE.
ELECTRIC LIGHT STATION.

The Corporation of Bootle invite Tenders for the Erection of a Brick Chimney Shaft at their new Electric Light Station.

Bill of Quantities and further particulars may be obtained on application at the Borough Engineer's office, where the Plans and Specification may be seen.

Tenders, sealed and endorsed "Electric Light Station Chimney," must be sent in to the undersigned not later than 9 a.m. on Wednesday, the 24th day of April, 1912.

The sum of One Guinea will be required as a deposit, which sum will be returned on receipt of a *bonâ-fide* Tender.

The Corporation do not bind themselves to accept the lowest or any Tender.

(By order)
J. HENRY FARMER,
Town Clerk.

Town Clerk's Office, Bootle.
March 25, 1912.

LANCASHIRE COUNTY COUNCIL.

The County Council invite Tenders for the Hire of Steam Rollers during the year ending March 31, 1913, or for a period of three years commencing April 1st, 1912.

Particulars and Forms of Tender may be obtained on application to the County Surveyor, Mr. W. H. Schofield, County Offices, Preston, to whom sealed and endorsed Tenders must be delivered not later than April 4th, 1912.

The County Council do not bind themselves to accept the lowest or any Tender.

HARCOURT E. CLARE.
Clerk of the County Council.

CITY OF BIRMINGHAM.

RECONSTRUCTION OF FOUL-WATER SEWER IN SANDY-LANE.

The Public Works Committee invite Tenders for the Construction of about 100 yards of 3 ft. 6 in. diameter Brick and Concrete Foul-water Sewer, together with an Overflow Chamber and Manhole in Sandy-lane.

The Plan and Specification may be seen, and Quantities and Forms of Tender obtained, at the Office of the undersigned on deposit of the sum of £2 (which will be returned on receipt of a *bonâ-fide* Tender). Persons tendering must at the time of tendering and at all times during the execution of the Works be paying all their workpeople not less than the Trade Union or Standard Rate of Wages in the district where such workpeople are actually engaged in the execution of the work, and must be observing the hours and conditions of labour recognised by the Association of Employers and the local organised bodies of workers in the various trades in such district. The Tender of any person not paying the Trade Union or Standard Rate of Wages, or not observing such hours and conditions of labour in his ordinary business, will not be accepted. The Contractor will be held responsible for the observance of these conditions by any Sub-Contractor employed by him.

Persons tendering will also be required to comply with the requirements of the Trades Boards Act, 1909, where applicable.

Tenders, sealed and endorsed "Sandy-lane Sewer," to be addressed and delivered to me at my Office not later than the 10th April, 1912.

The Committee do not bind themselves to accept the lowest or any Tender.

HENRY E. STILGOE, M.INST.C.E.,
City Engineer and Surveyor.

The Council House,
Birmingham.
March 25, 1912.

## MISCELLANEOUS.

FIRE-ENGINE, by Merryweather, in good working order, on wheels, fore-carriage, pole and horse gear. To throw two powerful jets. Price £75. Can be seen and tried at Lynn by arrangement.—Apply to Dodman & Co., Limited, Highgate, King's Lynn.

FOR SALE one pair Driving Wheels, suitable for Aveling & Porter's 15-tons Steam Roller, rimmed with Hadfield's manganese steel; rims 4 in. thick. The wheels may be seen at Linlithgow upon application.—J. D. Lapham, County Road Surveyor, Linlithgow.

## PREPARATION FOR EXAMINATIONS.

### MUNICIPAL AND COUNTY ENGINEERS' EXAMINATION.

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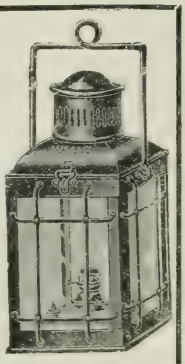

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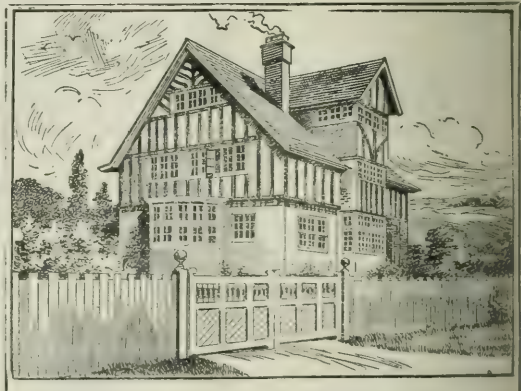

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# The Surveyor

And Municipal and County Engineer.

Vol. XLI. APRIL 5, 1912. No. 1,055.

## Minutes of Proceedings.

**London Water Supply: Dr. Houston's Report.**

Dr. Houston's latest report, with which we deal more fully elsewhere, is of exceptional interest. In it we find a considerable amount of information which is of a reassuring nature, but in certain passages very distinct warnings are given. It appears, in the first place, that, as far as scientific experiment can prove it, disease germs are not present in the raw waters of the Thames in large numbers. It might well be imagined that a river which receives so much pollution would contain an immense number of pathogenic germs in any sample of raw water submitted to examination, but this has not been found to be the case. On the contrary, out of a comparatively large number of samples only two typhoid-like microbes have been discovered. Proof is also afforded that the methods adopted for the isolation of such germs proved successful with artificially infected samples. Dr. Houston emphasises the importance of the fact that these experiments do not justify any relaxation in the care of water purification, and his remarks may well be compared with those to be found in the recent report on a typhoid epidemic at Cedar Falls, Iowa, which case was stated to be especially noteworthy because it was one in which laboratory tests failed to trace the poison, although it was later proved that the waters were sufficiently polluted at the time of examination to cause a serious outbreak of typhoid.

Dr. Houston draws attention to a fact which does not appear to have been considered hitherto with regard to the bacterial purification effected by storage. His experiments show that temperature has a very great effect upon the vitality of the typhoid bacillus, and that while the extinction of these germs takes place rapidly at a temperature of 50 deg. Fahr., or higher, it takes place at a very much reduced rate at lower temperatures, so that two weeks' storage at 64·4 deg. Fahr. becomes five weeks' storage at 32 deg. Fahr. However, with these results one is still forced to admit that adequate storage is still calculated to do its work, and that the proof of inutility of storage at low temperatures is *not* the outcome of the experiments. All evidence does, however, prove that the storage must be adequate, not only for the reason stated, but also because, after a period of drought, flood waters, which are of far worse quality than the ordinary river water, must flow into the reservoirs, and through them if they have been depleted during the drought, and "a period inevitably follows during which the duration of storage of necessity falls short," and this happens at a time when the water taken in is most impure, and when, owing to the lowness of the temperature, it needs the longest storage. It is difficult to see how even with very much larger reservoirs this state of things is to be prevented, and it is not surprising to find Dr. Houston once again speaking very seriously of the matter and suggesting pre-settlement and coagulation as a way out of the difficulty.

Certainly there are times when the river water needs such pre-treatment before it enters the reservoirs, and Dr. Houston's experiments, made with reservoirs holding several million gallons of water, show that a very great improvement can be effected by natural settlement in reservoirs holding about five-eighths of the day's flow. Such treatment would involve no additional working expenses, and the initial outlay would be comparatively small. Further, it is shown that occasionally, when the water is of very bad quality, coagulants could be added to the water so as to bring it up to any required degree of purity. It is to be expected that Dr. Houston's excellent advice will be followed by the Water Board. It will save the cost of the construction of disproportionately large storage reservoirs, and it will render the water safer than such reservoirs could make it, it will save expense, and it will remove the possibility of the storage reservoirs ever silting up—a matter not to be overlooked. The merits of settlement and coagulation are too well known to those who are acquainted with the subject to require the defence offered by Dr. Houston in his report, and it is to be hoped that the Doctor will not be hindered by ignorant prejudice in the matter. The whole report is of the greatest interest, and contains much information which will be of value to those interested in water-works problems.

* * *

**The Disposal of New York's Sewage.**

The second of the preliminary reports on the disposal of New York's sewage, issued by the Metropolitan Sewerage Commission of New York, describes the four principal drainage divisions in that part of the Metropolitan sewage district which lies in the New York State. It will be remembered that these preliminary reports of the commission are issued in advance of the final report for immediate consideration, and that some features will remain open for revision until the final report is published. In the first report the commissioners showed that it was impracticable to deal with the whole of the sewage of New York at one point, either by means of a sea outfall or by inland treatment, and were of opinion that it would be necessary to deal with various sections of the area separately. In the second report the commissioners tell us exactly what these divisions are to be, and give detailed information which enables the reader to understand the reasons for outlining these areas. The boundaries of the divisions have been determined partly by the quantities of sewage produced, partly by the facilities which exist for disposing of the sewage in a sanitary manner, and partly by considerations of cost. Working upon the basis that the harbour of New York must be protected, its form, location, extent, depth, volume of water passing, its uses for traffic, recreation, shell-fish culture, bathing, and the probable future development upon the harbour shores have all been very carefully considered in forming the drainage divisions, and in consequence it has been found impossible to make the divisions of territory harmonise with borough boundaries

In view of the findings of our own Royal Commission with regard to the discharge of sewage in the vicinity of shellfish beds, it is interesting to note first that "oysters are planted extensively" in Jamaica Bay, and that the New York Commissioners are of opinion that "the large area of water surface as compared with the shallow depth is favourable to the absorption of oxygen from the atmosphere, and to a thorough commingling of the waters, two conditions which favour the bay as a place for the harmless and inoffensive assimilation of sewage matters." The report does not tell us to what extent sewage will be purified. It may be that the commissioners will think it necessary to render the sewage bacterially harmless before it is discharged; but it is perfectly clear that they advise some degree of purification by dilution, for they say that "the exact degree of purification required for sewage cannot, at this time, be stated, but an effort should be made to avoid elaborate processes which will require much land and expensive plants, and involve large cost for maintenance. The aim should be to make good use of the absorptive capacity of the harbour waters. By good use is meant such use as will do no material harm to the public health and welfare, either by producing disease, or causing nuisance. In exceptional cases the utmost degree of purification obtainable may be necessary." We are further told that the possibility that a more complete system of protecting the waters may be needed in the future is being kept in mind in preparing the plans. The future reports of the commission will doubtless be of the greatest interest, seeing that the methods which will be suggested are likely to be the most economical, and at the same time the most efficient, yet devised for the disposal of sewage discharged on the seashore or into tidal estuaries.

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**The Tar Film: Effects of Weather and Traffic.**

Certain tests which have been made on the tar film of a surface-tarred road by Mr. W. W. Crosby, chief engineer to the Maryland State Roads Commission, point to a useful line of investigation of what takes place under the action of weathering and of traffic. The conditions and the nature of the tests are described in Mr. Crosby's paper, which will be found in another part of this issue, the road being one with a very small amount of traffic and the crust itself of water-bound limestone. The experiments were of a preliminary character, the object being to find out what changes took place in the tar itself and what was the influence of free carbon. Our readers will remember that a series of experiments recently carried out showed that the so-called "free carbon" may contain other substances, notably sulphur compounds, and the exact nature of this solid content of the tar-pitch or other bituminous material is likely to have a considerable influence upon its weathering properties, using the word "weathering" to include the slow processes accompanying exposure to the atmosphere for considerable periods. For practical purposes it is, of course, more important to know what changes take place in the softening point than it is to ascertain to what extent and in what direction there are changes in the melting point, but tests of melting points obviously afford the readiest and most definite means of finding out in what direction changes take place, and they serve as preliminaries to the more important tests which will doubtless be made as regards changes in cohesion, brittleness and softening points.

Major Crosby is inclined to question the opinion that the "free carbon" is simply an inert filler, and the tests to which we refer above support his view. Even if this material be nothing more than an inert filler it would, as we pointed out some time ago, be good economy to pay higher prices for bitumens which are without it and to add a cheap inert filler to make up bulk. It is not necessarily cheaper to do this if the cost of the purer bitumen is considerably more than that of the material which contains "free carbon," but the fact that we are paying the price of a binder for a material which is a filler must not be lost sight of. Moreover, as we have just seen, this filler is possibly not inert. In the case of a tar-pitch film which plays a seasonal part on a main road this consideration may be unimportant, but where such a film is a lasting one, either by itself or as a part of a gradual building up of a carpet layer, through several seasons the point may be one of some importance, as well as in a tar-bound crust. We do not want to have sulphur compounds or other chemically active substances gnawing at the vitals of our crust and taking the "nature" out of the tar. We suggest that surveyors should make a practice of taking samples from tarred roads, at different stages, in order to test, at least by simple physical experiments, what changes actually take place. It is quite possible that the kind of stone used in the crust may have chemical as well as physical effects modifying the results. Instability due to the formation of acids might be checked by the presence of limestone or corrected in advance by the use of lime.

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**The Road Congress and Exhibition.**

In view of the far-reaching importance and interest of the forthcoming Third International Road Congress, and of the Exhibition to be held at Vincent-square in connection with it, we devote several columns of our space this week to indicating the tentative arrangements at present contemplated. As our readers know, the Congress is to be held under the auspices of the Permanent International Association of Road Congresses, the London Organising Committee being constituted as follows:—Chairman, Sir George S. Gibb; vice-chairmen: Lord Montagu of Beaulieu, W. Joynson-Hicks, M.P., and F. H. Berryman; hon. treasurer, Sir Charles D. Rose, Bart., M.P.; hon. general secretary, W. Rees Jeffreys; hon. deputy general secretary, G. Montagu Harris. It will, we think, be admitted that the organisers have already drafted, with conspicuous and comprehensive forethought, a programme for the Congress which is essentially practical, but we cannot state too emphatically that at this stage it is only put forward as tentative, and is subject to additions or amendments. These our readers are cordially invited to supply without delay. Construction is wanted—not criticism; and though we are afraid the completeness of the programme leaves little room for either, it may well be that a point or two of value have escaped the attention of the committee, and might make for perfection if suggested now for deliberation. Equally complete and admirable seem the provisional arrangements for the Exhibition, for the details of which the credit must be assigned to Mr. Maybury, the county surveyor of Kent; Mr. Rees Jeffreys, the secretary to the Road Board; and Captain Kingston, of the staff of the Road Board. It is true that the Royal Horticultural Hall is not a vast building for exhibition purposes, but on the other hand it is conveniently near to Great George-street, where the meetings of the Congress will be held, and we are in hopes that after each Congressional meeting the members will migrate to the Exhibition *en masse*, preferably under the guidance of cicerones told off for each day and selected for their knowledge of the exhibits and for their linguistic endowments. Moreover we believe the accommodation of the Horticultural Hall will be supplemented by the utilisation—especially for the exhibits of road rollers, traction engines, heavy machinery and similar unwieldy items—of adjacent sites already being negotiated for. Reverting in conclusion to the Congress programme, it will be noted that the "ninth section" is a new feature, and probably we should not be wrong in attributing its introduction to the inspiration of Mr. Rees Jeffreys. But, whoever may be credited with it, it seems to be a most useful innovation, and should materially widen the scope of interest of the deliberations of the Congress.

**Preesall Council and the Surveyor.** The comedy of municipal life has a special value from the aspects of interest and entertainment, but sometimes, as was the case at the Preesall Urban District Council recently, it has quite an unlooked-for measure of usefulness. The old bugbear of interference by meddlesome councillors with the men on the roads had cropped up, and as a result of the customary recrimination a rude form of trial took place in the council chamber, which reminded one member of the famous case of Bardell and Pickwick, while the chairman did not hesitate to characterise the proceedings as "a lot of tomfoolery." That the element of comedy, however, was not absent from the proceedings is apparent from the report printed in the *Blackpool Times*. The man concerned in the case, the steam-roller driver, was called before the council, when a member said he thought they ought also to have the surveyor (Mr. J. H. Monk) present. "It may be here stated," the faithful chronicler informs us, "that the surveyor is not usually in the council chamber when the council is sitting, but when he is wanted the chairman stamps the floor, and heigh presto! the surveyor appears, no doubt in response to the signal." To call spirits from the vasty deep is quite an easy matter, but there is no certainty that they will come when called. To call an urban surveyor from the lower depths of a council chamber, however, has more of the element of certainty, as appears in this instance, for we are told that after the chairman "had stamped violently on the floor," the surveyor duly appeared. After all the circumstances had been thrashed out in charge and counter-charge, the bedrock, so to speak, of the matter was reached when the chairman declared that "he hoped that in future they would leave the surveyor in charge of the men employed by the council, and not interfere with him. Then they would have only one man to blame or praise." This judicious utterance, supplemented by the further suggestion that "they would never do any good until they supported the surveyor," seemed to appeal with so much force to councillors that a resolution to make the surveyor responsible for the workmen was carried with unanimity, and the comedy of Preesall had thus a *finale* which though no doubt unexpected—which, indeed, is the special quality of all good comedy—was none the less welcome as a sign alike of grace and common-sense on the part of the performers in the play.

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**Ligno-Concrete.** At the meeting of the Society of Engineers on Monday a paper of great interest was read by Mr. Gerald O. Case. Mr. Case is the inventor of the material known as Ligno-Concrete (which consists of concrete with timber reinforcement), and his paper showed the results of a large number of experiments and tests which he has made since 1907. He pointed out clearly that in Ligno-Concrete the function of the concrete is not merely to protect the timber from decay or the ravages of insects. On the contrary the two constituents are so combined that both are used to the greatest advantage; in other words, the concrete is reinforced by an embedded framework of timber rods. When a timber rod is so embedded there is a distinct tendency for it to absorb water and consequently to swell, the amount of the enlargement depending upon the kind of timber used. On the other hand there is a certain contraction taking place in the concrete during the process of setting. These phenomena cause two difficulties in Ligno-Concrete construction. In the first place the respective expansion and contraction of the timber and concrete are apt to split the latter; and in the second place the presence of moisture may affect the mutual adhesion between the two materials. Many of Mr. Case's experiments and tests were designed with a view to overcoming these difficulties, and the results appear to have been satisfactory. The conclusion arrived at was that the difficulty of the expansion of timber rods when embedded in concrete could be avoided by using teak, and could be overcome in the case of other timbers by soaking them in water before embedding them in the concrete; and further, that such soaking did not seriously affect the adhesion between the timber and the concrete. As a result of further tests as to the comparative strength and cost of Ligno-Concrete and ferro-concrete, Mr. Case concludes that the former material cannot compete with the latter for all purposes, but that there is a large field for it in the construction of bungalows, floors, piles, posts, fencing, coast and river work.

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**The Croydon Rural Drainage Scheme.** In our issue of last week, on page 510, there was a paragraph, under the sub-head "Surrey County Council," announcing that the Highways Committee of that body had been authorised to retain an expert drainage engineer to advise them with respect to a surface-water drainage scheme of considerable magnitude, involving an expenditure which may reach £60,000. We now supplement the information given by explaining that the proposed appointment was suggested by the following circumstances. The Croydon Rural District Council propounded a large scheme of surface-water drainage, to which the Surrey County Council were expected to contribute, as there are certain main roads within the area. Mr. Alfred Dryland, M.INST.C.E., the county surveyor, was directed to report upon this scheme, and as a consequence of his investigations he raised important questions as to the adequacy of the scheme for the purpose in view, having regard to future developments and also the alternative possibility of dealing with the surface water for a further period of years by the provision of a spacious absorption area. Inasmuch as there were legal and other points involved as to the position and liabilities of the county council and the rural district council respectively, it was thought wise to take the advice of counsel on the legal aspects, and also to fortify the county council with the opinion of an eminent hydraulic engineer on the points Mr. Dryland raised in his report. As a matter of fact, it may be added, the rural district council have already acted upon the alternative suggestion in Mr. Dryland's report, and are now carrying out a scheme of disposal by local absorption.

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**Holborn Paving Problems.** It may come somewhat as a surprise to municipal engineers that the works committee of the Holborn Borough Council recommend a reversion to granite setts as a paving for High Holborn on account of the rapidity of wear of the asphalt paving now in use. The kind of paving proposed differs materially from the paving which was so largely used in North London some years ago, and will be much less noisy. It by no means follows, however, that it is impossible to take measures which would prolong the life of an asphalt pavement under the severe conditions of to-day. The construction of subways, which would reduce the number of occasions on which the concrete foundation has to be broken through, would probably benefit asphalt paving more than any other, though its effect in prolonging the life of wood paving would doubtless be very important, both wood and asphalt paving being, when laid upon concrete, strictly of the "carpet" type. There are other points to which attention might be paid with a view to prolonging the life of an asphalt carpet layer, and to some of these we hope to be able to refer in a future issue.

**Southwark Slum Clearance.** An order has been issued by the Local Government Board concerning the Tabard-street, Grotto-place and Crosby row scheme, which provides for the clearance of three insanitary areas in Southwark, comprising altogether about 17 acres. The L.C.C. Housing Committee report that the gross cost of the scheme is now estimated at £467,000, and the nett outlay at £389,900.

# Changes Noted in a Tar Exposed to Traffic and Weathering when Used in a Road Surface.*

By W. W. CROSBY, Chief Engineer to the Maryland State Roads Commission.

During the special road meeting of the American Society of Civil Engineers (January, 1910) the question was asked as to what changes had been determined as occurring in a bituminous material exposed in a road surface through an appreciable period of time. From lack of answer at the time, apparently no such determination had been made by anyone present, and therefore the writer offers the following as possibly of interest along this line.

In the summer of 1908 a section of limestone macadam was laid and partly water bound according to modern methods, and then treated by the writer with a coat of refined tar (evidently a mixture of water and coal-gas tar) as follows:—

The macadam surface was thoroughly swept free of all fine material, and until the interstices between the larger stones composing the surface were empty to the depth of about ½ in., or until the dislodgment of these larger stones would have immediately ensued. Over the cleaned surface was then spread (by gravity) a layer of the tar heated to a temperature of about 250 deg. Fahr. in an amount of about 1 gallon per square yard. The tar was broomed to ensure an even distribution and allowed to then remain untouched for from four to five hours in order to secure what penetration was possible. Then a layer of clean stone chips passing a ¾-in. and remaining on a ½-in. screen was evenly spread over the tar. The road was then smoothed by one or two passages of a 10-ton roller and opened to traffic. The resulting surface became in a few days similar in appearance to that of a bituli'hic street, and has proved entirely satisfactory ever since. The first winter some complaints were heard as to its slipperiness, and this was probably due to the fact that it was the only piece of tarred road in the vicinity and horses had to become accustomed to it.

The road was a main entrance to a private estate, and the traffic over it, though occasionally of heavy weight, was infrequent.

The weather was favourable during the progress of the work, being hot and dry all the time.

Since its treatment, and to date, no maintenance has been accorded the road, and the surface to-day seems almost the same as what it was a month after its completion. In a few spots in the centre of the road the carpet has worn through, so that the stones of the macadam are visible. These stones, however, are tight, and there is apparently little disintegration of the carpet around the edges of such spots. Except for these, where evidently the shod feet of horses have worn through relatively thin places, the carpet appears to be fairly intact.

In the winter of 1911-12 the writer secured some pieces of the carpet from the side of the road. It was difficult to remove any of the carpet from the macadam without serious injury to the latter, because of the tenaciousness of the whole mass. The pitch showed bright and "live" in the fractures. From these samples bituminous material was removed by the use of extractors and hot benzene. The extractor consisted of a tinned cylindrical box, about 3¾ in. in diameter and 20 in. high, with a coil of copper pipe attached inside its top to act as a condenser. Inside this box was suspended from the coil a tin cylinder 3 in. in diameter and 10 in. long, open at both ends. On the lower end was fastened, by means of strings, two thicknesses of muslin with filter paper between. The sample from which the bituminous material was to be extracted was broken up and placed in the small cylinder. In the bottom of the outer was placed about 150 c.c. of C.P. benzene. The benzene used was guaranteed C.P. by the maker, but a portion of the amount used was distilled previous to use through a "Hempel" rectifying column 24 in. long.

A number of the extractors above described were then placed together in a water bath to a depth of about 3 in., and the water kept boiling during the extraction. The extraction was continued for about eighteen hours, and was apparently complete, any free carbon which may have been in the compound being held in the road material or aggregate.

The benzene solution of the bituminous material extracted was then transferred to a large Engler flask, and the latter immersed in an oil bath up to the side tube. The oil bath was heated gradually to a temperature of 150 deg. Cent., and held there until no further distillate was obtained. To obtain carbon-free bituminous material from the original tar, known to contain 14 per cent free carbon, the normal tar was mixed with Ottawa standard sand, and then the extraction proceeded with as in the case of the samples from the road.

The accompanying table will show the determinations obtained—first, on the original compound; second, on the carbon-free bituminous material of the original compound; and, third, on the carbon-free bituminous material extracted from the road surface after three years of exposure and use.

On comparing these analyses, the differences between the figures given for the original material (carbon free basis) and for the material extracted from the road surface seem generally to be according to reasonable expectation, except as to the *lowering* of the melting point. The lighter or more volatile constituents of the original pitch seem to have passed off and the pitch to have become heavier, more viscil, more permanent, and harder. The lowering of the melting point appears at first surprising. It is suggested that this may be accounted for by oxidation that occurred in the higher boiling-point constituents of the pitch with a polymerization resulting. Mr. W. H. Fulweiler reports a similar lowering of the melting point of water gas tar being obtainable by subjecting such material to blowing with hot air. If such an explanation seems probable, it is the more to be regretted that the "free carbon" compound of the weathered pitch has not been so far obtainable.

It was anticipated that some, even if only approximate, determination of the "free carbon" content of the road surface after exposure and use would be most interesting, and every effort was made to arrive at conclusions in this respect, but without any success that would seem to justify the publication of figures. A sample of the mineral aggregate from the road, relieved of the bituminous cement, was sieved and the carbon determined by combustion on various portions, but without concordant results. Further, it was apparent that the results were vitiated by the presence of woody fibre or cellulose in a considerable quantity, even in the finest portions. The attempt was made to float out the cellulose, but without success, and the same apparent failures met the attempts to dissolve out the cellulose with ammoniacal cupric oxide and other reagents. Possibly some other investigator may be able to shed light on the important question as to whether "free carbon" is really formed in bituminous materials under similar conditions of use.

On comparing the figures of the analyses again it will be noted as a most remarkable fact that the initial boiling point of the extracted bitumen in each case is much lower than that of the normal compound, which latter contained 14 per cent free carbon. Duplicate extractions and distillations of the compound were made for the purpose of checking the figures in this regard, and their correctness seems assured. In order to check still further this point, 14 per cent of free carbon was added to a new sample (70 grammes) of the bituminous material secured by the removal of the "free carbon" from the original pitch, and a third distillation of 50 grammes of the product made in a smaller flask with the following results:

| | | | |
|---|---|---|---|
| Initial boiling point ... | ... | ... | 143 deg. Cent. |
| Room temperature to 105 deg. Cent. | | | None |
| 105 deg. Cent. to 170 deg. Cent. | | ... | 0·4 per cent |
| 170 | ,, | ,, 225 | ,, ... ,, 7·6 ,, |
| 225 | ,, | ,, 270 | ,, ... ,, 10 ,, |
| 270 | ,, | ,, 300 | ,, ... ,, 6·0 ,, |

The "free carbon" added was supplied by Mr. W. H. Fulweiler as having been extracted by him from tar, and was not "lampblack" in any sense except perhaps as to colour.

Apparently from the meagre data available, the opinion of the writer held for some years, in spite of

* Paper read in Washington.

reputable statements to the contrary, is that the distillation of bituminous compounds is materially affected by the presence of "free carbon," and he thinks confirmation of this is had in the foregoing.

The writer hopes that the above may prove of sufficient interest to warrant further investigations along these lines, and in this connection would suggest the possible advisability of making a secondary analysis of all bituminous materials containing appreciable amounts (say over 5 per cent) of free carbon contemporaneously with the usual determination on the normal materials, including the portion insoluble in carbon bisulphide. From the foregoing it may be seen how some advantage could be had, at least in the comparisons with later analyses of the used material, were the determinations also made on the bitumen relieved of the free carbon. Some years ago the writer considered this point, but at that time was led to adopt the determination of characteristics on the normal or complete material, partly at least because of the then admitted uncertainty as to the effect of the presence of the so-called free carbon. There exists some opinion that the free carbon is simply an inert material present perhaps as a filler as most, but apparently from the above this opinion may be questioned.

The writer wishes to express here his deep obligation to Penniman & Browne, chemists of Baltimore, for their valuable assistance and suggestions in the work above mentioned.

| Determinations made on lines proposed by special Commission, Am.Soc.C.E. | First sample of tar—normal compound. | First sample of tar—carbon-free basis. | Extracted from road surface—carbon-free basis. |
|---|---|---|---|
| Water soluble material | None | None | None |
| Free carbon insoluble in carbon bisulphide | 14 per cent | — | – |
| Fixed carbon, less free carbon | 9·96 ,, | 12·77 per cent | 13·41 per cent |
| Specific gravity | 1·188 | 1·124 | 1·151 |
| Viscosity at 100 deg. Cent. (Engler) | 25·6 | 15·7 sec. | 25 sec. |
| Viscosity at 25 deg. Cent. (Lunge) | 6·4 | — | 3·8 |
| Viscosity at 25 deg. Cent (Engler) | — | 172·8 sec. | — |
| Loss on evaporation at 105 deg. Cent., 3½ in. dish, 21 hours | 27·75 per cent | 38·20 per cent | 19·35 per cent |
| Penetration of this residue at 4 deg. Cent. | Hard | Hard | Hard |
| Penetration of this residue at 25 deg. Cent. | Hard | Hard | Hard |
| Melting point of this residue | 50 deg. Cent. | 54 deg. Cent. | 38 deg. Cent. |
| Loss on evaporation at 170 deg. Cent., 2½ in. dish, 3 hours | 24·80 per cent | 37·65 per cent | 16·15 per cent |
| Loss on evaporation at 170 deg. Cent., 2½ in. dish, 5 hours | 29·80 ,, | 45·00 ,, | 21·75 ,, |
| Penetration of this residue at 4 deg. Cent. | Hard | Hard | Hard |
| Penetration of this residue at 25 deg. Cent. | Hard | Hard | Hard |
| Melting point of this residue | 69 deg. Cent. | 81 deg. Cent. | 48 deg. Cent. |
| Loss on evaporation at 205 deg. Cent., 2½ in. dish, 3 hours | 25·75 per cent | 38·25 per cent | 17·30 per cent |
| Loss on evaporation at 205 deg. Cent., 2½ in. dish, 5 hours | 32·25 ,, | 45·50 ,, | 23·15 ,, |
| Penetration of this residue at 4 deg. Cent. | Hard | Hard | Hard |
| Penetration of this residue at 25 deg. Cent. | Hard | Hard | Hard |
| Melting point of this residue | 76 deg. Cent. | 88 deg. Cent. | 51 deg. Cent. |
| Initial temperature of distillate | 165 ,, | 128 ,, | 136 ,, |
| Room temperature to 105 deg. Cent. | None | None | None |
| 105 deg. Cent. to 170 deg. Cent. | 1 per cent | 8 per cent | 7·3 |
| 170 deg. Cent. to 225 deg. Cent. | 6 ,, | 6 ,, | 2 per cent |
| 225 deg. Cent. to 270 deg. Cent. | 14 ,, | 14 ,, | 3·1 per cent |
| 270 deg. Cent. to 300 deg. Cent. | 4 ,, | 8 ,, | 3·1 ,, |
| Loss on evaporation at 105 deg. Cent., 3½ in. dish, 5 hours | 19·10 per cent | 25·65 per cent | 10·65 ,, |
| Penetration of this residue at 4 deg. Cent. | 21 | 55 | 37 |
| Penetration of this residue at 25 deg. Cent. | Soft | Soft | Soft |
| Melting point of this residue | 23 deg. Cent. | Soft | Soft |
| Crosby's Consistometer at 25 deg. Cent., No. 12 special,* 2 grms. | 42 | — | — |
| Crosby's Consistometer at 25 deg. Cent., No. 12 special,* ¼ grm. | — | 112 | – |
| Crosby's Consistometer at 25 deg. Cent., No. 12 special,* 3 grms. | — | — | 58 |

* On compound after evaporation.

Note.—All penetrations given are with No. 2 Standard needle, 100-gramme load. Distillation made upon 100 grammes. Engler viscosity on 165 cc. Melting points by K. and S. method.

**Roads Improvement Association.** The annual general meeting of the Roads Improvement Association will be held at Caxton House, Westminster, London, S.W. on Thursday, April 25th, at 5.30 p.m.

**Business Announcement.**—Messrs. William Firth, Limited, Iron and Steel Merchants, Water-lane and Wellington-street, Leeds, inform us that they are opening a branch office at Corn Exchange Chambers, Sheffield, under the management of Mr. G. Clifford Whitaker, who was formerly associated with Messrs. Whitaker Brothers, railway contractors, Horsforth. Mr. Whitaker will principally devote his attention to dealing in new and second-hand contractors' plant, &c., while the firm's old-established business in rails, girders, iron and steel bars, plates, &c., will be continued as before at the head office, Water-lane, Leeds.

## LIQUID FUEL IN BOILER FURNACES.

### A SIMPLE APPARATUS.

Messrs. Marshall, Sons & Co., Limited, Gainsborough, Lincs., draw the attention of steam users to their apparatus for using liquid fuel in boiler furnaces in place of coal. Their apparatus can be applied to all existing boilers which have at present coal or wood fired furnaces. It is possible in many cases to apply the apparatus without removal of the existing fire-bars. The liquid fuels generally used are the crude oils, and the heavier residuals such as astatki, and gas oil. Liquid fuel, the firm point out, has a much higher evaporative capacity than coal, and it can be burnt more efficiently. It will evaporate 10 to 11 lb. of water per lb. of fuel, as against 7 to 7½ lb. of water per lb. of ordinary coal.

The manipulation of the apparatus is exceedingly simple. It requires little or no attention when once adjusted, and will, it is contended, maintain a more regular steam pressure than is obtainable with coal fuel. It is also quite safe and clean to use. The liquid fuel is injected into the furnace by means of an atomiser, actuated by steam from the boiler. The furnace is lined with firebricks so as to make a hot chamber for the proper combustion of the oil. To ensure economical working it is desirable to control the air supply so that the resultant flame is quite white, but the dampers of Cornish and Lancashire boilers enable this control to be readily exercised. The conversion can be made in a short time and at a low cost. If necessary, the furnace can be altered back again for coal-burning just as readily. For starting purposes it is necessary to raise a small head of steam in the boiler by burning wood or other light fuel, so as to inject the oil and start up the furnace.

**An Admiralty Payment.**—The week Dalmuir Corporation received from the Admiralty £7,000 in payment of a debt which was said to be twenty-seven years old. The sum became due on a drainage scheme carried out by the corporation. According to a clause in the agreement, however, the payment was to be made when the work was done to the satisfaction of the Admiralty, and it seems that the Admiralty has only now expressed its satisfaction.

# The Research Work of the Metropolitan Water Board.

## DR. HOUSTON'S SEVENTH REPORT.

The seventh report on research work by Dr. A. C. Houston for the Metropolitan Water Board confirms the opinions expressed in previous reports, and suggests the expediency of using precipitation methods or coagulation, under certain conditions, to the river water before it enters the storage reservoirs.

The report is divided up into six sections, each of which deals with a series of experiments carried out in order to throw light upon separate questions.

### DISEASE GERMS IN RIVER WATERS.

In the first of these sections the search for pathogenic microbes in raw river water is dealt with. It is admitted that the bulk of the metropolitan supply is derived from sewage-polluted rivers, and it is pointed out that the results of chemical and bacteriological examination support the known facts relating to their contamination, so that in the absence of proofs to the contrary the water must be considered of unsatisfactory quality. The "health prosperity" of the Metropolis and the perfection of the purification processes afford the only justification for its continued use in the absence of evidence that the river waters do not contain pathogenic microbes. Thus the new experiments, which furnish some evidence upon this point, are valuable, and, from the fact that they generally give negative results as far as pathogenic germs are concerned, may be considered to be very satisfactory as far as they go. The results of a series of prolonged investigations show conclusively that microbes of epidemic disease cannot be uniformly present unless in exceedingly sparse numbers. It appears that up to the present 20,771 specially selected colonies, derived from 215 raw river water samples, have resulted in the discovery of only two typhoid-like microbes. It has generally been assumed that failure to detect the presence of the typhoid bacillus afforded no proof of its absence, but the methods adopted by Dr. Houston have been successful in detecting the typhoid bacillus in artificially infected samples. It was found in one experiment that with 1 part of typhoid urine added to 50,000,000 parts of Thames river water, the typhoid bacillus could be successfully isolated. There is therefore no reason to imagine that the methods used by Dr. Houston would fail to detect the presence of disease germs if they were present in the samples.

The experiments show that typhoid bacilli are not habitually present in small samples of river water of the volume of, say, 10 cubic centimetres. They cannot be said to prove that disease germs are not present in the raw river waters, but they tend to show that they are not present to the degree that might have been expected, and that the margin of safety is perhaps consequently greater. The report states, however, in the clearest terms, that this discovery or the result of the experiments described does not in any way justify a relaxation of the precautions which are taken in purifying the raw river water after it has been obtained.

### VITALITY OF TYPHOID MICROBES.

The second section of the report deals with the comparative vitality of cultivated and uncultivated typhoid bacilli in *raw* river water. This report affords further confirmation of a fact already discovered by Dr. Houston—namely, that typhoid bacilli which have been isolated from a case of typhoid fever and grown in artificial media in the laboratory have greater vitality than the typhoid bacilli which have not been thus sub-cultured, but which come fresh from the blood, organs, tissues, or excreta of persons suffering or who have suffered from typhoid fever. The cultivated typhoid bacilli die in river water much more rapidly than those which have not been cultivated. In thirteen experiments with the uncultivated typhoid bacilli the bacilli could not be found in the infected water after one week in nine experiments, and after two weeks in three experiments, and after three weeks in one experiment. Yet the same microbes after cultivation usually lived for over five weeks.

It should be noted that the present experiments were conducted under conditions which are more nearly related to the actual case of the London supply than were those previously made. In order to anticipate the objection that indoor experiments are artificial, and that there is considerable difference in water stored in partially filled stoppered bottles and water stored in an open reservoir of many million gallons capacity, two open galvanised iron tanks, each capable of holding 350 gallons, were used in the open air for the purposes of the experiment. The tanks were filled with raw river water, and were carefully watched and guarded, the bacilli were added, and the water was stirred thoroughly before samples were taken.

It appears that the chief value of these experiments is to prove that where the process of storage will eliminate *cultivated* typhoid bacilli within a given period, the same period will be more than sufficient for the elimination of the typhoid bacilli likely to be present in the raw water, and that in making deductions from such experiments a certain factor of safety is allowed.

### TEMPERATURE AS AFFECTING PURIFICATION BY STORAGE.

In the third section the vitality of typhoid bacilli in *raw* Thames water at different temperatures is considered. It is evident that this has an important bearing on the water supply question, seeing that large quantities of water are drawn from the river at flood times in the winter, when the water is most highly polluted owing to the washings from the drainage area and when the temperature is low.

It has been found that the effect of low temperatures is to lengthen considerably the period during which the typhoid bacilli survive in the water. The fact is generally accepted that when a large number of typhoid bacilli are added to water there occurs an initial drop in their numbers, usually within the first week. It has been found in the present experiment that the effect of low temperatures is to delay this initial drop considerably. At temperatures of 50 deg. Fahr. and upwards the drop takes place within the first week, but from one to two weeks are needed at about 41 deg. Fahr., and between two to three weeks at about 32 deg. Fahr. We may therefore conclude that the efficiency of the storage reservoirs is less in the winter than in the summer, a most important point. Five weeks' storage at 32 deg. Fahr. produced the same result as two weeks' storage at 64·4 deg. Fahr.—*viz.*, the reduction of from over 100,000 typhoid bacilli to 3.

"The critical months as regards temperature are December, January and February (about 39 deg. Fahr.). These are the months when specially large volumes of water are usually taken into our storage reservoirs, and the river water is apt to be most impure." These facts show the enormous importance of adequate storage. Attention is drawn to the fact that the rules governing the abstraction of river water are undeniably lax. "River water should not be recklessly taken into storage, irrespective of its current quality." It is shown by examples given that this thing is done. The lesson of this section of the report is that the value of storage does not justify the Board in relaxing vigilant control over the quality of water taken into its storage reservoirs. On the other hand, it is probably impossible to exclude all water which is of a low standard owing to the enormous quantity required for use; and this is the reason why Dr. Houston later on in the report recommends precipitation and coagulation for the worst water before it enters the reservoirs.

### THE VALUE OF THE COLI TEST.

The fourth section of this report deals with the characters of *B. coli* in river water, stored water, and filtered water. It is pointed out that certain coli-like bacteria have come to be associated with specific disease processes. Such bacteria are not confined to the human intestinal tract, "but most persons prefer not to drink the filth voided even by the lower animals, and in any case we have yet to discover a practical method for their differentiation." It is also shown that a coli test is a combined quantitative and qualitative test, and that it is essential that the qualitative test should embrace a group and not an individual. Also a group must not be too select, "otherwise we might easily be led to condemn a water to-day and to pass it to-morrow, without any real change in its actual condition having occurred." This has undoubtedly been done in certain cases where one water under

suspicion of human contamination has been condemned by the coli test, while another supposed not to be contaminated containing more coli has been accepted. It is most satisfactory to find that Dr. Houston is dealing with the matter. He tells us that the coli test should be regarded as "a quantitative enumeration of a group of microbes, which are superabundant in excremental matters, and absent, actually or relatively, from unpolluted waters." The report describes a considerable number of apparent varieties of B. coli, but it is not possible to assign to these any definite relative significance as indicators of dangerous pollution, and even if it were possible to do so, the process in use for their detection is such that the less significant varieties might dominate the cultures so that the more dangerous types would not be apparent, although they were originally present in the water under examination. Thus the coli test can only be taken at present as a quantitative test, and this is the true lesson of this section of the report.

PRE-SETTLEMENT FOR THE LONDON WATER RECOMMENDED.

The fifth section deals with the advantage of passing raw river waters through small reservoirs antecedent to storage in large reservoirs. This advantage had been considered in a previous report, but proofs are given in the present statement. The continuous passage of river water through reservoirs holding considerably less than a day's supply is found to reduce the number of bacteria very appreciably, and to improve the chemical quality of the water. It is clear that such practically purified water would be better fitted to undergo the processes of purification by storage and would probably be "in a condition less apt to encourage the excessive growth of algæ and aquatic plants." The occasional cleaning of these small reservoirs would be a fairly simple matter, whereas "the prospect of ever having to carry out a similar operation in connection with huge storage reservoirs is not lightly to be contemplated." The working cost of such reservoirs would be practically nil, and the initial cost would certainly not be prohibitive. Dr. Houston gives a very clear warning of the possibility of the new vast storage reservoirs some day becoming silted up. Such reservoirs are not subjected to the flood scours which periodically cleanse the beds of rivers. All suspended matter settling in them accumulates, except such part as decomposes and escapes at the outlet. The report also suggests that some form of roughing filter might be used, and that the effect of preliminary settlement might be increased by the use of coagulants. Experiments have been carried out in a 7,000,000-gallon reservoir at Hornsey, with about 11,000,000 gallons passing through it daily, and with a 5,000,000-gallon reservoir at Sunbury, through which 8,000,000 gallons passed daily. The percentage improvement during three separate periods due to the passage of raw waters through reservoirs holding less than a day's flow was as follows: Bacterial improvement, 39·2, 42·8 and 28·4; ammoniacal nitrogen, 20·0, 5·26 and 19·2; albuminoid nitrogen, 4·3, 8·82 and 3·08; permanganate, 5·6, 12·12 and 4·45; turbidity, 21·8, 28·57 and 7·8; colour, 2·9, 17·02 and 4·65. The advantages of producing this degree of improvement by simple settlement are clearly demonstrated.

OCCASIONAL COAGULATION SUGGESTED.

The sixth section of the report is particularly interesting, as proving the remarkable degree to which coagulation is capable of improving the Thames water. In America, where the supplies of large cities are generally derived from rivers and lakes, the purification of waters by precipitation expedited by the use of chemicals is a matter of general practice, and it is perhaps remarkable that the method has not been adopted for the London supply. The report does not suggest that chemicals should be used under normal conditions, but that it is of importance to consider whether their occasional use might not be advantageous. "From the quality point of view the most critical period in the case of the metropolitan water supply is that of floods following on a long period of drought. In these circumstances the temptation from the quantity point of view is to run specially impure river water through partially depleted storage reservoirs, and the filter-beds in consequence receive for a greater or less length of time practically unstored, or at all events inadequately stored, water." The great importance of this statement should be emphasised Dr. Houston having called attention to it very forcibly before. It is pointed out that the only possibilities are as follows: (1) To consider thirty days as the minimum storage period, and to build huge reservoirs to make this possible, or (2) to consider thirty days a maximum period of storage, and to adopt during times of stress and storm methods of purification antecedent to storage or subsequent to storage, but antecedent to final purification.

The use of chemicals (*e.g.*, alumino ferric) is suggested. Filtration costs 1d. per 10,000 gallons, alumino ferric would cost an additional 1½d. per 10,000 gallons or more, but this would only be an emergency expense, and would be worth while.

It is demonstrated from a number of experiments made that about 3 lb. of alumino ferric per 10,000 gallons would be the amount required to be effective, producing a reduction of bacteria of 80·6 per cent as an average for Thames water, but it is well worthy of note that with 16 lb. of alumino ferric per 10,000 gallons the percentage improvement was as follows: Bacteria, 97·1; colour, 85·7; permanganate (three hours at 80 deg. Fahr.), 74·9; and turbidity, 91·6; the water treated being on the whole worse in quality than an average sample of Thames water during the worst month of each year. Thus it would not be impossible to purify the worst water.

The report, taken as a whole, affords evidence as to the relatively good qualities of the raw water, the importance of adequate storage, but not the inutility of storage under low temperature conditions, the advantages of pre-treatment and settlement, and it also suggests the occasional employment of supplementary processes of purification—notably of coagulation. Further, with regard to the tiding over of any special crisis, Dr. Houston's statement that he would not be unprepared to put into operation "at almost a moment's notice" emergency sterilisation is of special interest.

## LONDON STREET PAVING.

### HOLBORN COMMITTEE'S PROPOSALS.

The Works and General Purposes Committee of Holborn Borough Council, in a report upon the repairing of the carriageway of High Holborn, state that the difficulty of keeping the paving in a satisfactory condition is very great. The weight of vehicles using this route, and the high speed at which they are driven, is perhaps a more important element than the mere increase in numbers, great as this is. The committee point out that the "life" of the asphalt paving under these circumstances is much shorter than it was a few years ago, and that the section of High Holborn east of Kingsway, repaved only two years since, and New Oxford-street, repaved less than three years ago, already show signs of serious wear. They have therefore come to the conclusion that in order to secure a durable paving fit to bear such constant heavy traffic, it is necessary to rule out both asphalt and wood and adopt granite setts. They anticipate that the proposal will meet with objection on the ground of noise, but if the stones are laid as suggested, there will be no more noise than at present with asphalt.

Last summer granite setts were substituted for asphalt at the intersection of Tottenham Court-road and New Oxford-street, the stones being dressed so as to provide a flat surface with very close joints grouted with bitumen. This is the kind of paving it is now proposed to lay in High Holborn, and the committee are confident from the experience gained from the experiment referred to that the result will be satisfactory.

**L.C.B. and Loans for Service Mains.**—At a recent inquiry in Leeds by an inspector of the Local Government Board into an application of the corporation for powers to borrow £60,000 for electricity purposes, the inspector commented upon the inclusion in the suggested loan of sums for service mains. The Local Government Board have since communicated with the town clerk on the subject, suggesting that in future the cost of such service mains and the purchase of meters should be provided out of revenue. The Finance Committee have agreed to act upon this suggestion as from the end of March, and have decided to ask the board to assent to the inclusion of the sum asked for in this special instance.

# The Third International Road Congress.

## PROVISIONAL INDICATION OF ARRANGEMENTS.

As already announced in The Surveyor, the Third International Road Congress will, on the invitation of His Majesty's Government, be held in London in June of next year, to continue the studies already undertaken regarding the construction and maintenance of roads and bridges in view of modern methods of locomotion. This congress, at which the Governments of over thirty different States will be officially represented, will open on June 23rd 1913 and will last for six days. It will be attended by representatives, not only of Governments, but of local authorities and road users from all parts of the world. It has been decided to hold at the Royal Horticultural Hall an exhibition of road machinery, and of materials and appliances used in road construction and maintenance, in connection with the congress, and in view of the fact that a very large attendance of foreign delegates is expected, in addition to engineers and surveyors from all parts of the United Kingdom, and that information has reached the committee that the exhibition is being looked forward to with great interest by many foreign authorities, owing to the pre-eminence of British manufacturers of road machinery and appliances, the exhibition should be of the greatest value in bringing the latest types of road machines and appliances to the attention of the foreign delegates, many of whom will be asked by their respective authorities to examine and report upon the advisability of purchasing such machinery and appliances. Mr. H. P. Maybury, the hon. secretary to the Exhibition Committee, and Mr. W. Rees Jeffreys, the hon. general secretary for the London Congress, would be glad to hear within the next few days from those who wish to exhibit, with an intimation of the articles they propose to show, and the space they are likely to require—this last information being essential, as space is limited. Copies of the provisional rules and regulations of the exhibition can now be obtained on application to either Mr. Maybury or Mr. Rees Jeffreys, at Queen Anne's Chambers, Broadway, Westminster, London, S.W. The charges for space in the exhibition have not yet been determined, but they will be on a moderate scale, and any application for space made now can be withdrawn later if the applicant is not prepared to pay the charges as eventually decided upon.

### PROGRAMME OF QUESTIONS AT THE CONGRESS.

*First Section.*

CONSTRUCTION AND MAINTENANCE.

*Sub-section A.* Construction and Maintenance of Roads outside Towns.

*Sub-section B.*—Construction and Maintenance of Roads in Towns.

*Sub-sections A and B sitting together.* Questions common to both.

*Second Section.*

TRAFFIC AND ADMINISTRATION.

*Sub-section C.*—Traffic and vehicles.

*Sub-section D.*—Administration, Finance and Statistics.

*Sub-sections C and D sitting together.*—Questions common to both.

*1st Section.*

CONSTRUCTION AND MAINTENANCE.

Questions common to Sub-sections A and B.

*1st Question*—Planning of New Streets and Roads.

(*a*) Old towns: 1, in central districts; 2, in the suburbs.
(*b*) In new towns.
(*c*) In the rural areas.

Importance of directness of route—Alignment—Longitudinal and cross sections—Curves—Analysis of practical and economic value of width under various circumstances—Steps necessary to ensure the security of and regularity of the various currents of circulation—Whether local or through Traffic—Reconciliation of requirements of each of the former—By-pass roads avoiding towns and villages—Treatment of crossings and corners—Arrangement of metalled carriageways, footpaths, special tracks, taking into account the presence or absence of tramways, of bicyclists, and of the various methods of circulation generally in use.

*2nd Question*—Types of Surfacing to be adopted on Bridges, Viaducts, &c. (fixed or movable bridges, suspension bridges, railway bridges).

Cost—Wear—Durability of various surfacings—Methods of maintenance and repair, of remaking.

Communications common to Sub-sections A and B.

*Communication 1* Improvements adopted since the Second Congress in Machinery used in the Construction and Maintenance of Macadamised Roads.

Sweepers—Watercarts — Machine rammers — Light rollers—Mixers—Stone driers and heaters—Transport wagons.

*Communication 2* -Tests of Materials used in the Construction of Macadamised Roads.

Laboratory and practical tests Testing machines and appliances Comparative value of various tests—Statistics of results obtained.

*Sub-section A.*

*3rd Question*—Construction of Macadamised Roads bound with Tarry, Bituminous, or Asphaltic Materials.

Which are the best methods and materials for the construction in open country of macadamised roads bound with tarry, bituminous or asphaltic materials?

Note.—Reports sent in under this heading must include all or some of the following heads, and furnish as much as possible data obtained from practical experience, and more especially on the results obtained in the various trials that have taken place since the Second Congress.

1. Foundations and drainage.
2. Sizes and shapes of broken stone for bituminous-bound surface crust.
3. Use of partially-worn materials in bituminous-bound surface crust.
4. Thickness and composition of the strength crust and of the super or wearing crust under different conditions.
5. Life of surface crust under different conditions of traffic, weather, subsoil, &c.
6. Relative importance of patching, repairs, and periodical renewals of surface crust.
7. Extent of wear permissible before renewal of surface coating.
8. Measurement of wear and appliances used for this purpose.
9. Various methods of bituminous treatment:—
   (*a*) Mixing methods—(1) in factories; (2) on the spot.
   (*b*) Grouting methods.
   (*c*) Carpeting methods.
   (*d*) Other methods.
10. Relative advantages and use of tar, tarry compounds, asphalt, bitumen, and other materials.
11. Tests and chemical analysis of tarry, bituminous, and asphaltic compounds.
12. Climatic effects causing slipperiness of the roadway- Remedies.
13. Effect on public health, fish life, or vegetation.
14. Specification of the methods of construction.
15. Cost data.
16. Cleansing and watering.

*Communication 3* — Construction of Water-bound Macadamised Roads.

Which are the best methods of construction and maintenance for water-bound macadamised roads used in country or suburban districts since the Second Congress?

Note.—Reports sent in under this heading must include all or some of the following heads, and furnish as far as possible data obtained from practical experience.

1. Foundations and drainage.
2. Choice of materials.
3. Sizes and shapes of broken stone and of chippings.
4. Use of partially worn materials in the formation of the surface crust.
5. Thickness and composition of the strength crust under different conditions.
6. Life of the surface crust under different conditions of traffic, subsoil, &c.

7. Relative importance of patching repairs and periodical renewals—Methods of resurfacing.
8. Specifications of the methods of construction.
9. Cost data.
10. Cleansing and watering.

*Communication* 4.—Technical and Economic Study of the Comparative Advantages of different Types of Roads.

[The names of the members of the sub-committee appointed to select the writer for this communication will be found in the "Personal" column in this issue.]

Under what circumstances and conditions of traffic are the following types of road preferable from the point of view of the traffic and from that of economy?

1. Stone setts.
2. Metalled roads, bound with tar, pitch, asphalt or bitumen by
   (*a*) Mixing or grouting methods.
   (*b*) Carpeting methods.
   (*c*) Other methods.
3. Metalled roads—Water-bound.

*Sub-section B.*

*5th Question*—Wood Paving.

Choice of wood—Methods in use—Resistance to wear—Methods of maintenance—Cost—Cleansing and watering.

*Communication* 5—Various Types of Stone Paving in Use.

Advantages of unification.

*2nd Section.*

TRAFFIC AND ADMINISTRATION.

Questions in common to Sub-sections C and D.

*6th Question*—Methods of Lighting.
(*a*) The public highway.
(*b*) Vehicles.

*Sub-section C.*

*6th Question*—Observations Noted since 1908 as to the Various Causes of Wear and of Deterioration of Roadways.
1. In towns.
2. In suburban districts.
3. In open country.

Effects produced by sun, frost, snow, or any variations of temperature. Effects due to the circulation of self-propelled and horse-drawn vehicles—Mixture of fast and slow traffic, aggregate volume and density in busy hours. Effect of speed, weight, construction, position of the exhaust, width and diameter of wheels, various kinds of tyres, shoeing of horses.

*7th Question*—Regulations for Fast and Slow Traffic on Roads.

Conditions to be observed with a view to the safety of the public—Precautions to be taken during progress of repairs—Regulations for the use of the roads during frost and thaw—Positions of lamp-posts and other obstructions.

*Communication* 6—Direction and Distance Sign-posts.

*Communication* 7—Development since the Second Congress of Self-propelled Public Service Vehicles.

Dimensions—Weight—Capacity—Cost of Upkeep—Mileage worked.

*Sub-section D.*

*8th Question*—Authorities in Charge of the Construction and Maintenance of Roads, Functions of Central Authorities and Local Authorities.

Advantages and disadvantages of centralisation and decentralisation—Area and organisation for construction, maintenance, repairs—Staff employed, its composition, and whence drawn—Systems of inspection.

*9th Question*—Finance of the Construction and Upkeep of Roads. Provision of Revenues.

Special taxes—on what classes of persons, vehicles or objects would the taxes weigh, bases on which the incidence of taxation should be founded? Borrowing for road construction and renewals. Methods of repayment.

*Communication* 8—Qualifications of Engineers and Surveyors in Charge of the Construction and Maintenance of Roads. Wages and Conditions of Service of Foremen and Roadmen.

*Communication* 9—Statistics of Cost of Construction and Maintenance.

Methods of keeping accounts—Repartition among the various authorities, boards, &c., interested—Comparative statistics per unit of population, mileage, traffic, &c.

*Communication* 10.—Terminology Adopted or to be Adopted in each Country relating to Road Construction and Maintenance.

## THE ROAD EXHIBITION.

The exhibition is open to all classes of machinery, apparatus, models, drawings, plans and maps which are illustrative of road construction.

*1st Class. Machinery and Tools.*—The Machinery and Tools Class will be divided into two sections—(1) Materials: (2) Machinery and Tools, the first of which will include samples of stone broken and chipped, tars and pitches, bitumen and asphalt, various surfaces, and testing apparatus; and the second, rollers, steam dryers, tar-macadam mixers, breakers, scarifiers, tarring and pitch grouting apparatus, asphalting apparatus, carts, tools and various apparatus, and cleansing and watering apparatus.

*2nd Class. Traffic.* This will be divided into three sections—(1) Mechanical road traction; (2) horse traction; (3) highway and vehicle illumination. The first of these will include vehicles for the transport of road materials, wheels and tyres designed to carry heavy weights without damage to the roads, non-skid apparatus not damaging to roads, and light railway and tramway tracks; the second, wheels and tyres, non-injurious horseshoes, and shoeing, with special reference to securing foothold; and the third, highway illumination (gas, oil, electric lamps and standards); vehicle illumination (front and rear lamps, head lights).

*3rd Class. Models, Maps, Drawings and Publications.*—In this class the exhibits will include maps and plans, statistics, forms of accounts, Acts, regulations and by-laws, meteorological records, information as to first cost and maintenance, traffic, &c., models of and monographs on road works, and publications.

*4th Class. Historical.*—Specimen sections of road construction, old and new, and historical exhibits will be accepted under this classification.

## THE EXHIBITION COMMITTEE.

Upon Mr. H. P. Maybury, the county surveyor of Kent, will devolve, as a labour of love, an immense amount of work in connection with the organising of the thousand-and-one details of the exhibition. He will be supported by a committee which has not yet definitely been formed, but may probably consist of the following:

President: Earl Beauchamp, H.M. First Commissioner of Works.

Members: Colonel R. E. Crompton, C.B., R.E., M.INST.C.E., consulting engineer to the Road Board.

Mr. J. Walker Smith, M.INST.C.E., chief engineering inspector to the Local Government Board of Scotland, and member of Advisory Committee of Engineers to the Road Board.

Mr. J. Willmot, F.S.I., county surveyor of Warwickshire, and member of Advisory Committee of Engineers to the Road Board.

Mr. H. Howard Humphreys, ASSOC.M.INST.C.E., consulting engineer to the War Office.

Mr. A. Dryland, M.INST.C.E., county surveyor of Surrey.

Mr. E. Shrapnell Smith, Editor of the *Commercial Motor*.

Mr. Wallace E. Riche, secretary of the Roads Improvement Association.

Editor of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER.

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**Sewage Disposal at Ipswich: An Investigation.**—Complaint having been made by the Samford Rural District Council and the East Suffolk County Council with respect to the discharge of sewage into the river Orwell, the Sewerage Committee of Ipswich Town Council have reported upon the matter. They found, according to their report, the water remarkably clear, considering that it is the waterway leading from the sea to a town of 75,000 inhabitants, with a large foreign shipping trade. The sand and shingle along the foreshore were bright and perfectly free from deposit, and when handled gave off no smell, nor were the fingers soiled. Careful search was made in the vicinity of high-water mark for a long distance along the foreshore, but no trace of deposit could be found. The retention of the crude sewage in the settling tanks and the screening of the effluent prior to its discharge into the river, which have now been in vogue for several years, appeared to be effective. No floating matter was seen except when the screens were being cleaned. In order to remedy this, the committee propose to fix Messrs. Smith's patent rotary screens above the present fixed screens.

## GLASGOW MUNICIPAL BUILDINGS EXTENSION.

### COMPETITIVE DESIGNS TO BE INVITED.

Last week in The Surveyor we reported a protest made by a deputation of architects to the Glasgow Town Council protesting against the employment of the city engineer (Mr. A. B. M'Donald) and his assistants in carrying out the extensions of the City Chambers. The sequel is given in the *Glasgow Herald* report of the town council meeting held on the 28th ult.

Bailie Mason moved the approval of the minutes of the Municipal Buildings Committee, which contained the details of the proposed new buildings on the east side of John-street. Bailie Mason said he hoped the corporation had at least recognised the pressing necessity for additional accommodation in every department. What they thought of was business premises suitable for their needs, with architecture worthy of the city, and the architecture must harmonise with the present buildings. They must have abundance of light and plenty of ventilation. The committee were unanimous in asking them to adopt this part of the report, but there was a subject on which they were not unanimous, and that was whether they should have an open competition and invite outside architects to prepare plans, or whether they should employ the architectural staff of the corporation. In the preparation of the report Mr. Houston, the architect in Mr. M'Donald's office, had been constantly employed for several weeks, and he had shown a mastery of his subject which was beyond praise. That being so, was it reasonable that he should be thrown aside when it came to the appointment of an architect, feeling, as Bailie Mason did, that he was capable of producing plans which would result in a building which would satisfy all their needs? Mr. Houston and Mr. Horne, the two architects in Mr. M'Donald's office, were among fifteen competitors who gained premiums, and whose plans were selected in a recent competition for new buildings for the London County Council, costing somewhere about £1,000,000. That alone stamped them as men of the highest standing in their profession. An open competition would mean increased costs for architects' fees and prizes to competitors, and a delay of at least six months, which, he thought, was very serious at this stage, as part of their ground was at present lying idle.

Dr. M'Connell seconded. If, he said, they went outside for an architect it would mean an increased expenditure equivalent to an increase of about ½d. per £1 on the rates. Past experience had shown that the corporation architects had not only kept within their estimates, but the work when completed had given entire satisfaction.

Mr. Carlton moved an amendment that competitive plans and designs be invited from outside architects for the erection of the buildings. In an important contract like this it was imperative that they should have the most skilful and experienced architects they could obtain. Mr. Carlton enumerated the requirements of the new buildings, and said that there was the question of extra cost which would be caused by this competition, but he did not think, considering the importance of the contract and the valuable assistance and information they would thereby obtain, that that was a great matter. In inviting competitive plans they should put no restrictions on them, but allow the architects to provide their own plans as well as their own elevation. In an important matter like this they must not allow the heart to overrule the head. It was their duty to endeavour to get the very best skill they could for this work.

Mr. M'Culloch, in supporting the amendment, said the problem that confronted the corporation was whether municipalisation or individualism was to prevail. If they decided to keep the work inside the buildings they would be denying themselves the advantage of professional assistance.

Mr. Cairns pleaded for fair competition. He contended that the corporation would get a far better job as cheap, if not cheaper, by allowing outside architects to compete for the work than by confining it to the city engineer's staff.

Mr. Bruce Murray also supported the amendment. He held that they would get the best results only by competition among men of recognised standing and ability.

On a division the amendment was carried by 30 to 27. This means that competitive plans and designs will be invited from outside architects for the erection of the buildings.

## THE ROAD BOARD.

### GRANTS TO HIGHWAY AUTHORITIES: SIXTH LIST.

During the months of January, February, and March, 1912, the Road Board, with the approval of the Treasury, have made advances amounting to £88,992 from the Road Improvement Fund to county councils and other highway authorities, as follows:—

| | £ |
|---|---|
| For the improvement of road crusts (including grants towards tar-macadam, &c., and surface tarring) ... ... ... ... | 74,542 |
| For road widenings and improvement of curves and corners ... ... ... ... | 6,709 |
| For road diversions ... ... ... ... ... | 1,582 |
| For construction and improvement of bridges | 1,231 |
| For construction of new roads ... ... ... | 4,928 |

The total grants up to March 31st are as follows:—

| | £ |
|---|---|
| For the improvement of road crusts ... ... | 421,949 |
| For road widenings and improvement of curves and corners ... ... ... ... | 57,145 |
| For road diversions ... ... ... ... ... | 18,676 |
| For construction and improvement of bridges | 15,128 |
| For construction of new roads ... ... ... | 4,928 |

Advances by way of loan have also been made to the sum of £36,613. In addition, further advances, amounting in the aggregate to £592,747, have been indicated to highway authorities towards works of improvement of which the details are still under consideration and discussion. The board have also intimated that they are prepared to contribute, subject to the approval of the Treasury, £875,000 towards the construction of a new western approach road to London.

| Authority. | Improvement of road crusts. | Widenings, corners and diversions | Bridges, New roads. | Total. |
|---|---|---|---|---|
| | £ | £ | £ | £ |
| Berkshire C.C. ... ... ... ... | 6,600 | - | — | 6,600 |
| Bucks C.C. ... ... ... ... ... | — | 331 | | 331 |
| Cheshire C.C. ... ... ... ... | — | 305 | | 305 |
| Cumberland C.C. ... ... ... | | 2,500 | — | 2,500 |
| Dorset C.C. ... ... ... ... | 733 | — | — | 733 |
| Hereford C.C. ... ... ... ... | 907 | - | | 907 |
| Lancashire C.C. ... ... ... ... | 1,340 | — | 1,000 | 2,340 |
| Middlesex C.C. ... ... | 10,000 | — | | 10,000 |
| Northumberland C.C. ... | 60 | — | — | 60 |
| Nottingham C.C. ... ... | — | — | 4,928 | 4,928 |
| Oxford C.C. ... ... ... ... | 157 | | — | 157 |
| Staffordshire C.C. ... ... ... | 104 | | — | 104 |
| Suffolk East C.C. ... ... ... | 20,000 | — | — | 20,000 |
| Surrey C.C. ... ... ... ... ... | — | 300 | | 300 |
| Warwickshire C.C. ... ... ... | 7,050 | — | — | 7,050 |
| Worcestershire C.C. ... ... | — | 300 | — | 300 |
| Yorkshire (North Riding) | 4,832 | 37 | — | 4,869 |
| WALES. | | | | |
| Anglesey C.C. ... ... ... ... | 150 | 300 | — | 450 |
| Carnarvon C.C. ... ... ... ... | 114 | — | — | 114 |
| Merioneth C.C. ... ... ... ... | 1,000 | — | — | 1,000 |
| Montgomery C.C. ... ... ... | 710 | 555 | — | 1,265 |
| Pembroke C.C. ... ... ... ... | — | 800 | — | 800 |
| Radnor C.C. ... ... ... ... ... | | 183 | — | 183 |
| SCOTLAND. | | | | |
| Aberdeenshire (Huntly T.C.) | 50 | — | — | 50 |
| Haddington C.C. ... ... | 893 | 1,951 | | 2,844 |
| Inverness C.C. ... ... ... ) | 5,630 | — | | 6,130 |
| Inverness T.C. ... ... ) | 500 | | | |
| Kirkcudbright C.C. ... ... ... | 943 | | | 943 |
| Lanark T.C. ... ... | 43 | | | 43 |
| Ross and Cromarty C.C. ... ... | 311 | — | | 311 |
| Selkirk C.C. ... ... ... ... | — | 160 | — | 160 |
| Stirling T.C. ... ... ... | 500 | — | | 500 |
| Sutherland C.C. ... ... | 3,200 | 569 | 231 | 4,000 |
| IRELAND. | | | | |
| Galway C.C. ... ... ... ... ... | 4,700 | - | | 4,700 |
| Longford C.C. ... ... ... ... | 1,250 | | | 1,250 |
| Tipperary (N. R.) C.C. ... ... | 1,350 | - | — | 1,350 |
| Tipperary (S.) C.C. ... ... ... | 277 | | | 277 |
| Waterford C.C. ... ... ... ... | 1,138 | | | 1,138 |

**Bridge Improvements at Bristol.**—The Sanitary and Improvement Committee of Bristol have been asked to report as to the six road and railway bridges in the city which most restrict the traffic, as to the order in which they should be dealt with, and as to the cost of the necessary improvement schemes respectively. The city engineer, Mr. L. S. Mackenzie, has also been instructed to report upon any other bridges that stand in need of improvement.

## THE ROAD BOARD PERSONNEL.

### 7.—MR. P. C. COWAN.

Mr. Peter Chalmers Cowan, chief engineering inspector to the Local Government Board for Ireland, is the representative of that country on the Advisory Committee of Engineers to the Road Board. Mr. Cowan was born in March, 1859. He was educated at the High School, Dundee, and was for some time a pupil of Mr. Robert Blackadder, a civil engineer with an extensive practice. When nineteen years of age he gained the Baxter Engineering Scholarship tenable for three years in the Engineering School of Edinburgh University. During this course he obtained first medals in engineering, senior natural philosophy and surveying, and for about twelve months he acted as assistant to the Professor of Engineering, the late Prof. Fleming Jenkin, M.INST.C.E., F.R.S. In 1882 he gained the Vans Dunlop Travelling Scholarship in Engineering, the value of which is £300, and from June to November of the same year he served with Mr. T. G. Smith, city surveyor, New York, and in October was elected a city surveyor by the city council. For the next two years he was an assistant engineer on the construction of the New York, West Shore and Buffalo Railway, and the problems connected with this work were discussed by him in a paper read before the Institution of Civil Engineers in 1884, for which a Miller prize was awarded.

Mr. Cowan was then engaged as assistant engineer in charge of the construction of 13 miles of the Cana-

Mr. P. C. Cowan M.INST.C.E.

dian Pacific Railway through rough and difficult country near the north-east corner of Lake Superior. His next appointments were in Scotland, with Mr. A. C. Boothby and Mr. John Macrae, MM.INST.C.E., on railway, tramway and harbour works. He was then for some time one of the engineers of the North-Eastern Sanitary Association, Newcastle-on-Tyne.

In 1886, after a severe competitive examination, he was appointed county surveyor in Mayo, where, in addition to the maintenance of roads, bridges, piers, and so forth, he carried on private practice, including architectural works, sewerage and water works. He was consulting engineer to the Piers and Roads Commission in 1886-7, and in the following year had full charge of the works of the Commission in co. Mayo, which involved the expenditure of about £10,000.

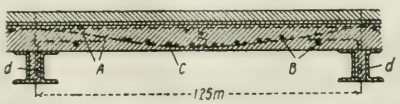
The Achill viaduct and swing bridge, which connect the Island of Achill with the mainland, and cost £6,000, were built under Mr. Cowan's supervision, and he also acted as consulting engineer for the Moy Bridge. In 1889 he was appointed to the county surveyorship of South Down, and less than twelve months later was placed in charge of the whole county, with an annual expenditure of £50,000 under his control. In co. Down he had an extensive private practice, and carried out many important works, including asylum extensions, hospital construction, &c.

Mr. Cowan was appointed chief engineering inspector to the Local Government Board of Ireland in 1899. He is a member of the Institution of Civil Engineers, a Fellow of the Royal Sanitary Institute, and an honorary member of the Institution of Municipal and County Engineers.

## THE WORLD'S HIGHEST BRIDGE.

French engineers have constructed across the gorge of the Rummel, near Constantine, Algeria, in Northern Africa, what is said to be the highest bridge in the world. A section of the reinforced concrete floor slab is shown in the diagram herewith.

This bridge has a suspension span of 539 ft., and a clear height above water of 571 ft. It has two footpaths and a roadway 14⅔ ft. wide. The roadway alone is reinforced concrete slab, as shown by the sketch, supported on beams of twin channels spaced 4·1 ft.




Details of Reinforced Concrete Floor Slab for High Suspension Bridge in Algeria.

apart. As will be noticed, the slab concrete extends down between the channels, stiffening the beam and protecting the inside faces against corrosion.

The reinforced slab is 4·2 in. thick, and is reinforced with a system of catenary bars having a sag of 3 in. between beams. These bars are 0·2 in. in diameter. Over the longitudinals are two sets of transverse bars 0·136 in. and 0·44 in. in diameter. The reinforcement is high-carbon steel. On the slab proper is a 0·4 in. layer of cement paste, in which are set asphalt blocks 8 in. by 4 in. by 1·6 in. These blocks are moulded under heavy pressure, to give them strength against compression.—*The Contract Record* (Toronto).

## ROAD MAINTENANCE IN CORNWALL.

### CONCENTRATION OF EXPENDITURE.

The county surveyor of Cornwall, Mr. Albert E. Brookes, in his report to the Highways, Main Roads, and Bridges Committee for the ensuing year, states, *inter alia*: "The effect of self-propelled traffic, and particularly that of heavy motors and traction engines, is becoming more marked and more serious as each winter comes round. The crushing and disintegration of the road metal caused by this class of traffic during the summer months only become apparent in the winter, when it is followed by distortion, and, in the case of weak sections, practically the destruction of the weight-bearing and distributing crust of the road. Until the road crusts have been built up to a sufficient strength, (1) to distribute the weights they have to carry so as to prevent distortion, (2) to reduce internal attrition to a minimum, and (3) to confine as far as possible the wear and tear to the surface, I can hold out no hopes of a decrease of expenditure in maintenance. I am quite convinced that, in dealing with the trunk roads of this county under modern conditions of traffic, the only system which will lead to ultimate satisfactory results, both in economy in maintenance and convenience of user, is one of concentration of expenditure to strengthen thoroughly the lengths dealt with.

"As far as our present expenditure permits, and with the assistance of the Road Board, I am putting this system into practice in the Western Division, and to some extent in the Eastern, and I am satisfied that I am making sound progress; but I have to point out that in adopting this principle (unless further increased expenditure is incurred) some lengths will show considerable deterioration, until in their turn they can be properly dealt with, and I ask the council, and the public generally, to make due allowance for this fact."

**Oswestry Sewage Works.**—The new sewage disposal works at Oswestry, designed by Mr. G. W. Lacey, borough engineer, have been completed. The contractors were Messrs. W. H. Thomas & Sons, Limited, Oswestry.

# Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

## THE MONTHLY PREMIUM.

The premium for March is awarded to

Mr. A. G. Andrews,
Town Hall,
Colchester,

whose contributions have, in the opinion of the adjudicators, been the best received during the month.

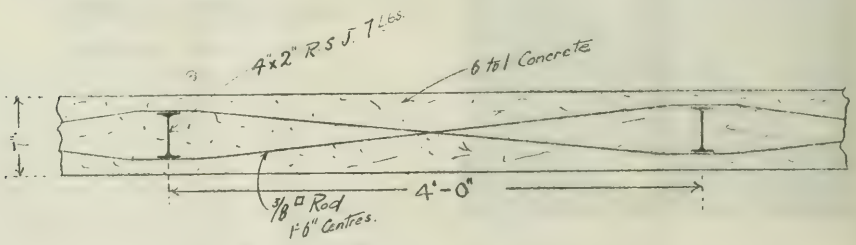
## QUESTIONS.

This week answers are invited to the following questions:—

**234. Pumping Station.**—Sketch and describe a small pumping station capable of lifting 100,000 gallons of water daily from a borehole in the rock and delivering through a rising main 500 yds. long into a reservoir, the total vertical lift being 100 ft. After working out the theoretical horse power required, state the brake horse power and type of engine you recommend, and give your reasons. (M. and C.E.)

**235. Elasticity of Steel.**—A rectangular steel bar, 3 in. by 2 in., is placed on edge between bearings 3 ft. apart. What load placed at the centre will deflect the bar $\frac{1}{4}$ of an inch? Assume E=30,000,000 lb. per square inch. (M.R.S.I.)

**236. Reinforced Concrete Roof.**—Is the form of construction shown in the annexed figure suitable for a roof for a one-storey building, 9-in. walls? The roof may be used for storage purposes, and would as such have to carry in addition to its own weight 2½ cwts. per foot super. The spans vary from 6 ft. 6 in. to 9 ft., and all the bays are 17 ft. long. Fall in roof 6 in. In order to reduce the thickness of concrete to, say, 6 in., would R.S. joists 3 in. in depth be sufficient? If any reader can suggest a better form of construction (cost being a consideration), I should be much obliged. ("Hôtel de Ville.")

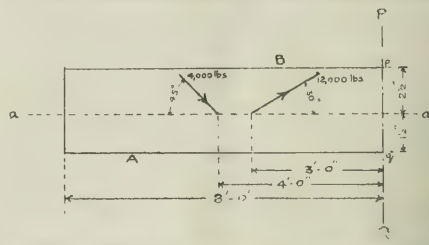



Reinforced Concrete Roof Construction.

**237. Egg-shaped Sewer.**—State a formula for obtaining the discharge of an egg-shaped sewer, also show how to obtain the hydraulic mean depth of same. (F. B., *Hereford.*)

**238. Small Sewage Disposal Installation.**—Sketch and describe an installation consisting of a septic tank and filters for dealing with the soil sewage of about 750 persons, showing all the calculations for size of filters, &c. The filters are to be arranged so as to be capable of being enlarged if required. It is possible to have land treatment afterwards on about ¼ acre to ½ acre of land. The effluent is to discharge into a ditch, and must be kept to a high standard. The scheme is not meant to be permanent, and is only required for a period of about six years, until sufficient assessable value is created to apply for a sewer loan to connect to a new outfall sewerage system. ("Somerset.")

**239. Stresses in a Beam.** A B is part of a beam of which *p q* is a cross-section cut by the plane P Q. *m n* is the axis of the beam. Forces of 4,000 lb. and 12,000 lb. act at the inclinations and distances shown. The moment of inertia of the section is 12-in. units, and its area is 4½ sq. in. Find the total compressive and tensile stresses in the section *p q*? (E. A. B., *Leicester.*)




## REPLIES TO QUESTIONS.

**230. Refuse Sorting.**—Describe, with sketches, a device for the mechanical sorting of house refuse.

The following description of the plant in use at Bethnal Green is taken from "Town Scavenging and Refuse Disposal," by Hugh S. Watson:—

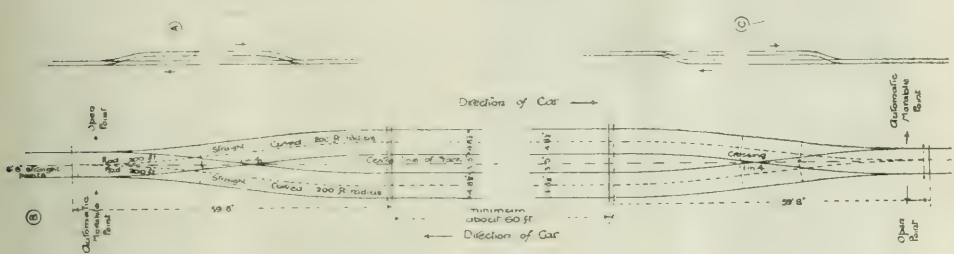
All the refuse brought to the works by the collecting carts is tipped on to a large grating, 2-in. mesh, placed over a hopper having a small sump at the bottom. The material is raked over, and any matter that will not pass through the grating is removed and burned in a furnace. The material which passes through the grating is raised from the hopper sump by an endless chain bucket conveyer. This delivers the material into a revolving screen having three different sizes of mesh, and open at the end, so that all matter which is too large to pass through any of the meshes is caught in a waggon which is placed at the open end of the screen. The whole of the matter which falls from the revolving screen is barged to various brickfields, where the fine stuff is mixed with the clay and used for brickmaking, and the two larger sizes of material are used for burning the clay. The material fetches from 30s. to 75 per barge load of 80 tons. The refuse burned in the furnace generates sufficient heat to provide its own forced draught, by means of a steam jet which is supplied from a Babcock & Wilcox boiler. The steam pressure generated in the boiler varies from 60 lb. to 70 lb. per square inch, and sufficient steam is generated to work a 12 h.p. Tangye horizontal engine, which drives the bucket conveyer and the revolving screen. About 100 tons of refuse are dealt with per day, of which one-third is burnt in the furnace, and two-thirds are passed through the revolving screen.

**233. Tramways.** Sketch a "turn out" or "passing place" on a single line of tramway, figure the leading dimensions, the angle of the crossing, and describe the length, position, and character of the "points" required for diverting the traffic. (M. and C.E.)

"Passing places" in a single track of tramway may be of three kinds, as shown in sketch A.

lateral or side loop; B, equilateral or diamond; C, straight run in. A typical diamond "turn-out" or loop is shown enlarged. Automatic movable and open points are used, one of each kind being placed at either end, at the commencement of "turn-out." The "points" may vary in length from 9 ft. to 13 ft., and sometimes more, according to the length of tongue used, which is usually 6 ft. to 9 ft. The automatic movable points have a "run-out way" of from 100-ft. to 200-ft. radius, preferably the latter, and the open points the same radius plus the gauge of track. The automatic points are provided with spring boxes. In these a spring is placed to keep the point "set" —viz., to automatically push back the tongue after the passing of car; and, in addition to the spring, a plunger should be provided, to permanently lock the tongue in either position. The points have bond holes for securing copper bonds, bolt holes for fishplates and anchors, and for the latter purpose some points have lugs or heel plates at the back or wide end. In open points and crossings the groove is reduced in depth to one-half the ordinary depth for a length of about 2 ft. on each side of "the points," to assist the car to "take" the curve and prevent excessive strain. The groove in open points, crossings and curved rails is slightly wider than that in a straight rail, and the lip of the groove is of a heavier section on account of the extra wear it receives. (G. S. -L.)

[Note.—This question is a repetition of Question No. 152, to which an excellent answer appeared in our issue of March 24, 1911. "M. and C.E." should therefore refer to that issue.—Ed.]




Tramway Passing Places.

## SOME RECENT PUBLICATIONS.*

British Rainfall, 1910. Edited by Hugh Robert Mill, Director of the British Rainfall Organisation. Price 10s. London: Edward Stanford, 1911.

This is the fiftieth annual volume, and it contains, as usual, a statement of the total rainfall for the last completed year, this time at 1,874 observing stations in Great Britain and Ireland, with the names of the observers or other responsible authorities. There is also a table of monthly rainfall at 300 selected stations uniformly distributed over the country, and full returns of the rainfall for every day at ten stations. These, with a series of weather notes by observers, constitute the raw material, which is elaborated in various ways.

Perhaps the most interesting part of the volume scientifically is the section devoted to the discussion of heavy falls of rain. Every widespread fall of rain, when the amount exceeded 1 in. in the twenty-four hours, is made the subject of a map which shows the area of the storm, and enables the different types of rainfall to be compared. The most remarkable series of maps relates to the terrific thunderstorms of the first ten days of June, 1910, in the Thames Valley, especially those of June 9th in Oxfordshire, when more than 4 in. of rain and hail fell in a few hours. A series of photographs of the hail lying on the ruined gardens at Watersstock illustrates the description of the storm.

Stress is laid on the probability that, despite the dry summer of 1911 in the South of England, we are now entering on a period in which wet years will predominate, after a long spell of years mostly dry.

The fiftieth year of publication sees a new arrangement of the rainfall stations, which are now grouped in river-basins as the only satisfactory method from the view point of physical geography. But for practical purposes the division into counties could not be abandoned, and so each county is divided by watershed lines into river divisions, and a double index by counties and by rivers shows how the river-divisions can be built up either into counties or river-basins. This sub-division will prove extremely useful to waterworks' engineers and others interested in the water resources of the country.

The Municipal Year-Book for 1912. Edited by Albert E. Cave. Price 15s. nett. London: The Municipal Journal, Limited.

This well-known annual compendium of information concerning men and matters municipal is this year larger than ever, some 160 pages having been added since the last issue. It is divided into no fewer than twenty-eight sections, of which only the more important can be mentioned here. The chief part of Section 1 (pp. 1-206) is devoted to an alphabetical list of the municipal corporations in England and Wales, statistics being given in each case, together with a list of the members of the council and the chief officials. Similar information in regard to county councils is contained in Section 2 (pp. 207-274); while Section 3 (pp. 277-325) is devoted to the local government of the Metropolis. Section 4 (pp. 327-472) contains statistics, and so forth, relating to urban and rural district councils. Sections 6 and 7 deal with Scottish and Irish local government respectively, while Sections 8 to 22 are concerned with the various local government services which are administered by local authorities. The one which will probably be of greatest interest to our readers is Section 19 (pp. 863 to 928), which deals with refuse and sewage disposal, and contains a summary of the methods adopted in the various districts. The municipal year-book is an indispensable adjunct in the office of every local authority, and will also be found of the greatest use as a work of reference for all interested in local government administration.

Laxton's Price-Book for 1912. Price 4s. London: Kelly's Directories, Limited.

This is the ninety-fifth edition of "Laxton," and to those who have become accustomed to rely upon former issues of this standard book it will be sufficient to say that the present volume fully maintains the excellence of its predecessors. The main feature of the book—which, by the way, has an excellent index—is, of course, the comprehensive list of builders' prices given under each trade. The value of "Laxton" as a book of reference, however, does not end here, for there are to be found in it a large number of useful tables and memoranda, all the Acts of Parliament and regulations in force which are of interest to builders and contractors, together with a very good *précis* of the legal decisions (which, however, does not include any cases since 1907), and a good deal of information of a general character. The new edition will be found as useful as any former one to builders, contractors, architects and engineers.

The records of meteorological observations taken at the Observatory, Edgbaston, during 1911 have been issued in book form by the Birmingham and Midland Institute Scientific Society. Mr. Alfred Cresswell, curator of the Observatory, has been responsible for the compilation of the mass of information collected, and is to be congratulated on the thorough manner in which he has carried out a difficult task. The price of the publication is 2s.

* Any of the publications reviewed or referred to as received will be forwarded by the St. Bride's Press Ltd., on receipt of published price.

# Law Notes.

Edited by J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

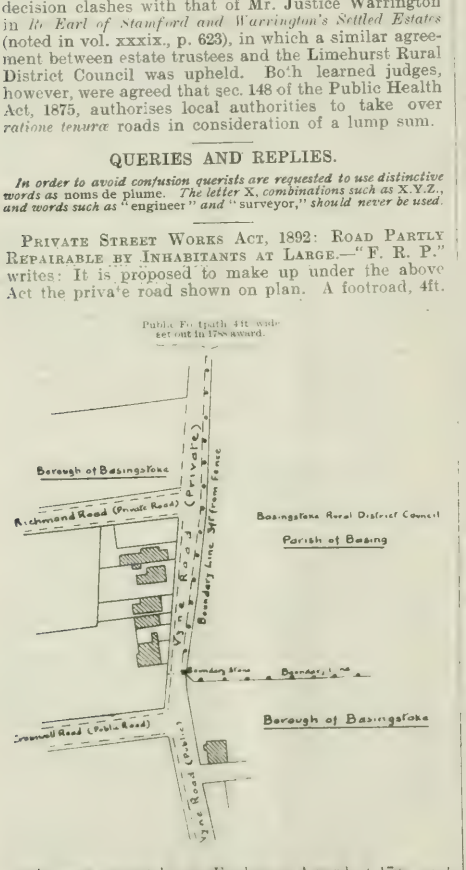
*The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, one side only) should be addressed to "The Law Editor," at the office of* The Surveyor, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—*i.e.*, without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

Highway Repairable, Ratione Tenuræ: Adoption by Local Authority.—An important question in connection with the adoption of *ratione tenuræ* roads was decided in *Re Hodgson's Settled Estates, Altamont* v. *Forsyth* (Chancery Division; Mr. Justice Neville; February 28th and 29th). An agreement had been entered into by a district council, under sec. 148 of the Public Health Act, 1875, for the adoption by the council of a highway repairable, *ratione tenuræ*, in consideration of a lump sum to be paid in extinction of the liability to repair attaching to a certain settled estate of which the plaintiff was tenant for life. The plaintiff applied to the Court to authorise the estate trustees to provide the stipulated amount out of capital funds in their hands. In support of the application it was argued that a liability to repair a highway, *ratione tenuræ*, is an "incumbrance" within the meaning of sec. 21, clause (ii.) of the Settled Land Act, 1882. Such a liability, however, is not expressly mentioned in that section, whereas it is mentioned specially in sec. 18 (1) of the Land Transfer Act, 1875. Mr. Justice Neville thought that this indicated that the liability in question was intentionally omitted from the Settled Land Act. He therefore declined to sanction the proposed payment by the trustees. This decision clashes with that of Mr. Justice Warrington in *Re Earl of Stamford and Warrington's Settled Estates* (noted in vol. xxxix., p. 623), in which a similar agreement between estate trustees and the Limehurst Rural District Council was upheld. Both learned judges, however, were agreed that sec. 148 of the Public Health Act, 1875, authorises local authorities to take over *ratione tenuræ* roads in consideration of a lump sum.

## QUERIES AND REPLIES.

***In order to avoid confusion querists are requested to use distinctive words as* nom de plume.** *The letter* X, *combinations such as* X.Y.Z., *and words such as* "engineer" *and* "surveyor," *should never be used.*

Private Street Works Act, 1892: Road Partly Repairable by Inhabitants at Large.—"F. R. P." writes: It is proposed to make up under the above Act the private road shown on plan. A footroad, 4ft.




wide, was set out by an Enclosure Award of 1788, and is repairable by the inhabitants at large, although the footroad is not now defined. About twenty years ago a strip of land about 20 ft. wide was added on the west side to make a road, and houses built adjoining. The borough boundary runs along the old footroad as shown, and the land, which is not built upon, on the east side of the footroad, is therefore out of the borough. I would point out that the last clause of sec. 150 of the Public Health Act, 1875, is not found in the Private Street Works Act, 1892; also the decision of *Herne Bay Urban District Council* v. *Payne* as to premises which are "extra commercium." (1) Can the whole road, including the old footroad, be made up at the expense of the frontagers liable, and in this case who are the frontagers liable? (2) Should the portion of the old footroad within the borough be made up at the expense of the local authority, and the added strip only charged to the frontagers liable? (3) In any case, should the local authority, being, it is presumed, owners of the soil of the old footroad, be charged as frontagers to the east side of the whole road, or should the cost be entirely charged on the premises on the west side of the added strip? (4) It is presumed that the land on the east side of the old footroad being outside the borough is not chargeable?

(1) and (2) In my opinion the frontagers cannot be charged under this Act with the expense of making up the whole road. Under sec. objection could be taken by the frontagers on the ground that the road is in part a highway repairable by the inhabitants at large. The question whether the frontagers are chargeable with the cost of making up the 20 ft. strip is not free from doubt. In a case under sec. 150 of the Public Health Act, 1875, in which an old highway was widened by the addition of a strip, it was held that that strip was a "street" for the making up of which the frontagers were chargeable (*Reynards* v. *Keswick*, 52 J.P., 581). But in that case the old highway and the strip were in two different districts. Assuming, however, that that decision governs the present case, it would appear that the frontagers on the west side are chargeable with the cost of making up the 20 ft. strip. (3) No. The owners of the soil of a public road or footpath are not chargeable, and the cost should be charged entirely on the western frontagers (*Plumstead Board of Works* v. *British Land Company*, L.R., 10 Q.B., 203). But, apparently, the footpath should nevertheless be included in the provisional apportionment as "premises abutting," although no one is chargeable in respect thereof (*Herne Bay Urban District Council* v. *Payne*, 1907, 2 K.B., 130). (4) Premises outside the borough are not chargeable (*Hornsey Borough Council* v. *Birkbeck Freehold Land Society*, 1901, 1 K.B.D., 521). But this land would not be chargeable even if it were within the borough, inasmuch as it does not abut upon the portion of the road which constitutes the "street" to be made up at the expense of the frontagers *viz.*, the 20 ft. strip

Private Street Works: Crossing on Footway Abutting on New Street.—"Ignoramus" writes: A landowner, A, in this district submitted a street plan for the consideration of the council. One of the proposed streets terminates at and joins a highway. This highway is kerbed, flagged and channelled, at the junction of the highway and the new street. The plans were approved. The landowner has leased some of the land fronting the highway to a builder, B, who has erected dwelling-houses fronting the highway, but the end dwelling-house has a gable fronting or abutting on the new street, which has been opened out by taking down a stone wall which formerly separated a meadow from the footway of the highway. The house with the gable in the new street has been sold by the builder to a third party, C. Now it will be necessary to take up the existing kerbing and flagging of the footway on the highway, to form a paved, &c., crossing as a means of communication for wheel traffic between the highway and the new street; in fact, at the present time carts are crossing over the flagged footway to gain access to, or egress from, the new street. Will you be good enough to say: (1) Can the cost of constructing a crossing on the site of the present footway be charged on the frontagers of the new street as an incidental necessary to the making good of the new street under sec. 150 of the Public Health Act, 1875? (2) In the event of its not being the duty of the local authority to lay down the crossing at the expense of the ratepayers, is there any likelihood of the council being surcharged by the Local Government Board auditor if the crossing is made at the expense of such ratepayers? (3) Are there any cases decided bearing on the points in question? (4) If so, will you be good enough to state where reports of such may be found?

(1) In my opinion the cost of constructing such a crossing cannot be charged against the frontagers of the new street. The site of the crossing forms part of the highway, and not of the new street. (2) (3) and (4) It is impossible to predict what the auditor may or may not do, but it would appear to be in the interests of the ratepayers that there should be a proper crossing, and it would probably save expense in the long run, as the flagged footway would, no doubt, be continually in need of repair if subjected to the constant traffic of vehicles. I do not know of any reported case similar to this. But

# The Surveyor

And Municipal and County Engineer.


## CHIEF CONTENTS.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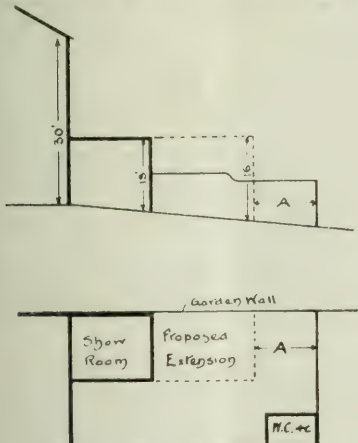
in *St. Mary Newington Vestry v. Jacobs* (L.R., 7 Q.B., 47), the right of a private owner to have a crossing for vehicles across a footway was upheld.

Building By-laws: Air-space.—"Perplexed" writes: It is desired to extend a showroom at the rear of business premises, as shown by the dotted lines on enclosed sketch. The main building is about 30 ft. high, and contains the shop on the ground floor and living rooms above, while the outbuilding (a show-



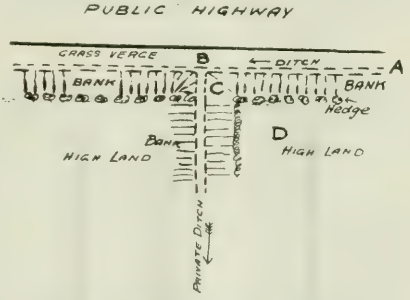

room) is about 13 or 14 ft. in height. I enclose by-laws relating to air-space about buildings. What should be the depth of the air-space A? Does the by-law applying to the main building also apply to the addition, notwithstanding the great difference in height?

In my opinion the depth of the air-space A must be 20 ft., being the depth required for the air-space of the main building, which is 30 ft. high. Clause (3) of by-law 51 prohibits the diminution by any alteration or addition of the space provided for the main building in pursuance of the by-law.

Scavenging by Local Authority: Privies. "Novo" writes: I enclose copy of a notice approved, printed and circulated by the urban district council, but not advertised, to the effect that after a given date "no privies in the urban district will be scavenged at the public expense." In a paragraph which follows, the owners of properties are reminded of the advantages of the water carriage system. A complete sewerage system and disposal works were put down some time ago by the council, and the council are therefore endeavouring to force owners to convert the privies still remaining, which are almost entirely of the old vault type. The council have undertaken (without an order by the Local Government Board) to cleanse earth-closets and privies under sec. 42 of the Public Health Act, 1875, and there is a weekly removal of house refuse from bins in force. Would you please say (1) Whether the council have power to revoke and abandon their undertaking? (2) Whether the consent of the Local Government Board is necessary to such revocation? (3) Whether the council must continue to scavenge until all privies are put on the water-carriage system? (4) The council contend that by providing the sewerage system they have provided an alternative system to the scavenging, and they propose at the expiry of the time notice to refuse to lay a rate for the scavenging of privies. Can they do this?

(1) In my opinion they have not. Reading secs 42 and 43 together I think the intention of the Act is that the local authority, having once undertaken the cleansing and scavenging, &c., should continue it. If they were at liberty to discontinue it sec. 43 would be rendered nugatory. (2) I do not think the consent of the Local Government Board (even if given) would be operative. (3) Yes, in my opinion. (4) I think the council are bound, in making the general district rate, to provide for all proper expenses, including those of the scavenging which they have undertaken.

Cleansing of Ditches near Highway.—"C" writes: I should be glad if you could inform me under what section of the Highway Act I can get the following nuisance abated: Water from the highway is conveyed from point A down to point B by a ditch. This ditch enters through the bank C into another ditch, which belongs to the tenant of the land marked




D. This private ditch, although being low enough for the drainage of the land D, is not low enough to admit the water from the highway at the point C, thus causing the highway to be flooded. Can I legally enforce the tenant to so dig out and clean the ditch as to allow the highway water free outlet?

Under sec. 67 of the Highway Act, 1835, the highway authority could themselves cleanse and sewer the ditch at their own expense; but they would have to pay the owner or occupier of the land for any damage he might therein sustain. It is, however, the landowner's duty at common law to cleanse and sewer the ditch to such an extent as to prevent a nuisance and obstruction to passengers. If he neglects to do so it is open to the highway authority, with the concurrence of the Attorney-General, to apply for an injunction to restrain him from causing a nuisance and obstruction to the highway by such neglect. See *Attorney-General v. Waring* (3 J.P., 881).

Officer's Compensation on Abolition of Office. —"Justitia" writes: Under sec. 120 of the Local Government Act of 1888 the compensation to be paid to an official of a local authority whose office is abolished is "not to exceed the amount which under the Acts and *rules* relating to the Civil Service is paid to an officer whose office is abolished." Would you please state: (1) Whether it is a fact that for a year or two past it has *not* been the custom of the Treasury to *add* years to the number of years actually served by an officer in computing the amount due to him as compensation? (2) If it has been the custom *not* to add years it is reasonable to infer that an officer of a local authority who might appeal to the Treasury in connection with a claim for loss of office would (on their assessing his case) not be allowed any number of years in addition to the actual number of years served by him, and also, in the event of the authority which intended to compensate him having proposed to *add* years to his actual period of service, they (the Treasury) would not allow such added years in the event of such appeal being made to them. (3) Have the Acts and Rules of the Treasury been altered legally to give them the power to cease "adding years" to period of actual service, considering it has for a number of years previously been their practice so to

do? (4) In computing the amount due, should the salary received by the officer at the date of the termination of his service be the amount on which compensation should be based, or should it be taken on the average salary received during the previous five years? I understand that it has been decided, in the case of *Livingstone* v. *Westminster Corporation*, 1904, 2 K.B., 109; 68 J.P., 276, that the actual salary received at the date of vacating office is the amount on which the compensation is to be based. Has this ruling been upset or altered, and would it apply to all cases coming under sec. 120 of the Act of 1888?

(1), (2) and (3.) The Acts in question are the Superannuation Acts, 1859 and 1884. The former, after providing for a superannuation allowance of 1/60th of the annual salary and emoluments for every year of service (in no case exceeding 40/60ths of the annual salary and emoluments) enables the Treasury to grant "an annual allowance by way of compensation" if an office is abolished. There appears to be no power to make rules, but it is the practice of the Treasury, in cases of abolition of office, to grant as compensation the above-mentioned allowance of 1/60th for every year of service plus the following additional allowance:—

| | | | | |
|---|---|---|---|---|
| For 20 years of service and upwards | | | | 10/60ths additional. |
| ,, 15 | ,, | ,, | but under 20 | 7 ,, |
| ,, 10 | ,, | ,, | ,, 15 | 5 ,, |
| ,, 5 | ,, | ,, | ,, 10 | 1 ,, |

It is also the practice to make a deduction of 1/4th of the amount of the compensation when an officer has not been required to devote his whole time to the duties of his office (Lumley's "Public Health Acts," 7th Edition, pp. 1,125-6). Whether there has been any variation in the practice of the Treasury since the publication of this work (1908) I cannot say, but whatever the present practice is, it is to be presumed that the Treasury would be guided by it in dealing with an appeal. (4) The maximum compensation is apparently governed by the ultimate salary and emoluments and not by an average of the previous five years. I am not aware of any decision overruling *Livingstone* v. *Westminster Corporation*.

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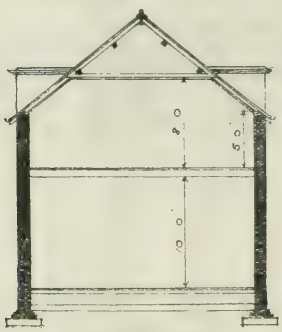
Building: What is an Attic?—"A.R.I.B.A." writes: I enclose copy of a section regulating the heights of rooms, which is embodied in a Private Act of Parliament granted to a corporation. The Act is dated prior to the Public Health Acts Amendments



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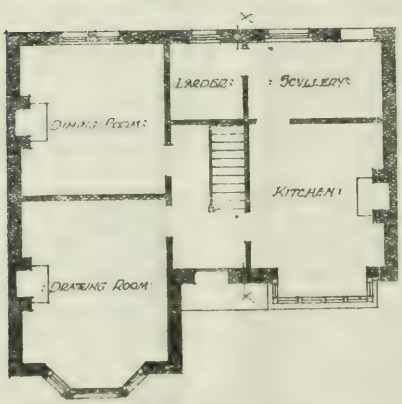


Ground Plan.

Act of 1890. I am sending also a tracing of the plan of a house which the surveyor to the corporation contends does not comply with the said section. I should be glad of your opinion as to whether his interpretation is correct. There is no definition in the Private Act of an attic. The surveyor contends that there cannot be an attic on the first floor. At least one floor must intervene between ground floor and the attics.

[Section of Private Act above Referred to.]

Every habitable room on the ground floor shall be not less than 10 ft. in height at least from the floor to the ceiling thereof; every habitable room not on the ground floor (not being an attic) shall be not less than 9 ft. in height at least from the floor to the ceiling thereof; every attic shall be 8 ft. in height at least where the ceiling is horizontal, and such horizontal part shall be at least equal to one-fourth of the floor, and the perpendicular walls of every attic shall be at least 5 ft. in height.

An attic is defined in Lloyd's Encyclopædic Dictionary as "a room or series of rooms at the top of a house just under the roof; a garret." And a garret is defined as "an upper apartment of a house immediately under the roof; an attic." These definitions are clearly wide enough to include an upper room in a two-storied house, and as there is nothing in the Act to require a more limited interpretation, I cannot see how the surveyor's contention can be sustained. The plan appears to comply with the requirements of the Act as set out above.

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Sewer Construction.—"Slag" writes: A new road is being made in the district of a rural district council. It adjoins an old lane, which, however, for a part of its length has recently had erected on one of its frontages a number of detached and semi-detached villa residences, so that it is now losing its character as a rural lane and becoming a suburban road. In the new road a surface-water sewer is being laid, but the only method of obtaining an outfall for this is by laying a new surface-water sewer along the old lane for a length of about 500 yds., where it would fall into a river. There is already a surface-water sewer along part of the old lane, but owing to its level this could not be used, and would be discarded if a new sewer were put in. If a new surface-water sewer is laid along the old lane it would not only be used as an outfall for the sewer in the new road, but would also be used by the local authority for connecting existing street gullies and others to be put in. I should be glad to know your opinion upon the respective legal obligations of the local authority and the estate owner who is constructing the new road in connection with the provision of this proposed new surface-water sewer in the old lane.

So far as the new road is concerned the local authority can exercise the powers of sewering given by sec. 150 of the Public Health Act, 1875, or (if adopted) by the Private Street Works Act, 1892. But the local authority will have to provide the necessary outfall at their own expense. See *Regina* v. *Tynemouth Rural District Council* (1896: 2 Q.B., 451).

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Private Streets: Forming Full Width.—"Fordian" writes: In this district estate plans showing streets 36 ft. wide have been approved, in accordance with the council's by-laws. Builder's plans showing streets of this width have also been approved, but unless the street was being, or has since been, built on both sides, only half width—*i.e.*, 18 ft.—has been actually given up for traffic, the remainder (usually grazing land) being fenced off. This 18 ft. width frequently gets into a state of disrepair. It may be mentioned that builders only lease the land up to half-street width, the remainder being in the hands of the estate. (1) Can my council demand a 36-ft. width being given up, if only one side of the street is built upon? (2) If not, could the 18-ft. width be made up under the Private Street Works Act, 1892?

(1) There is evidently an intention to lay out a new street, and in pursuance of that intention some houses have been built. In these circumstances I think it is clear that a new street is being laid out, and that the council can require such street to be laid out of the width required by the by-laws, whether houses are built on both sides or not. (2) The 18 ft. strip would, I think, be a "street" for the purposes of the Act.

---

House Drainage: "Site of the House."—"T. T." writes: A question has arisen in my district regarding the distance which the council can insist upon an owner draining to a sewer. In sec. 23 of the Public Health Act, 1875, it states that notice can be given to the owner or occupier of premises to make a covered drain or drains into any sewer which the local authority are entitled to use, and which is not more than 100 ft. from the site of the house. I shall be exceedingly obliged if you will state whether the word "site" means the house or the boundaries, according to the Act.

The phrase "site of the house" appears to mean that piece of land on which the house itself stands. See "The Law of Sewers and Drains," by Macmorran and Wills, p. 101. *Barnett* v. *Chambers*, 11 Q.B.D., 392; *Liggett* v. *Hastings Local Board*, 18 Q.B.D., 482. The 100 ft. is to be measured "as the crow flies" (*Mould* v. *Cole*, L.R., 8 Ex., 32).

**We have to draw the attention of querists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6 in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.**

# Correspondence.

*"Men are never so likely to settle a question rightly as when they discuss it freely."*
MACAULAY'S *"Critical and Historical Essays."*

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS: THE SOUTH-EASTERN DISTRICT ELECTIONS.

*To the Editor of* THE SURVEYOR.

SIR,—I enclose you a copy of a letter which I have addressed to Mr. Maybury, in reply to a circular-letter which he sent to the members of the institution in the South-Eastern District after a meeting of the Kent Association of Surveyors had been held at Maidstone. The receipt of such circular-letter was the only intimation that the members had that such a meeting had taken place. I need hardly say that Mr. Maybury's letter has caused a feeling of strong resentment among the members of the institution in the counties of East and West Sussex, and I imagine that similar resentment must be felt by the members in the Surrey county. As the matter is of considerable importance to the institution and to its members, I shall be glad if you will kindly have my letter published in your next issue. I may say that I have already informed Mr. Maybury of my intention to give publicity to the correspondence.—Yours, &c.,

A. ERNEST PRESCOTT,
Borough Surveyor.

Town Hall,
Eastbourne.
April 2, 1912.

[COPY OF LETTER REFERRED TO.]

### SOUTH-EASTERN DISTRICT: INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

DEAR SIR,—It would be very difficult for me to give you any adequate idea as to the surprise I felt on receipt of your circular-letter of the 27th ult. In that communication you were pleased to observe, *inter alia*, that "some time ago you were requested by the president and secretary of the institution to take all necessary steps for the election of a district chairman, a district secretary, and a district representative on the council." You further observe that "at the annual meeting of the Kent Association of Surveyors, held at Maidstone last Saturday week, you seized the opportunity of having the question of the above election put upon the agenda for discussion, when it was unanimously decided that the honours of the posts should be divided, and that the first chairman of the district should be a Surrey representative, the secretary a Sussex one, and the representative on the council a borough engineer and surveyor resident in the county of Kent. You further proceeded to state that great dissatisfaction was expressed at the apathy of the present council, and wound up an extraordinary communication by suggesting that the members in the South-Eastern District should be unanimous in recording their votes for three certain members so named by the Kent Association of Surveyors at the meeting referred to.

I am unwillingly obliged to register a most emphatic protest against the issuing of such a communication and to place on record the following facts:

(a) That the meeting you were invited by the president and secretary to convene has never taken place.

(b) That the members in the counties of Surrey and Sussex which are comprised in the geographical area of the South-Eastern District have had no voice whatever in the selection of the men you have put forward for the three vacant positions.

In other districts the whole body of members were specially called together for the express purpose of selecting their men, but, unfortunately, you have added an unpleasant touch to the elections in the South-Eastern District by failing to consult the wishes of the members in the counties of Surrey and Sussex, a course of procedure that I do not hesitate to characterise as utterly unfair and which must inevitably provoke a great deal of resentment. It is noteworthy that you do not appear to have had any conception of your duty to the district as a whole, and your action in ignoring the wishes of a large number of members is not likely to command itself to any reasonably minded person. Why you should endeavour to persuade yourself and others that the surveyors of Kent possess some sort of intellectual and moral right to settle these elections themselves without even conferring with the surveyors of Surrey and Sussex passes my comprehension. I have the greatest possible respect for the opinion of my brother surveyors in Kent, but surely the opinions of surveyors in other counties are entitled to the amplest consideration also, and your failure to recognise this will not, I can assure you, keep the elections within peaceful channels. No policy can succeed which neglects plain, moral principles, and the fact that you have omitted to adjust your policy to principles of "fair play" gravely discredits the propriety and justice of your recommendations. Let me finally state that I am strongly in favour of the candidature of Mr. P. H. Palmer, of Hastings, and had a meeting been properly convened it was my intention to have brought forward his name for nomination as the direct representative on the council. Mr. Palmer has been on the council for many years, and has served us ungrudgingly and disinterestedly, and, after such good and useful service, it will be most ungracious not to elect him.—Yours truly,

A. ERNEST PRESCOTT,
Borough Engineer and Surveyor.

H. P. Maybury, Esq.,
County Surveyor,
Maidstone, Kent.

## ESTIMATING.

*To the Editor of* THE SURVEYOR.

SIR,—Mr. J. Eastwood's article on "Estimating," in your issue of March 29th, is interesting and of considerable value, but I think it is a pity that two of his approximate estimates—namely, that for tar-spraying and that for pitch-grouted macadam are likely to mislead surveyors who attempt to make use of them for this year's work.

In the first place, he has taken the price of tar at 36s. per ton at the depot, whereas in the majority of instances tar is now not procurable under 60s. a ton. The correction due to this figure would bring the cost of the tar per yard super. up to ·625 of a penny, which would bring his total cost up to 1·05, but I believe that most surveyors will consider this figure still too low, and that the average cost of tar-spraying this year in rural districts will, if the quantity he proposes is used, and which is pretty correct—namely, 4½ yds. covered per gallon—come to a figure approaching 1¼d. per yard super.

Again, in the second case—his standard estimate for pitch-grouted macadam—if his estimate for pitch be corrected to present prices, say 50s. a ton, his total figure, using the correction taken from his own diagram, will amount to 3s. 3½d. per yard super. This I need hardly say is a wholly prohibitive figure, at any rate for country roads; but this high cost arises from his over-estimating the price of almost every item, and over-estimating the quantity of pitch required by nearly 80 per cent. We have now ample experience, and know that 14 gallons of pitch per ton of stone is the correct figure, whereas Mr. Eastwood estimates for upwards of 20 gallons. In most cases it will be found that even with the existing high price of pitch this work can be carried out for between 2s. and 2s. 6d., according to the cost of carriage of stone and pitch.—Yours, &c.,

"CONTRIBUTOR."

London.
March 29, 1912.

## SEWER GAS AND CONCRETE.

*To the Editor of* THE SURVEYOR.

SIR,—I notice in your issue of February 16th some remarks on the effect of sewer gas on concrete sewers.

I should like to add a warning on the danger. We have a number of small concrete pipe drains and sewers in Madras, mostly 6-in., 9-in., and 12-in. diameter. They have been laid some seven or eight years, and are now found in many places to be corroded very badly indeed. The disintegration in every case is internal, and in the soffit. In some pipes nearly an inch thick is left, and collapse

is taking place. The sewage has a high temperature here, and decomposes rapidly; and these sewers have never been ventilated properly. The pipes themselves appear to be of quite good hard concrete, and the inverts are usually as good as new. We attribute the corrosion to sewer gas.—Yours, &c.,

E. P. Richards.

City Engineer's Office,
Madras.
March 7, 1912.

## LIGNO-CONCRETE.

By Gerald O. Case.

At a meeting of the Society of Engineers, held on Monday evening at the Institution of Electrical Engineers, consideration was given to a paper on "Ligno-Concrete," by Mr. Gerald O. Case. The properties and uses of this material, we may remind our readers, have already been explained in a special article by Mr. Frank J. Gray, Assoc.M.Inst.C.E., F.R.G.S., which appeared in our issue of February 24, 1911.

In the introductory remarks on Monday, Mr. Case referred to the use in America and Australia of concrete in combination with timber, and pointed out that while the concrete effectively preserved the timber, it was not used to the greatest advantage. The object of his investigations was to ascertain if it were possible to reinforce concrete with timber rods. Roughly speaking, steel was about eight or nine times stronger than timber, but ten to fifteen times as expensive. The efficiency of timber, as a reinforcing material, depended on whether there was sufficient adhesion between the timber and the concrete, and whether the difficulties of the absorption of moisture by the timber from the wet concrete, and the splitting of the latter, could be overcome.

The paper described the experiments made by the author to ascertain (*a*) the amount of water absorbed by eighteen kinds of timber immersed in fresh water, along the grain and through the end grain respectively; (*b*) the relative absorption by the timber of fresh and sea water in the same period; (*c*) the relative amount of water absorbed by timber embedded in 6 to 1 concrete and neat cement blocks; (*d*) the effect of applying wood preservative, creosote, varnish, &c., to the timber before insertion in the concrete or cement blocks; (*e*) the effect on the adhesion between the timber and the concrete of soaking the rods before insertion. Examples were given to show that concrete effectively preserved timber embedded in it.

Particulars were given of the construction of twenty-five concrete beams, reinforced by timber rods. Three ligno-concrete beams, 8 in. deep by 4 in. wide, were tested with a central load on a 4-ft. span; the average ultimate load producing fracture about 3 tons. The results of these tests were compared in the paper with the tests on ferro-concrete beams recorded by Mr. E. Marburg in the "Proceedings" of the American Society for Testing Materials (1904, vol. iv.). It appeared that for the same ultimate strength of beam, it was necessary to use 9 per cent of sectional area of pitch pine tensile reinforcements, as against 1 per cent steel reinforcements. A comparison of the prices of steel and pitch pine showed a saving in favour of ligno-concrete.

The author pointed out that in cases where more than about 1·2 per cent of steel reinforcement was required ligno-concrete could not compete with ferro-concrete, because the required size of the timber bars would be too large for convenient use. There appeared, however, to be a big field for it for use in constructing bungalows, buildings for small holdings, floors, piles, posts, fencing, coast and river works, &c. It had already been used for making fence posts and for building a short length of sea-wall. The ligno-concrete fence posts cost about 2s. per cube foot. They were about 20 per cent cheaper than creosoted deal, and about 40 per cent cheaper than English oak. In Canada, four bungalows had been built with ligno-concrete slabs, and the Pacific Coast Construction Company, of Victoria, British Columbia, now had contracts in hand for twenty buildings, in which the material was to be used.

**London Van-Horse Parade.**—The London Van-Horse Parade Society will hold their annual parade in Regent's Park on Easter Monday.

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Bognor U.D.C.** (March 27th. Mr. M. K. North).—£538 for the construction of a footpath on a portion of the Chichester-road from Sheepwash-lane to the Big Tree.—The clerk, Mr. J. Jubb, stated that the footpath would be 1,570 ft. in length. The surveyor, Mr. O. A. Bridges, also gave evidence.

**Bootle T.C.** (March 30th. Mr. H. R. Hooper).—£45,755 for the purposes of the electrical undertaking.—The town clerk, Mr. J. H. Farmer, stated that the money was required for the purchase of land and machinery for a new generating station. Mr. T. D. Clothier, borough electrical engineer, gave the details of the scheme, in which he said it was proposed to equip the station with two turbines capable of developing 3,000 kilowatts per hour. The new works would put the corporation in such a position as to deal with any future requirements expeditiously and economically.

**Caerphilly U.D.C.** (March 28th. Mr. A. G. Drury).—£14,800 (1) to acquire under a Provisional Order land for sewage disposal at Nelson, (2) land for a recreation ground, and (3) land to deposit house refuse in other parts of the district.—Mr. W. Spickett, clerk to the council, explained the circumstances which led to the promotion of the present sewerage scheme for Nelson, and stated that the Rhymney Valley Sewerage Board would not be affected in the slightest degree by it. Proceeding, he said they were unable to get the land by private treaty, hence the Provisional Order. Mr. Raikes (of Messrs. Willcox & Raikes), the engineer preparing the scheme, submitted details. He said the present population of Nelson was a little below 3,000, but they were providing for an exceptional growth in the future, and their scheme had been laid out for a population of 8,000.

**Chester-le-Street U. and R.D.C.** (March 21st. Mr. A. A. G. Malet).—This was an inquiry into the application of the Chester-le-Street Rural and Urban District Councils to borrow £8,500 and £1,500 respectively to defray the cost of erecting a road bridge over the Wear, between Chester-le-Street and Lumley, near Lumley Castle. It was stated that the county council had agreed to pay half the costs of building the bridge. The cost to the local councils was estimated at £9,663, out of a total expenditure of £17,326.

**Failsworth (Lancs) U.D.C.** (March 23rd. Major J. Stewart).—£5,239 for private street works improvement.—The clerk, Mr. H. C. Broome, said it was intended to make up six streets and four passages. It was proposed to carry out the works by contract let by public tender. They asked for seven years in which to repay the loan.

**Ilfracombe U.D.C.** (March 28th. Mr. W. O. E. Meade-King).—£200 for sewerage works in the new Barnstaple-road, £1,750 for the laying out of the new cemetery and the building of a mortuary chapel, £724 for widening Marlborough-road, £975 for widening the new Barnstaple-road, and £679 for widening Watermouth-road, Hele. Evidence was given with respect to the schemes for which the money was required, and the inspector afterwards visited the places in question.

**Kingsbridge (Devon) U.D.C.** (March 27th. Mr. W. O. E. Meade-King).—£200 for the provision of a refuse tip at Bowcombe Creek and the purchase of the wharf.—It was stated that the refuse of the town amounted to about 520 tons annually, and about 400 tons of it was tipped by the side of Bowcombe Wharf. The council proposed to extend the present wharf by filling in the site of the refuse tip adjoining and building a quay wall of dry stone-walling, capped with stones set in cement. The estimated cost of that wall was £119. The inspector suggested that in place of piles longitudinal fenders should be bolted into the face of the quay wall.

**Newcastle-upon-Tyne T.C.** (March 26th. Mr. F. H. Tulloch). £1,300 for the provision of a bowling green on land adjoining the Walker-road Recreation Ground.—The town clerk, Mr. A. M. Oliver, after statistical information had been submitted, remarked that the site was 4,420 sq. yds., of which 860 would form part of the adjoining streets. The council asked that the term of repayment of the loan might be twenty years. The whole of the bowling greens of the city were very much used, and the corporation considered another was required in the east end of

the city. The site was not near to any of the parks provided with bowling greens. The city engineer, Mr. W. J. Steel, submitted plans and details.

**Norwich T.C.** (March 26th. Mr. T. C. Ekin).—£19,000 for the purpose of the electricity undertaking, £3,000 in respect of new office buildings, and £3,000 for two new boilers.—The £19,000 is made up as follows: Turbo generator, £10,000; mains, £6,000; and services, £3,000. Mr. Arnold H. Miller, town clerk, stated that with respect to the office buildings the work is more than half done, it having been the intention of the corporation to pay for it out of revenue. In addition to these, however, the corporation have taken in hand several other works, and the following is a statement of what it was proposed to do during the current and the next two or three years out of revenue: New battery (including buildings and booster, less allowance for old battery), £4,650; new offices and furnishing, £3,600; two new boilers, £3,450; coal bunkers, conveyor, crane, and work in connection with same, £4,950; conversion of public lamps for electric lighting, £15,000; total, £31,650.

**Queenstown (Co. Cork) U.D.C.** (March 21st. Mr. J. F. MacCabe).—£10,000 to build fifty houses, thirty of them at Carrignafoy, and the remainder at Newtown.—It was stated that one of the sites already acquired was at Carrignafoy, the highest point in the town, and the council could acquire a second site at Newtown. The sum of £6,600 was put down as the total cost of the houses at Carrignafoy, and that would entail the repayment of £414 odd per annum. Taking the rent of thirty houses at 4s. a week, that would give a return of about £300 a year, which would leave the sum of £114 to be made up out of the rates. One penny in the £ on the rates would bring in £90, so that an extra rate of 1½d. or 2d. in the £ at the outside would be sufficient to cover the expense. Mr. Joseph McCarthy, the engineer in charge of the scheme, produced his plans, and gave his estimate of the cost—£6,601 for the houses at Carrignafoy, and £3,000 for the houses at Newtown. The inspector said that he did not at all favour the plan for the huoses at Carrignafoy, as they would appear to get the minimum of sunlight, which was an important factor nowadays in the building of houses of this class.

**Rhyl U.D.C.** (March 27th. Mr. P. M. Crosthwaite).—£3,211 for the purposes of work for water supply, and £2,000 for resurfacing with asphalt the Rhyl promenade.—The water engineer, Mr. L. G. Hall, said the money was required chiefly for the laying of an additional new 8-in. main to join the existing 7-in. and 5-in. mains, and new filtering beds at Glascoed. It was stated that after floods the water from the gathering reservoir on reaching the service reservoir at Glascoed was discoloured and carried much matter in suspension, causing the filtering beds to fill rapidly. This entailed constant sand skimming, and interfered with the regular working of the filtering beds, allowing unfiltered water to get through into the district. The new gravel beds were designed to remove the trouble. Owing to the largely increased water supply required by the district, the existing feed pipes to the filtering beds were also inadequate. With reference to the retopping of the promenade, the surveyor, Mr. A. A. Goodall, said it was proposed to place a 1-in. thick coating on the existing surface, and the cost was estimated at £2,000.

### APPLICATIONS FOR LOANS.

**Belfast R.D.C.** £500 for works of sewerage.

**Birkenhead T.C.**—£4,764 for a new cemetery.

**Brighouse T.C.**—£2,700 for paving works.

**Colne T.C.**—£21,461 for street works.

**Epsom U.D.C.**—£500 for electricity mains extensions.

**Merton U.D.C.**—£400 for the purchase of land in King's-avenue, New Malden, for highway depot purposes.

**Newton Abbot (Devon) R.D.C.**—£560 for an additional water supply for Ogwell.

**Salford T.C.** £17,600 for a secondary school.

### LOANS SANCTIONED.

**Abergele U.D.C.**—£129, contribution towards the cost of widening the cemetery entrance.

**Bognor U.D.C.**—£2,400 for the erection of thirteen cottages.

**Essex C.C.** £5,000 for a new school at Chingford.

**Southwick (Sussex) U.D.C.**—£850 for the reconstruction of the surface-water outfall.

**Walton-on-the-Naze U.D.C.**—£280 for improving the public conveniences.

**Wood Green U.D.C.**—£1,320 for laying out Tewkesbury-gardens, and £2,530 for surface-water drainage works.

### FORTHCOMING INQUIRIES.

APRIL.

| | | £ |
|---|---|---|
| 9.— | **Evesham.** For housing purposes (Mr. Edward Leonard) ... ... ... ... | 10,000 |
| 10.— | **Barrow-in-Furness.** For sewerage and street improvement purposes (Mr. W. O. E. Meade-King) ... ... ... ... | 2,420 |
| 10.— | **Birmingham.** For the purpose of the electric light undertaking (Mr. T. C. Ekin) ... ... ... ... ... ... | — |
| 10.— | **Brierfield.** For sewage disposal works (Mr. R. G. Hetherington) ... ... ... | 6,500 |
| 10.— | **Devonport.** For electricity, public convenience, and road purposes (Mr. H. Shelford Bidwell) ... ... ... ... | 11,239 |
| 10.— | **Neath.** For sewage disposal purposes (Mr. A. G. Drury) ... ... ... ... | 800 |
| 10.— | **Pontypridd.** For the construction of a river-wall (Mr. F. H. Tulloch) ... ... | 1,500 |
| 10.— | **Richmond (Surrey).** For gardens extension and paving purposes (Mr. Edgar Dudley) ... ... ... ... ... | 25,000 |
| 10.— | **Swinton.** For laying out a recreation ground (Mr. M. K. North) ... ... ... | 400 |
| 10.— | **Ventnor.** For the construction of a sea-wall (Mr. P. M. Crosthwaite) ... ... | 3,700 |
| 10.— | **Walthamstow.** For open space and street purposes (Major J. Stewart) ... | 1,000 |
| 11.— | **Bolton-upon-Dearne.** For sewage disposal purposes (Mr. R. G. Hetherington) ... | 6,000 |
| 11.— | **Bootle.** For street improvement purposes (Mr. M. K. North) ... ... ... | 8,370 |
| 11.— | **Fleetwood.** For private street works (Mr. W. O. E. Meade-King) ... ... | 3,520 |
| 11.— | **Rhondda.** For the provision of a burial ground (Mr. F. H. Tulloch) ... ... | 10,200 |
| 11.— | **Seaton.** For sea-wall and footpath extension purposes (Mr. H. Shelford Bidwell) ... ... ... ... ... | 400 |
| 11.— | **West Bromwich.** For electricity and school purposes (Mr. T. C. Ekin) ... ... | 9,700 |
| 12.— | **Clitheroe.** For water supply purposes (Mr. W. O. E. Meade-King) ... ... | 1,310 |
| 12.— | **Cefligaer.** For cemetery purposes (Mr. F. H. Tulloch) ... ... ... ... ... | 5,400 |
| 12.— | **Great Crosby.** For private street works (Mr. M. K. North) ... ... | — |
| 12.— | **Milford Haven.** For refuse disposal purposes (Mr. A. G. Drury) ... | 2,150 |
| 12.— | **Portland.** For water supply purposes (Mr. P. M. Crosthwaite) ... ... ... | 14,250 |
| 13.— | **Bristol.** For paving and sewerage purposes (Mr. F. H. Tulloch) ... ... ... | 9,507 |

**Bradford's Revenue from Sewage.**—New machinery for the extraction of marketable produce from the city's sewage has lately been installed at Bradford, at a cost of £60,000, and will be started in a few days. Last year the corporation made a profit of £30,000 from grease recovered from the sewage, and it is anticipated that at the new works at Esholt the annual profit will be raised to £50,000. The total sales of these products up to last year reached £100,000. A market has also been found for the pressed cake which remains after the grease has been extracted, and large quantities of this have been exported to be used as fertilisers in France, South America, and other foreign countries. The cake has even been in demand as fuel during the coal strike, and has been used as such in the local factories. Bradford is probably the only city in the kingdom which derives revenue from this source. The present plant is the result of ten years' experiments by the city sewage engineer, Mr. Garfield. He first installed two presses, which yielded in grease sales £222. At present sixty-four presses are at work at the Frizinghall sewage works. When the new works at Esholt are complete over 100 presses will be working.

# Municipal Work in Progress and Projected.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Hawick £1,000, Portadown; housing and town planning—Bognor £2,400; roads and materials—Ayrshire £2,529, Brighton £3,190, Chester-le-Street £17,326, Edinburgh £9,206, Hammersmith £4,073, Middlesex £4,622, Southwark; sewerage and sewage disposal—Ealing £1,700, Worthing, Wortley; water, gas and electricity—Banffshire £2,112, Rotherham.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

## BUILDINGS.

**Bridgnorth (Salop) R.D.C.** A memorial in favour of a bridge across the Severn between Bridgnorth and Bewdley has been forwarded to the county council.

**Hawick T.C.**—A sum of £1,000 is to be spent upon the provision of a municipal lodging-house.

**Largs T.C.**—A women's bathing-house is to be erected on the shore by the council.

**Margate T.C.**—The offer of Mr. Andrew Carnegie of £8,000 for a public library is being considered by the council.

**Portadown U.D.C.**—The town surveyor, Mr. William Wilson, has reported favourably on the prospect of the bridge over the river Bann being widened. It is expected that the county council will contribute half of the cost of the scheme.

## HOUSING AND TOWN PLANNING.

**Bognor U.D.C.**—The Local Government Board have written stating that they would sanction at an early date the council's application to borrow £2,400 for the building of thirteen workmen's cottages, and deferring consideration of the application to borrow a further sum of £7,200 for forty-one additional cottages until the council definitely decided to erect them.

**Drogheda T.C.**—Reports were before the corporation last week from the medical officers of health which point to the urgent need there is for proceeding with the erection of working-class houses within the borough. The town clerk said it was evident from the number of houses that are being condemned by the medical officers that the new houses that are to be erected under their housing scheme would not suffice to meet the demand for sanitary habitations. It was decided to postpone the adoption of the medical officers' reports, and meanwhile to expedite the housing scheme now in hand and go on with another.

## PARKS AND OPEN SPACES.

**Dalkey (Co. Dublin) U.D.C.**—It has been agreed to purchase Dalkey Island for a sum of £525 as a public park.

**Nottingham T.C.**—The Public Parks Committee has been requested to report as to the desirability of acquiring land in Hucknall-road between Herbert-road and Haydn-road for the purpose of a recreation ground for the Sherwood, Carrington and New Basford districts.

**Tunbridge Wells T.C.**—The formation of the bowling green, tennis courts, removal of the children's playground, provision of extra children's shelter, and alterations to the existing one have been carried out at the Grosvenor Recreation Ground at a cost of £154.

## REFUSE COLLECTION AND DISPOSAL.

**Bridlington T.C.** It is proposed to spend £1,500 on the installation of a condenser at the destructor works.

## ROADS AND MATERIALS.

**Aberdeen T.C.**—It has been agreed to lay Adamant pavement in Park-street and South-West Esplanade.

**Ayrshire C.C.**—The road between Caldwell Station and Lugton is to be constructed under the direction of the Northern District Committee, at an estimated cost of £2,529.

**Bridlington T.C.**—House property, valued at £1,500 is to be purchased for the widening of Manor-street.

**Brighton T.C.** The Works Committee recommend that the tramway track around the Old Steine be relaid, Jarrah toothing to be used on each side of each rail with creosoted deal between, at an estimated cost of £3,190.

**Cardiff T.C.**—The Property and Markets Committee recommend the council to purchase frontages at a cost of £2,430, for the widening of Queen-street, where the new road is being made into Cathays Park.

**Chailey (Sussex) R.D.C.**—The Roads Inspection Sub-Committee report that they have been three days in making an inspection of the curves and corners of the roads within the council's district, and they endorsed a list showing where, in the opinion of the committee, improvements could, with advantage, be made. With three or four exceptions the improvements for the most part would not involve any large expenditure, and if taken in hand gradually, and with the kindly assistance of roadside owners of property in granting the necessary sanctions, would lead to notable improvements, and a general lessening of the risks of the public. The report has been referred to the Highways Committee to deal with.

**Chester-le-Street (Durham) U.D.C.**—It is proposed to construct a new highway between Chester-le-Street and Lumley, at a cost of £17,326, the cost to be borne by the various authorities concerned.

**Cornwall C.C.**—Upon the recommendation of the county surveyor, Mr. A. E. Brookes, it has been agreed to purchase for £680 a steam tractor, with extra wheels and fore carriage for converting to steam roller, with two trailer wagons. The running expenses are estimated by the makers at under £1 per day, and the daily capacity is given as 100 ton-miles. The estimated cost per working year was stated to be £265 0s. 6d., compared with £533 by animal-power haulage, a nett saving of £278 per annum.

**Edinburgh T.C.**—At the last meeting of the council the Streets and Buildings Committee submitted a list of streets requiring to be paved, at a total cost of £7,638. The list was sent back for further consideration, and the committee have now agreed to recommend the addition to the list of a portion of South Clerk-street (wood paving, estimated £475) and Learmonth-terrace (mastic asphalt, estimate £1,093).

**Grays (Essex) U.D.C.** The tender of the Standard Appliance Company has been accepted for the supply of two tar boilers, at £37 18s. each.

**Hammersmith B.C.**—Latimer-road, between Boundary-road and Braley-road, containing an approximate area of 5,740 super. yds., is to be paved with creosoted deal blocks, at an estimated cost of £3,587. The carriageway in Latimer-road between Hume-street and Boundary-road is to be repaved with the same material, at a cost of £486.

**Ipswich T.C.**—The Paving and Lighting Committee have been instructed to consider the question of widening the approach to Stoke Bridge.

**Kingston (Surrey) T.C.**—Under the heading of "Tenders," we gave last week (p. 520) the results of those sent in for recoating main roads. In submitting the matter the surveyor, Mr. R. H. Clucas, said the British Trust Company was quite a new company, and he did not know enough of their material to justify him in advising the acceptance of their tender, involving £2,375, in respect of Portsmouth-road. That of the Roadament Company, whose material had been on the Thames Embankment now for some years, was accepted, and the British Trust Company were accepted, in respect of Surbiton-road, at £297.—In the same issue (p. 510) we stated that the wages of the road foreman had been increased. Unfortunately, we were premature, as the recommendation was referred back to the Highways Committee. We hope, however, we were only anticipatory. It has been decided by the corporation again to make use of Akonia for the prevention of dust on the roads of the town.

**Middlesex C.C.**—A sum of £4,622 is to be spent on paving High-road, Wood Green, with wood, and £100 upon the purchase of land.

**Newhaven R.D.C.**—As the result of a conference of this with other local councils with respect to the improvement of the Newhaven to Eastbourne road, the councils interested are to be asked to prepare their schemes and estimates for the improvement of their respective portions of the road, and exchange for mutual consideration. A fresh set of statistics of the traffic will be taken in Easter week.

**Newport (Mon.) T.C.**—The Works and General Purposes Committee have been considering a scheme for the construction of a new road leading from Mendalgief to the Maesglas district.

**Southwark B.C.**—It has been agreed to repave the following streets with wood: Old Kent-road, from East-street to Mina-road, and from Great Dover-street to New Kent-road, west side (£3,254); Trinity-street, from Borough High-street to Trinity-square (£1,000); St. George-road (£5,120); Southwark-street, from Borough High-street to Red Cross-street (£1,500); East-street, from Blackwood-street to Etherton-street (£1,282). The asphalt in Villa-street, South-street (Rodney-road to East-street), Swan-street, Tower-street, Austral-street, Broadwall, Collingwood-street, and other streets is to be relaid.

**Worthing T.C.**—The Highways Committee recommend the laying of new wood blocks in Chapel-road, at a cost of £752.

**York T.C.**—In regard to the extension of the tramways for the Bishopthorpe-road route, the Tramways and Electricity Committee have given the city surveyor, Mr. F. W. Spurr, instructions to proceed with the necessary plans, estimates, and specification for carrying out the work. The city electrical engineer has also been instructed to prepare the necessary specification for the electrical equipment.

## SEWERAGE AND SEWAGE DISPOSAL.

**Ealing T.C.**—It is proposed to provide two continuous filter bacteria beds at the northern sewage works, at a cost of £1,700.

**Surrey C.C.**—In our last issue we intimated that the Highway Committee of the council had been authorised to engage an engineer to advise them with respect to a surface-water drainage scheme for the Croydon Rural District Council area. We draw attention to a note in "Minutes of Proceedings" in this issue which is supplementary to the announcement referred to.

**Swansea T.C.**—The Water and Sewers Committee have accepted the tender of Messrs. Griffith Davies, of Swansea, at £1,627, for sewerage works.

**Worthing T.C.**—In order to remedy complaints of defective drainage at Broadwater, the borough surveyor (Mr. F. Roberts) has recommended the provision of additional pumping plant at the outfall works. He will submit details of a scheme to the Sanitary Committee.

**Wortley R.D.C.**—The sanitary surveyor, Mr. G. E. Beaumont, has prepared alternative schemes for the construction of sewage disposal works, one estimated to cost £1,764 and the other £1,380. He has now received instructions to prepare a further scheme on a different site.

## WATER, GAS, AND ELECTRICITY.

**Banffshire C.C.**—Mr. James Barron, engineer, of Aberdeen, in a report to the council stated that the present water supply at Endoclerry was inadequate to the extent of 33,000 gallons daily, as well as lacking in pressure for the higher lying district. He recommended that a quantity of water should be abstracted from the burn of Rannas and Burnhead of Rannas at about 400 ft. above sea level and conveyed in cast-iron pipes to a new reservoir of 60,000 gallons capacity to be erected on the moor of Endoclerry 280 ft. above the sea level. This would ensure sufficient pressure to supply the whole neighbourhood. In order to provide against drought, he proposed to tap both streams. He estimated the total cost of the scheme at £2,112. The water was reported of good quality. The council have agreed to adopt the scheme.

**Burry Port (Carmarthenshire) U.D.C.**—It has been decided to obtain a supply of water for domestic purposes from the Llanelly Urban District Council.

**Ellesmere R.D.C.**—Messrs. Berrington, Son & Watney, of Westminster and Wolverhampton, have been instructed to report on the best means of supplying Dudleston Heath with a suitable water supply.

**Haverfordwest T.C.**—A committee has been appointed to consider the question of the introduction of electric lighting.

**Oldham T.C.**—An addition to the water supply for the borough and the adjoining districts was inaugurated last week with the formal opening of a pumping station at Butterworth Hall, Milnrow, where the underground waters which exist in the colliery workings have been tapped for the purpose of increasing the domestic supply of the district. By agreement with Messrs. Platt Bros. & Co., the owners of the colliery, the corporation have acquired the exclusive right to take these waters, paying a charge of 2d. per 1,000 gallons, with a minimum of £400 per annum, and they may take to the extent of 750,000 gallons per day, while it is anticipated that the supply will within a few years be increased to over 1,000,000 gallons per day as further workings in the collieries become exhausted. Messrs. Platt Bros. & Co. raise the water from the workings and deliver it on the surface in the reservoir, provided by the corporation, the cost of the raising being included in the terms mentioned above, and the corporation pumping station is required to pump the water up to Piethorn reservoir, which is reached by means of a 12 in. iron main 4,750 yds. long. The water is delivered into that reservoir, where it mingles with the surface-gathered supply.

**Pudsey T.C.**—The agreement with the Bradford Corporation for a water supply at 8½d. per 1,000 gallons for a period of sixty years has been ratified.

**Rotherham T.C.**—The Finance Committee have approved of the expenditure of £1,000 for the erection of a water tower near the Boston Park reservoir.

**Wells (Somerset) R.D.C.**—The scheme for the North Wootton water supply has been forwarded to the Local Government Board. The estimated cost is £2,600.

**Worthing T.C.**—The electric lighting account, submitted in connection with the half-yearly estimates, shows a balance to the credit of the undertaking of £282, and it is estimated that at the end of March of next year there will be a credit balance of £1,184.

**Wortley R.D.C.**—Consideration is being given to the purchase of a local farm for £1,650 in order to tap three springs for the purpose of a water supply. The proposal, which has been referred to a committee, is to secure the water supply and then re-sell the land.

## MISCELLANEOUS.

**Bradford T.C.**—The financial year ended March 31st has proved the most profitable in the corporation tramways. The approximate figures for the year's working show that the total receipts have been £282,356, compared with £264,075 last year, an increase of £18,281.

**Leeds T.C.**—The corporation tramways have had a most successful year. The traffic receipts for the financial year, which ended on Sunday, amount approximately to the very large figure of £391,277, an increase of no less than £25,579 over the preceding year, or nearly £500 a week.

**Newcastle-on-Tyne T.C.**—The total receipts of the tramways for the year ending on Sunday were £223,500, the largest on record. Out of revenue during the year £12,000 was given to relieve the rates, and £12,250 was paid to the Newcastle Electric Supply Company to enable the corporation to supply power to its cars in the Walker district.

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**Proposed Public Baths for Chelmsford.**—The borough surveyor of Chelmsford, Mr. P. T. Harrison, has received instructions to report upon the provision of public baths.

**Institution of Civil Engineers.**—A paper on "Exminster Sewage Disposal Works" will be read by Mr. Herbert G. Hoskings, at a students' meeting to be held on Friday, the 12th inst., at 8 p.m.

**A New Engineers' Club.**—Societies of Engineers are formed usually for the purpose of advancing engineers' knowledge and practice (says *Engineering and Contracting*). Out in Idaho an organisation of engineers has been effected which has for its primary purpose something entirely different. In brief, its object is matrimony. Seven young engineers connected with an irrigation project in Idaho have organised a bachelors' club for the purpose of receiving proposals from lonely Leap Year maidens. According to the statement of one member of the club, all of the bachelors will have an equal chance to obtain a wife from among those who enter into correspondence with the club. When a letter is received from an anxious bachelor girl each member of the bachelors' club will be entitled to send his photograph, accompanied by a letter telling of his qualifications, to the girl, and it is expected that she will choose the one she wants.

## PERSONAL.

Mr. A. J. Bailey, a senior assistant in the architect's department of the London County Council, has retired after forty-three years' service.

Mr. J. W. Lupton, assistant surveyor and sanitary inspector to the Knaresborough Rural District Council, has been appointed surveyor to the Flaxby Rural District Council.

Mr. J. B. Nuttall, the new surveyor of Heywood, has received several handsome gifts from his late colleagues in Bury, on his leaving the service of the Bury Corporation to take over his new duties.

Mr. G. A. Ballard, of Birmingham, and Mr. R. H. Jenkins, of Hemel Hempstead, have been appointed as assistants in the York city surveyor's office, at a salary of £100 per annum each.

Mr. C. H. Croxford, surveyor to the Wood Green Urban District Council, and Councillor Hext, have been appointed delegates to a conference of extra-Metropolitan authorities to consider motor-omnibus traffic.

Mr. William Leigh, borough surveyor of Chorley, has tendered his resignation, to take effect on June 30th, after twenty-eight years' service as surveyor and nearly forty-seven years' connection with the surveyor's department of the corporation.

Mr. J. W. B. Blackman, city engineer of New Westminster, British Columbia, has had his salary increased from $3,000 to $3,300 per annum. The proposed municipal undertakings for the year will involve an expenditure of about $1,500,000, principally for sewerage and paving of streets.

Mr. J. Burrell, surveyor and inspector of nuisances to the Seaham Harbour Urban District Council, on retiring recently after twenty-seven years' service, was presented by the chairman of the council, Mr. J. W. Grant, with an illuminated address setting forth appreciation of his long service, and an ebony walking-stick, with silver mount suitably inscribed.

Mr. E. H. Ford, of the borough engineer and surveyor's office, Walsall, has been appointed engineering assistant to the Southport Corporation. Mr. Ford is an associate member of the Institution of Civil Engineers, and has passed the examinations of the Institution of Municipal and County Engineers, and the Inter.B.Sc. (Engineering) of London University.

Mr. G. Jerram, surveyor to the Merton Urban District Council, has had his salary increased to £300; and the following increases have also been sanctioned: Mr. J. B. Pointon, inspector of nuisances, to £200; Mr. F. S. Buck, surveyor's clerk, to £80; Mr. H. Brewster, surveyor's junior clerk, to £26; and Mr. V. S. Wells, superintendent of fire brigade, to £120.

Colonel Crompton, Road Board; Mr. J. A. Brodie, Liverpool; Mr. A. Dryland, Surrey County; and Mr. H. T. Wakelam, Middlesex County, are the subcommittee appointed to select the writer for Communication No. 4 at the forthcoming International Road Congress, the subject of which will be: "Technical and Economic Study of the Comparative Advantages of Different Types of Roads."

Mr. Harold G. Cordon has been appointed by the Belper Rural District Council clerk of works to supervise the construction of the Duffield scheme of water supply. Mr. H. G. Cordon has, in addition to his duties of assistant surveyor to the council, just completed the supervision (as clerk of works) of the construction of a scheme of water supply to five parishes in the rural district, costing some £12,000.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

### STUDENTS' EXAMINATION.

The annual spring examinations for students, in connection with the Institution of Municipal and County Engineers, were held at the Medical Hall, Thames Embankment, London, S.W., on Thursday, Friday, and Saturday last, when an average number of candidates presented themselves for examination. The following gentlemen acted as examiners—viz.:—

Mr. A. E. Collins, Norwich; Mr. J. W. Cockrill, Great Yarmouth; Mr. G. Green, Wolverhampton; Mr. J. Pickering, Cheltenham; Mr. H. T. Wakelam, Middlesex County; Mr. R. Read, Gloucester; Mr. A. D. Greatorex, West Bromwich; and Mr. W. H. Prescott, Tottenham.


## FOR OTHER ADVERTISEMENTS

See End of Paper.

URBAN DISTRICT COUNCIL OF WATH-UPON-DEARNE.

SURVEYOR AND WATER ENGINEER.

The above Council hereby invite applications for the office of Surveyor and Water Engineer.

Applicants must be properly qualified, and must have had experience in Municipal Engineering and Surveying.

The person appointed will be required to reside within the district, and devote his whole time to the duties of his office. Office accommodation and clerical assistance will be provided at the Town Hall. Salary £160 per annum, rising by annual increments of £10 to £190.

The appointment will be subject to three months' notice on either side.

Applications, stating age, qualifications, and accompanied by copies of three recent testimonials, to be forwarded to the undersigned on or before Monday, the 15th April. No canvassing allowed.

NICHOLSON & CO., Solicitors,
Clerks to the Council.

Wath-upon-Dearne, Yorks.

MATLOCK URBAN DISTRICT COUNCIL.

SEWERAGE AND SEWAGE DISPOSAL WORKS.

IMPORTANT NOTICE.

EXTENSION OF TIME FOR TENDERING.

Owing to the intervention of the Easter Holidays and other circumstances, the time for receiving Tenders has been extended to April 29th.

For particulars, refer to issue of March 15th, or apply to the Engineers, Messrs. James Diggle & Son, 14 Victoria-street, Westminster, London, S.W., and Hind Hill-street, Heywood.

R. TAYLOR,
Clerk to the Council.

Town Hall,
Matlock.
April 2nd, 1912.

ELY RURAL DISTRICT COUNCIL.

TENDERS FOR CLUNCH AND GRAVEL.

The Ely Rural District Council invite Tenders for 688 tons of Coarse Clunch and 520 tons of Coarse Screened Gravel. Forms of Tender may be obtained from Mr. F. W. Firby, District Surveyor, Sutton, Isle of Ely.

Tenders, endorsed "Tender for Clunch" or "Gravel," as the case may be, to be delivered to me on or before the 24th of April instant.

The Rural District Council do not bind themselves to accept the lowest or any Tender.

E. B. CLAXTON,
Clerk to the Ely Rural District Council.

Egremont-street, Ely.
April 2, 1912.

EPSOM URBAN DISTRICT COUNCIL.

STEAM ROLLER.

The above Council invite Tenders for Supplying a 10-ton Double-speed Special Compound Steam Road Roller with a Morrison Scarifier attached, delivered to Epsom. Sealed Tenders, with Specification, endorsed "Steam Roller," to be delivered at my Office not later than 7.30 p.m. on Tuesday, the 16th of April, 1912.

Any firm or person sending in a Tender will be required to state therein the date upon which delivery could be made.

The Council do not bind themselves to accept the lowest or any Tender.

(Signed) E. G. WILSON,
Clerk to the Council.

Duncannon,
Church-street,
Epsom.
April 3, 1912.

# Sanitary Legislation and Education.*

By H. PERCY BOULNOIS, M.Inst.C.E.

It is evident that there can be no legislation without education; an ignorant people would be incapable of promoting legislation. We possess no knowledge of any very early sanitary legislation, though the discovery of cave dwellers' middens, where bones and shells of shell-fish were deposited in large quantities, point to some sort of sanitary precautions in prehistoric times. No doubt there were certain rules and regulations as to crude efforts of some sort of sanitation by tribes and other communities, but I believe there is no record of any sanitary legislation before the time of Moses, who, in order to enforce sanitary laws upon his ignorant followers, endowed these laws with Divine inspiration. . . .

So far as I can ascertain, the first sanitary Act framed in this country was in 1388, when Richard II. imposed what was then an enormous penalty of £20 upon any person who cast animal filth or refuse into "ditches, rivers, and waters." Here we see the beginning of the "Prevention of Pollution of Rivers Act." If this early Act had not been repealed it would be interesting to see the legal wrangles which would take place on what *was* filth or refuse, or what was a "ditch, river, or water."

A few Acts seem to have followed principally dealing with the water supplies of various towns, but in 1531 Henry VIII. appointed certain commissions of sewers whose duties were not very well defined. They were directed to proceed "by such ways and means, and in such manner and form" as to them "shall seem most convenient to be ordained and done," also "to reform, repair, and amend the said wells, ditches, banks, gutters, sewers, gotes, calcies, bridges, streams, and to cleanse and purge the trenches, sewers, and ditches in all places needful." Very little seems to have been done with regard to the general health of the community in succeeding years, and even so late as the year 1831, when this country was visited by a severe epidemic of Asiatic cholera, the Government seem to have been unable to devise better legislation than the following Order in Council: "It may become necessary to draw troops, or a strong body of police, around infected places so as to utterly exclude the inhabitants from all intercourse with the country"—a method of quarantine which was certainly drastic, but was an evident confession of weakness and incapability to deal with an epidemic on sanitary or scientific lines. Another Order in Council of the same date recommended "copious effusions of water and strong 'ley' are suggested for dealing with the clothes and furniture of all infected persons." These orders were, however, soon followed by another, which was far more sensible, and was really the beginning of the formation of local sanitary authorities, as we now know them, as the Order constituted local boards of health: "Each to consist, if possible, of a resident clergyman, and a number of substantial householders, and of one medical man at least"—an exceedingly good nucleus for the formation of boards of health; and this really marked a new era in the growth of sanitary legislation which immediately followed. The duties of these boards were, among others, to appoint inspectors, who were to "visit daily and to inquire carefully after the health, means of subsistence, cleanliness, and comforts of the inmates of the house." . . .

The Royal Commission to inquire into the condition of towns and populous places was appointed in 1843, with the late Edwin Chadwick as chairman, and this marks the real commencement of sanitary legislation in this country; a large number of Acts followed, and among others may be mentioned the Towns Improvements Clauses Act, 1847, the Public Health Act, 1848, the Removal of Nuisances Act, 1855, the Local Government Act, 1858, the Nuisances Removal Amendment Act, 1863; the Public Health Amendment Act, 1866; the Factory and Workshops Regulation Act, 1867; the Artisans' and Labourers' Dwellings Act, 1868; the Adulteration of Food and Drugs Act, 1872, the Public Health Act, 1872, followed in 1875 by the well-known and great Public Health Act, which is still the basis of most of our sanitary legislation to this day and under which so many of us in this room have held or hope to hold, our appointments. Since that date we have been flooded with sanitary legislation, but it would be an excellent thing if Parliament could devote some of its valuable time to another great Public Health Act like that which was passed thirty-seven years ago, and give us a codified Act with all the necessary and desirable amendments of that great Act which the natural evolution of time and education always brings.

### EDUCATION OF OFFICIALS.

Now, with regard to the education of the officials who have to administrate this sanitary legislation, it is evident that they should be educated to the necessary standard. With regard to the medical officer of health, I know of no profession which requires such an all-round knowledge of medicine, chemistry, sanitary science, and legislation, and even sanitary engineering, as that of this official; and I know no body of men who are better educated or so well equipped for their duties as the medical officers of health of this country. I speak with knowledge, as I have worked beside them for a considerable number of years. When these officials were first appointed, it was easier to fill the positions than to find the right man for the post of sanitary inspector, as the latter had received no training and had no official status.

The questions which were set in the year 1879 at the examination of sanitary inspectors held by the Royal Sanitary Institute are well worth repeating, and are as follows:—

(1) What power of entry can be exercised by an inspector of nuisances?

(2) What books should an inspector keep, and how should he enter his work in them?

(3) What is a water trap? What are its objects? Give examples of good and bad traps.

(4) What materials are used for soil pipes? Which do you prefer? What faults are likely to be found in them? How should they be ventilated?

(5) Mention some offensive trades. Describe what points you would look to in inspecting any one of them with which you are acquainted.

(6) A case of typhus fever is reported to you, what would you do?

(7) What is a cellar dwelling? Under what conditions may it be legally inhabited?

(8) How do you recognise diseased meat? If you found such meat exposed for sale what would you do?

These questions appear very simple to us now, and I have no doubt they would gladden the heart of any candidate who presented himself for examination at the present time, but it is remarkable, even with such simple questions as these, how few of those who presented themselves were able to obtain the institute's certificate. I did not become an examiner until the year 1887, but even then the type of candidate was very different from the present type, and I can assure you we often got some very remarkable answers to our questions. I collected some about the years 1888-90, and will proceed to give you some specimens of them taken at random.

In reply to a question as to whether a person is liable to contract small-pox through drinking bad water, the candidate replied:—

"Highly polluted water may be consumed for long periods without contracting small-pox, but should a case occur in the locality it would spread. Also water tainted with small-pox excreta would contract the disease."

*Q.* What is a common lodging-house?

*A.* "A common lodging-house is a place where a person can get a night's lodging or more."

*Q.* What are the parasites in a human body?

*A.* Fleas, bugs, and lice, but they won't do any harm unless they are disturbed.

Some very obscure answers were as follows:—

"It shall not be lawful to allow any body that has died of an infectious disease in any bedroom, workshop, or factory."

"Where a person having died of an infectious disease is without proper lodging accommodation, the local authority may, by order of the justices, empower any of their officers to remove such person."

A legal definition of "owner" was given as

* From an address delivered on March 26th at the Annual Meeting of Associates of the Royal Sanitary Institute, of which body Mr. Boulnois is chairman of council. The address was referred to briefly in last week's Supplement.

"The person who is responsible for all defects which may be injurious or dangerous to health."
And finally:

"Persons suffering from an infectious disease must not ride in any conveyance except a hearse without first informing the driver."

I almost regret that I get no "howlers" now. The standard of candidate has improved, education has been at work, and although, of course, the answers to the questions may not be correct, they are couched with some knowledge of the subject, which was not the case in the early days.

EDUCATING THE PUBLIC.

It is evident, I think, that legislation without education of the people is almost useless. Legislation fails to make a nation sober; it is the common sense and education of the people which will do this. Legislation will never make a people truly religious; it has been tried, and has always failed. It is very doubtful if legislation can make them clean and healthy, unless they themselves give a helping hand. Dr. Arthur Newsholme, the medical officer of the Local Government Board, in a memorandum, issued in 1909, on "Administrative Measures against Tuberculosis," says of this disease, that it "has often been described as a disease of misery," and that this was true, because "misery favours infection." But he considered it "much more a disease of ignorance," and he enlarged upon the importance of educational measures, such as instruction to the members of the general community and the importance of teaching hygiene in school life. He points out the necessity for bringing the pressure of public opinion to bear against indiscriminate expectoration, and against overcrowding and other evils of housing and occupation. "Much more," he says, "could be done in these directions by special instruction of various social groups, trades unions, friendly societies, and so on, as well as in the Army and Navy. We shall, I think, all cordially agree with these sound suggestions from a man of the experience of Dr. Newsholme.

There can be no doubt that considerable ignorance as to sanitation still exists among all classes; it is an unattractive subject, and very little value is attached to health unless it is lost, when its true value is at once recognised. For instance, how few people carefully examine the sanitary condition of a house before taking it. All they look at is the number and size of the rooms, the pattern of the wall papers, the convenience of situation, and the amount of rent. They grudge a few guineas for expert advice, and look upon it as a personal affront if someone ventures to suggest that the drainage or the sanitary arrangements are not all that could be desired. How many people, outside those professionally engaged, have ever even heard of the Parkes Museum, and if they did would venture to pay it a visit? No doubt considerable advances have been made in sanitary education in the last few years, but there is still a lamentable want of the mere rudiments of the subject among the masses of the people of all classes.

THE NATIONAL HEALTH WEEK.

I cannot conclude this address without some reference to the proposed "National Health Week." The object of this movement is to arouse, if possible, an intelligent interest in health matters, even among the most thoughtless and ignorant members of the community, and to secure increased support for local health authorities and all voluntary societies. It is hoped to focus public attention on the subject of sanitation by means of sermons, lectures, public meetings, demonstrations, exhibitions, cinematograph shows and newspaper articles. It is ambitious in its objects, but for this the first year it can only be expected that a few of the larger towns will be able to negotiate a Health Week. But it is a step in the right direction, and it is hoped that the successes and failures of this the first year of the attempt may lead to a greater success in the future. The scheme is under the auspices of the Agenda Club, 28 Hart-street, E.C., and anyone desirous of knowing more of the movement can obtain information by writing to the secretary at the club at that address.

The movement should at once be supported by all those who have the subject of public health at heart, and if only some enthusiasm could be brought to bear on the subject of "sanitary education," I am quite certain that it would be of enormous benefit to the community. A nation is made up of its units, and if these units are healthy, sound strong, reasoning men, women and children, the prosperity of that nation is secured. "Salus populi suprema lex" is a very old proverb, but none the less true. The National Health Week movement, if properly supported, will go far towards the sanitary education of all classes of the community, and I heartily wish it the success it deserves.

Each individual among my audience might help it in many ways; among others I suggest:—

(1) Make it known among your friends and get them to talk about it.

(2) Ask your "parson" to preach a sermon on the subject of health or mention it in his sermon.

(3) Get teachers to talk about it to the children under their charge.

(4) Try and get people interested and meet all their criticisms if possible by explaining the great benefit of such a scheme as Health Week.

(5) With letters to the public journals; and, above all, be optimistic about health, which is a *positive* thing to which everyone is entitled.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President* Mr. Albert D. Greatorex, M.Inst.C.E., Borough Engineer and Surveyor of West Bromwich.

### FORTHCOMING MEETINGS.

The following meetings have been arranged:—

April 27th.—Council meeting.
May 4th.—Exmouth.
May 11th.—Nuneaton.
May 24th-29th.—Paris.
June 1st.—Council meeting.
June 7th—8th.—Stirling.
June 15th.—East Ham.
June 22nd.—Lowestoft.
June 29th.—Bridlington.
July 6th.—Stourbridge.
July 11th—13th.—Annual meeting, London.

Provincial members who propose to take part in the visit to Paris will, in cases where the journey exceeds a distance of 30 miles, be able to obtain return tickets to London at a single fare and a quarter.

Thomas Cole,
11 Victoria-street, S.W. *Secretary.*

## INSTITUTION OF MUNICIPAL ENGINEERS.

*President*—Mr. E. A. Stickland, Assoc.M.Inst.C.E., Borough Surveyor, Windsor.

### NORTH-WESTERN DISTRICT.

On Saturday, April 13th, a visit will be paid to the Heywood sewage works, when the manager, Mr. R. J. McKenn, will explain the works.

Conveyances will wait at station to convey the party to the sewage and refuse destructor works. After tea a discussion on county council grants for road works will be opened by Mr. J. W. Gleave.

Members intending to be present are requested to send an intimation to that effect not later than April 9th to Mr. Jas. W. Gleave, deputy-surveyor, Town Hall, Heywood, accompanied by a remittance of 1s.

J. Hayes,
*Hon. District Secretary.*

117 Church-street,
Worthington.
March 30, 1912.

### COUNCIL MEETING.

At a meeting of the council, held on March 27th, the following applicants were recommended for admission:—

As Members: Mr. J. R. Mead, deputy borough surveyor, St. Helens.

As Members: Messrs. G. E. Mathews, engineer and surveyor, South Holland Drainage Trust, and J. R. Oliver, burgh surveyor's office, Edinburgh.

As Transfer to Associate Membership: Messrs. R. McGoun, assistant city surveyor, St. Kilda, Victoria, and F. M. Sharp, assistant engineer, Canadian Northern Pacific Engineers, Hope, B.C.

(Under the new by-laws these elections will be

ratified at the next council meeting if no written objections are lodged within fourteen days.)

New Members, &c.

From the applicants recommended for admission at the last meeting four members and one associate member were elected, and there were two transfers to membership, and two to associate membership.

List of Members.

It was decided to proceed with the publication of a new "List of Members," and members are requested to notify the secretary of any changes which they desire to be made.

International Road Congress, 1913.

A letter from the hon. secretary of the General Organising Council of the congress was considered, and it was decided to nominate the president, Mr. Henry J. Farmer, and one other member to represent the institution on the congress.

Examinations.

It was decided to defer the May examinations, in view of the impossibility of making final arrangements at the present time, owing to the coal strike. For the same reason, the meetings arranged by the Southern District Committee are postponed.

N.A.L.G.O.

The council invite attention to the suggestion, contained in a paper entitled "Superannuation and Security of Tenure," read recently before the institution, that its members should affiliate direct to the N.A.L.G.O., or undertake the formation of local associations in districts where such do not at present exist.

Council Meeting.

The next meeting will be held on Saturday, April 27th, at 3 o'clock.

B. Wyand,
39 Victoria-street, S.W. *Secretary.*
March 29, 1912.

## ROYAL SANITARY INSTITUTE.

### PROVINCIAL SESSIONAL MEETING AT CARDIFF.

A meeting of the Royal Sanitary Institute will be held on Friday, April 12th in the Council Chamber, City Hall, Cardiff, when a discussion will take place on

The Development of Cardiff Waterworks,

to be opened by Mr. C. H. Priestley, M.Inst.C.E., waterworks engineer, Cardiff.

Among those who are expected to take part in the discussion are Prof. W. S. Boulton, B.Sc., Professor of Geology, University of Wales; Alderman C. H. Bird, J.P., chairman, Waterworks Committee, Cardiff; Councillor J. Robinson, J.P., L.R.C.P., chairman, Health Committee, Cardiff; Messrs. Herbert E. Allen, M.Inst.C.E.; W. Harpur, M.Inst.C.E., F.S.I., city engineer, Cardiff; B. E. Harvey, M.Inst.C.E., borough engineer, Merthyr; J. Howard-Jones, M.D., D.Sc., medical officer of health, Newport (Mon.); D. E. Roberts, M.Inst.C.E.; J. H. Sugden, M.Sc., F.I.C.; and E. Walford, M.D., D.P.H., medical officer of health, Cardiff.

The chair will be taken at 5 p.m. by Mr. W. Whitaker, B.A., F.R.S., F.G.S.

On the following day a visit will be paid to Cardiff reservoir in the Taff Fawr Valley, Breconshire.

### MEETING AT BLACKPOOL.

On May 24th next, at Blackpool Town Hall, discussions will take place on "The Card Index System as applied to Public Health Work," to be opened by E. W. Brodribb, M.D., D.P.H. (Medical Officer of Health of the Joint Scheme of Sewerage for Treatment for Bispham-with-Norbreck and Carleton); Dr. Arthur Hurdle, Assoc.M.Inst.C.E. On September May 24th sewerage will be arranged by the new promenade, the new sewerage works for Thornton, Fleetwood, Bispham-with-Norbreck and Carleton, and the new sewerage works of the Fleetwood Urban District Council.

**Dust Prevention in Regent's Park.**—The Crown Estate Paving Commissioners have again ordered the thoroughfares in Regent's Park to be treated with Akonia for dust-prevention purposes during the present season, this being the sixth year of treatment.

## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned* (*No.* 1359 *Holborn*), *subject to later confirmation by letter.*

INSPECTOR OF NUISANCES. April 6th. Coseley Urban District Council. £100—£125.—Mr. W. Lees, clerk.

HIGHWAY SURVEYOR AND SANITARY INSPECTOR. — April 8th. — Claypole Rural District Council. £180 per annum.—Mr. A. J. Franks, clerk.

INSPECTOR OF NUISANCES.—April 8th.—Kiveton Park Rural District Council. £104 per annum. Mr. J. S. Whall, clerk, 66 Bridge-street, Worksop.

CLERK OF WORKS.—April 10th.—Bandon Town Commissioners. £2 per week.—Mr. J. Coghlan, town clerk.

SURVEYOR.—April 10th.—Totnes Rural District Council. £120—£130.—Mr. F. K. Windeatt, clerk.

BUILDING INSPECTOR.—April 10th.—Corporation of Plymouth. £100 per annum.—Mr. James Paton, borough engineer and surveyor.

CLERK OF WORKS.—April 11th.—Hale Urban District Council. 50s. per week.—Mr. J. G. Whyatt, clerk.

SANITARY INSPECTOR.—April 13th.—Lewisham Borough Council. £150—£200.—Mr. E. Wright, town clerk.

LAND VALUER.—April 15th.—Board of Trustees for the Improvement of Calcutta. 1,250 rupees per mensem, rising to 1,500 rupees.—Mr. C. H. Bompas, chairman, 5 Clive-street, Calcutta.

ARTICLED PUPIL.—Corporation of Lichfield.—Mr. W. B. Chandler, city engineer and surveyor.

## MUNICIPAL COMPETITIONS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned* (*No.* 1359 *Holborn*), *subject to later confirmation by letter.*

RATHDRUM. April 13th. Plan for a sewage treatment system in Kilpedder, for the rural district council. A premium of £50 is offered.—Mr. Bernard Manning, clerk.

WOMBWELL.—May 1st.—Designs for public swimming bath, for the urban district council.—Prizes of £40, £30 and £20 are offered. Mr. W. Quest, surveyor.

HALE.—June 28th.—Designs for a town planning scheme for the urban district council. Premiums of £50 and £25 are offered.—The Clerk.

DUSSELDORF.—July 1st.—Plan for the extension of the city. Premiums of £1,000 and £375 are offered. The Chief Burgomaster.

## MUNICIPAL CONTRACTS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned* (*No.* 1359 *Holborn*), *subject to later confirmation by letter.*

### Buildings.

CHESTERFIELD. April 6th. For the erection of public conveniences for the corporation. Borough Surveyor.

KEITH.—April 6th. For widening and improving a bridge for the corporation.—Mr. J. G. Fleming, town clerk.

CHESTERFIELD. April 6th. For extension to be carried out by the corporation. Borough Electrical Engineer, Chatsworth-road.

COVENTRY.—April 8th.—For the erection of thirty-two workmen's dwellings for the Housing Committee.—Mr. J. E. Swindlehurst, city engineer and surveyor.

KENDAL.—April 8th.—For the construction of a bandstand, for the corporation.—Mr. F. W. Oxberry, borough surveyor.

SHEFFIELD.—April 9th.—For the erection of public conveniences and other offices, for the corporation.—Mr. R. M. Prescott, town clerk.

ISLE OF WIGHT.—April 9th.—For the erection of cottage and outbuildings, for the county council.—Mr. J. Dufton, clerk, 20 Holyrood-street, Newport, Isle of Wight.

DUMFRIESSHIRE.—April 10th.—For the erection of new county buildings, for the county council.—Mr. John Robson, county clerk, Dumfries.

MARGAM.—April 10th.—For alterations at public baths and erection of caretaker's house, for the urban district council.—Mr. D. E. Jones, clerk, Port Talbot.

WEST RIDING.—April 12th.—For alterations at a council school, for the county council.—Education Architect, County Hall, Wakefield.

MANCHESTER.—April 13th.—For the erection of a school, for the Education Committee.—Accountant, Education Offices, Deansgate.

DERBYSHIRE.—April 15th.—For the construction of three schools and alterations to existing schools, for the Education Committee.—Mr. George H. Widdows, architect, St. Mary's-gate, Derby.

INVERKEITHING.—April 15th.—For the construction of ferro-concrete water tank, enclosure walls and footpaths, for the corporation.—Mr. John R. Menzies, town clerk.

KING'S LYNN.—April 18th.—For the erection of a mortuary, for the corporation.—Mr. Alfred J. Smith, borough surveyor.

MANCHESTER.—April 18th.—For the erection of mess-room and lavatories, for the Gas Committee.—Mr. J. G. Newbiggin, engineer, Rochdale-road Station.

WALLASEY.—April 18th.—For the construction of purifier-house at gasworks, for the corporation.—Mr. H. W. Cook, town clerk.

FINCHLEY.—April 19th.—For an installation to deal with house and trade refuse, for the urban district council.—Mr. E. H. Lister, clerk.

BEXLEY.—April 20th.—For the erection of a branch library, for the urban district council.—The Clerk.

NORTHUMBERLAND.—April 22nd.—For the erection of a school at Hazelrigg, for the Education Committee.—Mr. C. Williams, secretary, Moothall, Newcastle-upon-Tyne.

BEDFORDSHIRE.—April 24th.—For the erection of a school, for the county council. The Clerk.

BOOTLE.—April 24th.—For the erection of brick chimney shaft, for the corporation.—Mr. J. Henry Farmer, town clerk.

ASHTON-UNDER-LYNE.—April 24th.—For alterations to electricity works, for the corporation.—Mr. John Neal, borough comptroller.

PONTYPOOL.—April 27th.—For the erection of 100 dwellings, for the urban district council.—Mr. H. H. Haden, clerk.

## Iron and Steel.

BATH.—April 9th.—For the supply of cast-iron pipes and special castings, for the corporation.—Mr. E. D. Wardle, town clerk.

GOOLE.—April 10th.—For laying cast-iron water pipes, for the urban district council.—Mr. R. Tyson, clerk.

CRICKLEWOOD.—April 12th.—For the erection of six installations of Diesel oil engines, for the Metropolitan Water Board.—Chief Engineer, Savoy-court, Strand, W.C.

DARENTH.—April 12th.—For the erection of a Diesel oil engine, with pumping machinery, for the Metropolitan Water Board.—Chief Engineer, Savoy-court, Strand, W.C.

LONDON.—April 16th.—For the supply of 484 tons rolled-steel bar, special section, for magnet e brake, for the county council. The Clerk.

MARGATE.—April 17th.—For the supply of cast-iron fencing, for the corporation.—Mr. E. A. Borg, borough surveyor.

STIRLING.—April 22nd.—For laying cast-iron water pipes and constructing foundation for steel tank, for the county council.—Mr. Thomas Lupton, district clerk, 22 King-street, Stirling.

## Roads.

DEWSBURY.—April 6th.—For work of paving and flagging, for the corporation.—Borough Surveyor.

NEWARK.—April 6th.—For making up two streets, for the rural district council.—Mr. R. Oakden, junr., surveyor.

HEMSWORTH.—April 6th.—For the supply of whinstone, limestone, granite, and dross, for the rural district council.—Mr. T. H. Richardson, surveyor.

FAVERSHAM.—April 6th—9th.—For the supply of road materials, for the rural district council.—Mr. J. D. Chittenden, district surveyor, Ashford-road.

NORTON.—April 6th.—For the supply of materials and team labour, for the rural district council.—Mr. J. E. Moulding, clerk, The Edge, Sheffield.

NORTH RIDING.—April 8th.—For the supply of slag screenings and team labour, for the county council.—Mr. W. G. Bryning, county surveyor, County Hall, Northallerton.

BARROWFORD.—April 8th.—For works of paving and flagging, and the supply of road materials, for the urban district council.—Mr. A. T. Chandler, clerk.

SOUTHGATE.—April 9th.—For carrying out private street works, for the urban district council.—Mr. C. G. Lawson, surveyor.

CREWE.—April 9th.—For making up back passages, for the corporation.—Mr. G. Eaton-Shore, borough surveyor.

CORNWALL.—April 9th.—For the supply of materials, hauling, team labour, and purchase of scrapings, for the county council.—Mr. Albert E. Brookes, county surveyor.

HERTFORD.—April 9th.—For the supply of 15,000 gallons of crude or distilled tar, for the corporation.—Mr. T. J. Sworder, town clerk.

LEEK.—April 9th.—For making up two streets, for the rural district council.—Mr. J. M. Shaw, clerk.

TOTNES.—April 10th.—For repairs to district roads, for the rural district council.—Mr. F. K. Windeatt, clerk.

RAWTENSTALL.—April 10th.—For carrying out road work in several streets, for the corporation.—Mr. J. Johnson, borough surveyor.

EAST SUFFOLK.—April 10th.—For the supply of road materials, carting, hauling, and tools, for the county council.—Mr. A. Townshend Cobbold, clerk.

GLAMORGAN.—April 10th.—For improving main road, laying surface-water drains, and improving footpaths, for the county council.—Mr. W. E. R. Allen, deputy-clerk, Westgate-street, Cardiff.

HOOLE.—April 10th.—For the supply of tar-macadam, for the urban district council. Mr. C. Atkin, surveyor.

GOOLE.—April 10th.—For the execution of street improvement works, for the urban district council. Mr. Robert Tyson, clerk.

HURST.—April 11th.—For making up several streets, for the urban district council. Mr. R. Whitworth, clerk.

READING.—April 11th.—For work of making up, for the urban district council.—Mr. J. Bowen, borough engineer and surveyor.

MOTTRAM.—April 11th.—For the supply of rock setts, for the urban district council.—Mr. F. Thompson, clerk, 123 Stamford-street, Stalybridge.

CORK.—April 12th.—For laying 12,000 to 16,000 sup. yds. of wood paving, for the corporation.—Mr. F. W. McCarthy, town clerk.

HENDON.—April 12th.—For making up a road, for the urban district council.—Mr. Henry Humphris, clerk.

HAVERHILL.—April 13th.—For the supply of granite, slag, tarred-macadam, and basalt, for the urban district council.—Mr. W. H. Eley, surveyor.

SKIPTON.—April 15th.—For making up two roads, for the urban district council.—Mr. Richard Wilson, clerk.

WANDSWORTH.—April 15th.—For flagging the footway of part of Upper Richmond-road, for the borough council.—Mr. Henry George Hills, town clerk.

BRIGHOUSE.—April 15th.—For the supply of granite setts, for the corporation.—Mr. S. S. Heywood, borough engineer.

URMSTON.—April 16th.—For paving, flagging and improvement works, for the urban district council.—Mr. James Heath, surveyor.

CARSHALTON.—April 17th.—For making up a road and approaches, for the urban district council.—Mr. W. W. Gale, surveyor.

FINCHLEY.—April 19th.—For the supply of from 300 to 400 tons of granite material, for the urban district council.—Mr. E. H. Lister, clerk.

HOUGHTON-LE-SPRING.—April 20th.—For the supply of road materials, for the rural district council.—Mr. D. Balfour, surveyor.

MARYLEBONE.—April 22nd.—For the supply of Fletton bricks and wood blocks, for the borough council.—Mr. James Wilson, town clerk.

SICCA.—April 25th.—For the carting of stone and gravel, for the rural district council.—Mr. Stanley C. Warden, clerk, Stratford-on-Avon.

### Sanitary.

AYLESBURY.—April 6th.—For work of scavenging, for the rural district council.—Mr. F. H. Parrott, clerk.

SOUTHAMPTON. April 6th.—For the collection of house refuse, for the corporation. Town Clerk.

NEWARK. April 6th.—For the extension of sewage disposal works, for the rural district council.—Mr. R. Oakden, junr., surveyor.

BILLERICAY.—April 8th.—For laying sewers, with manholes, flushing chambers and construction of sewage tanks, for the rural district council.—Mr. C. E. Lewis, clerk.

BIRMINGHAM.—April 10th.—For the construction of brick and concrete sewer, overflow chamber and manhole, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

OBINGFORD. April 10th.—For alterations to sewage disposal works and laying sewers, for the urban district council. Messrs. Tooley & Foster, Queen's-road, Buckhurst Hill.

WYCOMBE.—April 10th.—For the construction of sewage disposal works, for the rural district council. —Mr. B. L. Reynolds, clerk, 12 Easton-street, High Wycombe.

SALFORD.—April 10th.—For laying concrete tube sewer and manholes, for the corporation. Borough Engineer.

HENDON.—April 12th.—For laying storm-water sewer, with manholes, for the urban district council. Mr. Henry Humphris, clerk.

RUNCORN.—April 12th.—For laying stoneware and iron pipes, and manholes, for the rural district council.—Mr. G. F. Ashton, clerk.

MATLOCK.—April 15th.—For the construction of main outfall and subsidiary sewers of earthenware, steel and cast-iron pipes, manholes, detritus tanks, percolating filters and effluent drains, for the urban district council.—Mr. R. Taylor, clerk.

LEITH.—April 15th.—For laying sewer, for the corporation.—Burgh Surveyor.

RAUNDS.—April 15th.—For extensions to sewage disposal works, for the urban district council.—Mr. W. F. Corby, clerk.

MANSFIELD.—April 18th.—For laying 2,450 yds. of stoneware pipe sewers and manholes, for the corporation.—Mr. J. Harrop White, town clerk.

BRIGHTON. April 26th. For the construction of sewers and other works, for the corporation. Borough Surveyor.

TEDDINGTON.—May 15th.—For the construction of sewage disposal works and refuse destructor, for the urban district council.—Mr. G. H. Salmons, clerk.

WATFORD.—For laying stoneware pipe sewer and storm-water sewer, for the urban district council.—Mr. W. Hudson, clerk and solicitor.

### Stores.

DUNDEE.—April 6th.—For the supply of battens, cartage, cement, freestone rubble and metal, granite chippings, pavement and kerb, for the corporation.—Mr. W. H. Blyth Martin, town clerk.

KIRKCALDY.—April 10th.—For the supply of brass castings, brushes, tar, cartage, sand and waste, for the corporation.—Mr. O. F. Francis, burgh electrical engineer and tramways manager.

WALLASEY.—April 13th.—For the supply of coal, shovels, bolts, meters and cable, for the electricity works.—Mr. H. W. Cook, town clerk.

NEWMARKET. April 16th.—For the supply of brooms, shovels, skips, disinfecting fluid and powder, picks, and scarifier points, for the urban district council.—Mr. S. J. Ennion, clerk.

### Miscellaneous.

BIRMINGHAM.—April 10th.—For the supply of box carts, water vans, tip wagons and hand carts, for the corporation.—Mr. H. E. Stilgoe, city engineer and surveyor.


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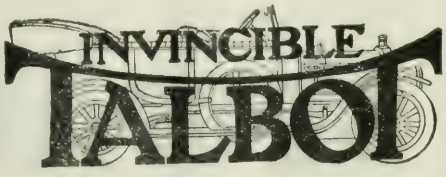


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## TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BELPER.—Accepted for the supply of road materials, for the rural district council.—Mr. R. C. Cordon, surveyor:—

| | Tons. |
|---|---|
| GRANITE. | |
| Ellis & Everard, Leicester | 400 |
| Salisbury & Wood Burton-on-Trent | 500 |
| Groby Granite Company, Leicester | 400 |
| J. Carr & Co., Sheffield | 250 |
| FURNACE SLAG. | |
| Tarmac Company, Ettingshall | 520 |
| Denby Iron Company, Derby | 150 |
| Butterley Iron Company, Derby | 150 |
| Belper Union Workhouse, Belper | 150 |
| Stanton Iron Company, Nottingham | 140 |
| J. Carr & Co., Dronfield | 280 |
| LIMESTONE. | |
| Clay Cross Company, Chesterfield | 1,000 |
| Longcliffe Limestone Company, Wirksworth | 360 |
| T. Shaw, Matlock | 110 |
| Bowne & Shaw, Wirksworth | 790 |
| J. Smart & Son, Matlock | 440 |

BELPER.—For the supply of cast-iron pipes, for the rural district council:—
Stanton Iron Company, Nottingham, for the supply of approximately 3 miles of 6-in. diameter cast-iron pipes.*
Middleton & Hopper, Bedford, for excavating work.*

BILSTON.—For the supply of broken Rowley rag or granite, for the urban district council:—
Rowley Regis Granite Company, Limited, Birmingham.*
E. Richards, Oldbury.*
Mountsorrel Granite Company, Ltd., Loughborough.
Pyx Granite Company, Limited, Horsehay.
Clee Hill Granite Company, Limited, Clee Hill.
Abdon Clee Stone Quarry Company, Ltd., Bridgnorth.
Sommerfield & Lang, Liverpool.
Currall, Lewis & Martin, Limited, Birmingham.
W. Davis & Son, Walsall.

CHELSEA.—For rebuilding Cook's-ground school, for the London County Council:—

| | |
|---|---|
| J. Garrett & Son, Balham-hill | £25,301 |
| G. Parker & Sons, Peckham | 24,723 |
| F. & H. F. Higgs, Herne-hill | 23,479 |
| J. Longley & Co., Crawley, Sussex | 22,687 |
| McLaughlin & Harvey, Limited, Brecknock-road | 22,365 |
| W. Smith & Son, Harleyford-road | 22,178 |
| W. Lawrence & Son, Finsbury-circus | 21,312 |
| W. Downs, Walworth | 21,227 |
| G. E. Wallis & Sons, Limited, Haymarket | 20,721 |
| F. & T. Thorne, Isle of Dogs | 20,451 |
| G. Godson & Sons, Kilburn-lane † | 20,386 |

Architect's estimate, £20,500.

CARLTON.—Accepted for the supply of granite, slag and tar-macadam, for the urban district council.—Mr. J. C. Hallar, engineer and surveyor:
Granite—Charnwood Granite Company, Limited, Loughborough.
Slag.—R. Norfolk, for the Bestwood Coal and Iron Company, Limited, Nottingham.
Basalt.—Ible Basalt Company, Matlock.
Tarmac.—Tarmac, Limited, Ettingshall.

CHELMSFORD.—For the execution of street works, for the corporation:—

| | |
|---|---|
| R. A. Bonnett, Chelmsford | £453 |
| Wilson, Border & Co., Romford | 415 |
| W. J. Lingwood, Romford | 357 |
| G. Impey, Wanstead | 336 |

HALE.—For making-up a road, for the urban district council:—

| | |
|---|---|
| W. Snape & Sons, Eccles | £391 |
| Exors. of T. Barber, Altrincham | 262 |
| W. Shepherd, Rochdale | 254 |
| W. P. Meikle, Liverpool | 253 |
| W. J. Woodfine, Sale* | 244 |

HOXTON.—For rebuilding Curtain-road school, for the London County Council:—

| | |
|---|---|
| Kirk & Randall, Woolwich | £16,164 |
| J. & M. Patrick, Wandsworth | 13,924 |
| Brand, Pettit & Co., Tottenham | 13,875 |
| T. D. Long, Deptford | 13,664 |
| W. Johnson & Co., Limited, Wandsworth-common | 13,563 |
| Patman & Fotheringham, Limited, Islington | 13,538 |
| Rowley Brothers, Wood-green | 13,319 |
| G. Godson & Sons, Kilburn | 13,328 |
| G. E. Wallis & Sons, Limited, Haymarket | 12,994 |
| Holliday & Greenwood, Limited, Brixton | 12,945 |
| E. Lawrence & Sons, Limited, City-road † | 12,894 |

Architect's estimate, £13,000.

LOWER BEBINGTON.—Accepted for the supply of macadam, setts, kerbs, channels and flags, for the urban district council.—Mr. H. W. Corrie, surveyor:—
Delivered on roads.—Penmaenmawr & Welsh Granite Company, Penmaenmawr, 2½-in. macadam, 9s. 3d.; 2-in. macadam, 9s; 1½-in. macadam, 8s. 9d.; 1-in. chippings, 6s. 6d.; ¾-in. chippings, 6s. 9d; 6-in. × 3½-in. setts, 27s.
Delivered at Bebington station. 8s 9d, 8s. 6d., 8s. 3d., 6s., 6s.
Delivered on roads—Pwllheli Granite Company, Runcorn, 2½-in. macadam, 8s 10d.; 2-in. macadam, 8s. 10d.; 1½-in. macadam, 8s. 10d.
Delivered at Bebington Station.—8s. 3d., 8s. 3d., 8s. 3d.
Exors. of R. Siddall, Manchester.—Straight kerbs, 12 in. × 6 in., 2s. 5d. per lineal yard; circular kerbs, 12 in. × 6 in., 3s. 2d. per lineal yard; turns, 18 in. radius, 12 in. × 6 in., 4s. 3d. each; straight channels, 12 in. × 6 in., 2s. 6d. per lineal yard; circular channels, 12 in. × 6 in., 3s. 3d. per lineal yard; machined faced flags, 3 in., 3s. 8d. per superficial yard; grit stone setts, 18s. per ton.
Wigan Coal & Iron Company, Liverpool.—2½-in. concrete flags, 2s. 9d. per superficial yard.

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# The Surveyor

And Municipal and County Engineer.

Vol. XLI. APRIL 12, 1912. No. 1,056.

## Minutes of Proceedings.

**The Ethics of Architectural Practice.**

It is matter of common knowledge that the successful architect must be endowed with qualities more varied in their nature than those which are required of the practitioner in almost any other profession. In the first place he must be gifted with the artistic temperament, while it is also necessary that he should be possessed in no small degree of the more prosaic qualifications which are summed up by the phrase "business capacity"; moreover, he is frequently called upon to exercise judicial functions in disputes between his client and the contractor. It is eminently desirable, therefore, from a public point of view, that the entrance to the profession should be more strictly guarded than it is at the present time so as to secure that, as far as practicable, only men of the highest integrity may be permitted to undertake architectural work in a professional capacity. So long as the profession remains an "open" one, however, it behoves all *bonâ-fide* architects, acting through the recognised societies and institutions, to secure that a high standard of professional etiquette shall be maintained. The council of the Society of Architects have for some time had under consideration the question of drafting a code of ethics relating to matters of professional etiquette, and Mr. C. McArthur Butler, the secretary of the society, has collected a great deal of useful information on the subject from some fifty societies connected chiefly with architecture, engineering and the allied professions at home and abroad, and from some institutions representative of other professions. The result of his inquiries is embodied in an excellent paper which he read at a meeting of the society last night.

The consideration of this question is fraught with considerable difficulty, owing to the fact that, so long as the architectural profession is not protected by at least some statutory recognition of the principle of registration, any code which may be drawn up cannot be enforced by any adequate sanction. In "closed" professions, like those of law and medicine, for example, any flagrant breach of etiquette or act of professional misconduct can be visited with absolute suspension from practice. In the profession of architecture, on the other hand, the utmost punishment would be removal from the roll of any society to which the offender might be attached—a punishment which he might himself forestall by a voluntary resignation, leaving the council of his institution without any jurisdiction over him, and continuing to practise with impunity. Mr. Butler fully realises this difficulty, and, failing the establishment of a controlling body clothed with statutory powers, we think that his method of meeting it is an excellent one. He advocates the establishment of a voluntary Board of Professional Control, comprising representatives of the various existing societies, to act in all questions of etiquette, or affecting public or professional interests. If such a board were created it would be impossible for a delinquent to fly from one society or institution to another, and the position of the unattached architect would be considerably weakened. In regard to the actual compilation of a code, however, in our view this should be made as short as possible, and at first should only deal with matters of fairly general occurrence, such, for example, as the practice in relation to competitions. Other matters might be dealt with as they arise, and points of doubt might be submitted to the board for their opinion from time to time; the board acting in an advisory capacity, and its decisions being preserved in permanent form for general guidance. The various societies could then be trusted to apply to their members the principles so established. The whole question of professional etiquette is of great importance, as directly affecting the degree of esteem and confidence in which the profession is held by the public, and the Society of Architects are to be congratulated on having taken up the matter with so much vigour and enterprise.

* * *

**The Organisation of Highway Engineering.**

It sometimes happens that a competent and zealous surveyor finds, on taking up a new appointment, that the roads for which he is to be responsible have been deliberately neglected as a part of a penny wise and pound foolish policy of "saving" the rates. We hope that the Road Board, when assured of the competence and industry of such men will see their way to relax the severity of their present attitude, which punishes the surveyor and the travelling public, but has probably little effect on the local ratepayers and their representatives on the council. In such a case the surveyor should apply for a grant which will not be spread over a considerable mileage of his roads, but be spent in thoroughly building up a short length, with proper arrangements for drainage and protection of the edges, and the provision of a thick crust with a good margin of thickness in the wearing layer. The particular improvement which he desires to make could, of course, form a part of an application including requests for grants for such other purposes as his council might deem desirable. If the council, not liking the condition that they must pay a share of the cost of the improvements out of the local rates, should decline to make any application at all, there remains the alternative of simply letting some of the roads go in order that expenditure may be concentrated on the parts which are to be put in a thoroughly sound condition. The principle is recognised, for instance, by Mr. A. E. Brookes, county surveyor of Cornwall, who, as reported in our issue of April 5th (p. 533), is, with the help of the Road Board, building up strong roads by concentrating expenditure; although this may result in the roads which are waiting their turn showing "considerable deterioration." Where the natural foundation or subsoil is fairly good this policy is, we believe, a sound one, and may be carried out with little inconvenience to the public, especially if,

though the expenditure on materials is saved, a little extra be spent on small constant repairs. In some cases the results would then, we believe, be surprisingly good, and the policy of dealing thoroughly with a few miles at a time is one that has been strongly urged in these pages.

As regards the administrative aspect of the situation brought about by the backward policy of some district councils, this policy will have to give way, and that very soon, to the steady pressure of public opinion. Our own view is that the districts should be combined to form larger areas, in some cases by joining neighbouring rural districts, and in other cases by making one road district out of an urban district with a rural district wrapped round it. Some of the counties, too, are absurdly small, and others are not naturally the groupings of districts, as regards the incidence of population or the topographical features of the country. In the case of Sussex, for instance, a good natural county, consistent as regards population and topography, and mainly symmetrical about an east and west axis, has been chopped into two by a north and south line. The whole administration of roads needs reorganisation, and it should be done in such a way that the surveyors of small experience and qualifications become assistants to the senior and more qualified men, the range of posts giving opportunities for steady promotion. There is not, at the present moment, much prospect of an opportunity for the promotion of a comprehensive scheme to be carried out by Act of Parliament, but we believe that a good beginning would be made if the Road Board were to develop their present financial scrutiny of plans and estimates accompanying applications into an engineering scrutiny, the results of which would be recorded and communicated to the surveyors concerned. The surveyor, on the return of the plans with the intimation that a grant was or was not to be made, would have the advantage of knowing what points in his proposals commended themselves to the Board's trained staff, and what points were regarded as unsatisfactory. It is, we think, through organisation in fact that the surveyors may be brought into one administrative organisation.

* * *

**Weather Forecasts: The Main Issues.**

We are indebted to Mr. Frank Harris, engineer and surveyor to the Tonbridge Rural District Council, for his prompt response to our suggestion that he might furnish us with an example of a period in which the weather was worse than that foretold by the official forecasts. The only criticism we make of his report is that he apparently deals in each case with a period of some twelve hours, while the period covered by the forecast is twenty four hours. We make a point of this, because we feel sure that if Mr. Harris received a morning forecast by telegraph the comparisons would be, on the average, more favourable to the Weather Office. We leave it to our readers to form their own opinions as to whether the forecasts would have been any use from the practical point of view as a guide to the choice of boots and clothing, and, for instance, the question whether a person going out for the day should take an umbrella as well as an overcoat. (See "Correspondence" in this issue.)

As regards the "special forecast" for the week-end, we do not wish to discuss the value of such forecasts, because they are not suited to the purposes of surveyors. The special forecasts which *are* suited to the purposes of surveyors are those which are sent out as soon as a spell of weather of a certain kind is expected. If, for instance, the weather is wet or changeable a surveyor can write to the Weather Office asking to be informed as soon as a dry spell is expected, or a spell of weather just good enough for tarring. It could easily be arranged to have definitions of first-class and second-class road-tarring weather, which would simplify the replies. If a surveyor wants to take his men off road-watering work for some other job he can ask to be informed as soon as the weather is likely to be wet for several days. The Weather Office sometimes makes a statement of the "further outlook" as a part of the daily forecast, but not unless the conditions justify it.

The more important matter is, of course, the daily forecast. Mr. Harris thinks that it is not sufficiently accurate or sufficiently localised to be of use. On the former point we have fully explained our view As regards localisation, it is clear that the greater the number of districts the longer it will take to prepare and issue the forecasts, which is a serious matter. Moreover, the actual weather experienced may depend upon elevation and topographical position. In North Wales, for instance, a forecast for showery weather from the West—or locally understood signs of such weather—means one thing to the coastal strip, another thing on the moors and mountains, and possibly quite different weather in the Conway Valley. A forecast for the South-East of England might be such that, with the main features the same, we should expect a fair but hazy and misty day on the Wealden area, but a fine, sunny day in the greater part of Kent. Often, however, the weather is such that it brings practically the same conditions over the whole of the official "district," and the forecasts for these districts are, in our view, of considerable value, and would be of much greater use if they were distributed by telegraph.

* * *

**The Royal Sanitary Institute Congress.**

Seventy-seven public authorities, thirty-one societies, universities and colleges, and four Government departments have up to the present appointed delegates to the Congress of the Royal Sanitary Institute which will be held at York from July 29th to August 3rd. There will be five sections of the congress, dealing with, among other matters, sanitary science and preventive medicine and engineering and architecture, in addition to which there will be the usual conferences of municipal representatives, medical officers of health, engineers and surveyors to county and sanitary authorities, and sanitary inspectors. An exhibition of sanitary apparatus and appliances will be held in connection with the congress, and will be opened on July 27th. The proceedings of the congress will commence with the reception of the members and delegates in the Mansion House by the Lord Mayor of York, following which a public luncheon will take place in the Guildhall, and the inaugural address will be delivered in the Festival Concert Hall in the evening by the Archbishop of York. Mr. J. Walker Smith, chief engineering inspector to the Local Government Board for Scotland, will preside over the Engineering and Architecture Section of the congress, and the president of the Institution of Municipal and County Engineers, Mr. A. D. Greatorex, will act in a similar capacity at the conference of engineers and surveyors which will meet on July 30th. The Modification of the Building By-laws is one of the subjects which will come before the Engineering and Architecture Section for discussion, and the matters to which consideration will be given at the conference of engineers and surveyors include Housing and Town Planning Progress — to be introduced by Mr. H. Gilbert Whyatt, borough engineer of Grimsby—and Sewage Disposal in Rural Districts. The congress will have as its president Prince Arthur of Connaught. Its list of vice-presidents is an imposing one, and there are strong local general, executive and other committees which may be relied upon to do everything possible for the success of the gathering — further announcements in regard to which will be found in these columns from time to time.

**The Road Board Grants.**

In our issue of last week (p. 532) we printed the list of Road Board grants for the past three months, and the totals under the different heads up to March 31st. It will be seen that by far the greater part of last quarter's total was made up of grants for improvements of road crusts, including surface tarring, but nearly £5,000 was allotted for new roads and £6,709 for road widenings and improvement of curves and corners. Road widening should, we think, be given a separate head, so that the public may see how much is being spent on widening and how much on curves and corners. As regards the last-named improvements, it should not be overlooked that the wear due to motor traffic at sharp curves is in many cases very severe indeed, and even on bends of a considerable radius it is often easily to be seen that the wear under the outer wheels is far more severe than that under the inner wheels. The moral is that, however convenient it may be for users of the road, a change which makes it possible to go faster round bends and corners tends to increase the cost of road maintenance. It is difficult to believe that the time saved is of any importance to the road user. The total of all the quarters or eighths of minutes lost at bends and corners is a very tiny proportion of the time spent at the destination of a motor journey, and if carriers and carters save any time at all it is a very short time compared to one call at one "Blue Lion." As regards safety, there is little in it. Each driver of any kind of vehicle drives as he thinks fit, with hardly any check at all by the responsible authorities, and the small margin of safety which he allows is about the same whether he goes slowly round a bend or takes advantage of alterations which allow him to go faster with no greater risk. There are, of course, some improvements that are necessary, but we have seen alterations that were in no sense improvements, and, since the tendency is for such changes to add to the maintenance costs of the road, we trust that the Board will subject applications for alterations to bends and turnings to rigid scrutiny, and, as we have said, keep this branch of work distinct from road widening.

* * *

**Liability for Negligence.**

A judgment which is of considerable importance to engineers was recently delivered by the Official Referee in a case in which certain trustees were awarded damages amounting to £4,810 against a firm of engineers and surveyors who were found to have been negligent in the preparation of the contracts, plans and drawings, and in supervising the work of the contractor, in the construction of a sea and retaining wall and the making of certain roads. We are not now concerned with the merits of this particular case, but it may not be inopportune in view of this heavy judgment shortly to state the legal liability of an engineer for negligence. Of course in the present state of the law any one may undertake to act as an engineer, but by doing so he brings himself within the legal principle, enunciated by Mr. Justice Brett in *Turner v. Goulden* (1873), L.R., 9 C.P. 57, that when a person undertakes to carry on a business for reward, he is bound to bring to the exercise of it an ordinary degree of skill and to act with reasonable care and diligence; and if he does not do so he is liable to his client in damages. This canon raises the question as to what constitutes reasonable skill and care. The fundamental rule, which has been adapted to varying facts in many cases, is that a professional man must act in accordance with the recognised canons of the science or art which he professes to have. The question is one of fact which must be determined having regard to all the circumstances of each individual case. In the case of *Chapman v. Walton* (1833), 10 Bing. 63, Tindal C.J. suggested that the real test was whether other persons exercising the same profession and being men of experience and skill would or would not have done the work in the same way. It will thus be seen that a person holding himself out as an engineer must possess an average degree of skill, and it would be well if the heavy responsibility attaching to the negligent execution of work were more thoroughly realised by those whose only qualification to describe themselves as engineers at all is that the profession is an "open" one.

* * *

**Birmingham Tramways Track.**

The alleged unsatisfactory condition of some of the tramway tracks at Birmingham has been the cause of considerable complaint, as an outcome of which a deputation of road users, organised by the Midland centre of the Roads Improvement Association, recently laid their grievances before the Corporation Tramways Committee. Their memorial embodied the following suggestions: (1) That the general condition of the tramway tracks was far from satisfactory, and that they should receive careful supervision. (2) That in many cases the paving of the tramway margins makes an imperfect joint with the paving of the other part of the carriageway, in some places one part of the paving being laid at right-angles to the rails, while that adjoining is laid in diagonal lines. (3) That a serrated edge should be used for all sett or wood paving adjoining macadam. (4) That the excessive camber in many streets causes slow going traffic to cling to the centre of the carriageway, thus greatly reducing the traffic capacity of the highway. (5) That wherever the width of footpath admits the iron standards should be erected at a distance of 18 in. from the kerb. At present vehicles laden with overhanging goods avoid keeping close to the side of the road for fear of striking the standards at the edge of the foot paths. (6) That stopping places should not be opposite each other on up and down tracks, but that the "stop-posts" should be fixed at such distances apart as will leave a space of not less than 10 yds. between two standing cars. These suggestions are eminently practical, and might well be considered for other tramways than those at Birmingham.

* * *

**Bituminous Road Crusts: Some Important Points.**

Sound common sense is conspicuous in a progress report of a special committee appointed for the study of bituminous materials for road construction by the American Society of Civil Engineers—the report referred to being that reproduced in another part of this issue, and also to be found in the February number of the Society's "Proceedings." The committee point out the importance of taking a broad view in the matter of traffic enumeration, and their remark on the insufficiency of a "bald return" as the sole basis of the selection of the type of road or pavement is a timely warning of a pitfall of the immediate future. Their recommendations under the heads "Sub-grades and Foundations" and "Methods of Construction" constitute an equally timely warning against those careless or "finikin" methods often adopted with bituminous materials, and only too well known in this country. "The use of any form of a bituminous surface," we read, "does not preclude the necessity for the construction of a well-drained, thoroughly compacted, and adequate sub-grade." And, further on, "It is essential, as in a water-bound macadam construction, that a suitable quality of road metal be used." Those of our readers who have been led into the error of attributing imaginary virtues to very large road metal—a common error of the intrusive layman—will note with interest the remarks as to the need for special care in the use of stone of more than 2-in. gauge. There is good stuff in this short report, and it is well worth perusal.

C*

# The Main Levelling of Copenhagen, 1907-8.

By C. F. V. BOOCK, Surveyor-in-Chief and Municipal Engineer in Charge of Division B, Copenhagen.

The last main levellings of bench marks carried out in Copenhagen prior to 1907-8 were made during the years 1887-8 and 1900-1. The first of these was executed by the director of the road and drain making department, and under the guidance of surveyor-in-chief P. Bentzon, who fixed the positions and heights of the 360 bench marks which, at that time, were laid down in the town. The main levelling of 1900-1 was carried out by the chief municipal engineer, under the superintendence of Lieut.-Colonel M. Sand, who levelled 313 marks in the incorporated districts of Copenhagen.

As, however, a great many of those marks had disappeared, owing to the demolition of buildings, and others had been damaged or rendered useless by being covered by post-boxes, showcases, &c., and, further, as some of the marks employed in the incorporated districts were buried granite or cement blocks which had not remained in place, it became necessary to renew many of the old marks and also to place a number of new marks in districts where formerly there had been too few.

As it was ordained that in the year 1907 the newly created division of the public works department should, among other things, make the necessary main levellings inside the city boundaries, I was ordered to supervise the carrying out of the precision levelling required. It was clear to me that the object was to perform a modern levelling of the whole town, which, when Frederiksberg is included, amounts to 7,900 hectares. Frederiksberg was not to be levelled, but as Copenhagen entirely surrounds this town, the levelling had to be performed in a circuit round it, thereby entailing long distances, which very much increased the time required for the execution of the work.

The first thing to be done was to choose a method of proceeding which would give the best possible results, and by which the work would be economically done.

It was by studying the "Handbuch der Vermessungskunde," by Prof. W. Jordan, and by reading an article in "Zeitschrift für Vermessungswesen," which compared the precision levelling performed in Leipzig in 1904 with the method adopted by the Danish major-triangulation, which I had been made acquainted with through Lieut.-Col. M. Sand, that I decided to employ a method of procedure which, by means of a number of checkings, both of the instruments used and also of the work performed, secured as reliable a result as could be reached.

### THE BENCH MARKS AND THE MANNER OF PLACING THEM.

In planning the work consideration had to be given to the number of new marks there were to be placed, how they should be placed, and of what kind they should be. The positions of the old marks had therefore first to be examined, so that a decision could be arrived at as to whether they were still usable or would have to be replaced by new ones. It was found that a lot more of the old marks than had been supposed had disappeared or been destroyed. It was therefore necessary to place a larger number of new ones than was at first anticipated.

In the incorporated districts some of the bench marks, consisting of stone or cement blocks (the marks for triangulation and main circuit joints) had sunk; and as the use of these bench marks is generally very troublesome on account of their being covered by earth and dirt, and therefore difficult to find, I decided to place new marks as far as possible in substantial buildings, a number of which had been erected since the last execution of main levellings. Stone was only employed where no better material could be found.

The distance between the bench marks was from 150 to 500 metres, according to the proximity of the buildings in which they could be placed.

Within the area inside the boundaries of Copenhagen, which now amounts to about 7,020 hectares, are now placed a total of 671 bench marks. As a great many of the new ones had to be placed in buildings, it was necessary first to obtain the permission of the owners; and after an extensive examination with records of where new marks had to be placed, the position on the buildings concerned was either marked or described so exactly that the mason or the stone-cutter was not liable to err. After this had been done, applications for permission to place the marks were sent out to several public institutions and to about 300 private owners. All the applications were granted with the exception of a few made to owners.

Unfortunately we have no law which secures a right to the municipality to place such marks and casts a duty on the owners concerned to take care that the marks are not covered, demolished or taken away. The municipal council is not in a position to demand a declaration to this effect without being forced to give sufficient compensation to the owner concerned. On account of this one must rely upon the benevolent support of the owners, which, it is to be hoped, will not be wanting when the importance of these marks is made clear to the inhabitants.

The marks employed are shown in the drawing below, and I hope that they are sufficiently clear to render explanation unnecessary.

A total of 576 cast-iron plates (Fig. 1) have been placed; 299 of these are new ones and 277 old ones; a hemisphere of iron has been riveted to 241 of the last kind; the radius of the hemisphere is 1 cm. By

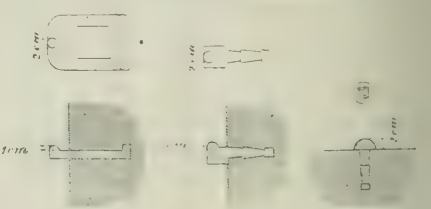


Fig. 1. Levelling plate (cast iron).

Fig. 2. Levelling bolt (cast iron).

Fig. 3. Levelling bolt (cast iron or gun-metal).

Fig. 4. Levelling bolt (gun-metal).

Fig. 5. Levelling bolt gun-metal with inserted platina nail).

this means it was secured that those plates fixed in 1887-8 should have the same appearance as the plates of the main levelling in 1900-1 in the incorporated districts and those marks fixed by me in 1907. Not only was uniformity thereby gained, but also the considerable advantage that the levelling staff can now be placed in every case on a point instead of on a plane surface, which does not always remain horizontal. Of course, the precision is improved by this.

Fig. 2 shows a square, horizontally placed iron-bolt with hemisphere, nineteen of which were fixed last year. They have been employed where the plates could only be inserted with difficulty.

Fig. 3 shows a levelling bolt vertically fixed; we have now thirty-eight of these, of which twenty-three have been placed in stones which had been previously levelled. The bolts have a head formed as a hemisphere with a radius = 2 cm. There are thirty-four iron bolts and four gun-metal ones.

Fig. 4 shows a gun-metal levelling bolt of the same kind as the major-triangulation generally employs; thirty-seven of these are now fixed, of which sixteen are new ones, eight belong to the major-triangulation, and the rest—13—were placed during the former municipal main-levelling operations. They have been cast down in granite or brickwork in particularly substantial buildings. One of the bench marks is the top of an iron sceptre.

Besides these 671 marks which are intended for practical use, there are twenty-eight of the kind shown in Fig. 5. They are cylindrical gun-metal bolts with embedded platinum nails, the perpendicular distance

of the centre of which from the bench mark below has been exactly measured with a glass measuring-rod. They do not extend beyond the brickwork in which they have been placed; they are only slightly noticeable, and will thus not be exposed to demolition.

They are intended to serve as main bench marks for future placing of marks, and for this reason they have been made particularly indestructible.

Only twenty-eight of the last-named marks have been employed, as they are not of practical use. Two of the buried points belonging to the major-triangulation have been used during the levelling; and these have only been embodied for the sake of comparison.

INSTRUMENTS AND APPLIANCES.

So extensive a field work demanded two parties, and consequently two sets of instruments and appliances were procured. On account of the fact that in this town we do not possess specialists in making levelling instruments, most of the instruments had to be ordered from well-known firms in Germany; and as the making of such accurate instruments generally takes a long time, the field work could not be started before the end of July, 1907, when we received the first instrument from the firm of Otto Fennel & Söhne of Cassel. The second was delivered by Max Hildebrand of Freiburg (Saxony).

On both instruments the telescope is detachable, or —what means the same—can be turned round its own axis or removed. To the telescope is fixed a reversible spirit-level which can be read as well in position over as under the telescope. The telescope can be moved in a vertical plane about ±3°. This movement is performed by means of the vertical tangent screw, which is checked by an encased spiral spring fixed in the opposite support of the telescope. The height of the telescope, after it has been levelled, is constant. The horizontal bar that carries the Y has on the Fennel pattern instrument a circular enlargement on the middle. To this enlargement the bottom screw and the tangent screw are fixed, and vertically over the socket is placed a box-level, by means of which the first levelling of the instrument can be effected.

In the same manner an extension of the horizontal bar is placed over the socket on the Hildebrand instrument. One side of this extension carries the bottom screw, and the other side the tangent screw. Two small spirit-levels are placed on the horizontal bar, by means of which the rough levelling of the instrument is done.

By experience the following constants were found: Focal length of the Fennel telescope = 42 cm.; of the Hildebrand = 40 cm.; diameter of the object lens on both = 4 cm. Magnifying power: Fennel's = 37, Hildebrand's = 35 times. On both instruments the additive constant is 0·6 m., and the constant for distance 100.

The levelling instruments above described have the advantage that all errors which arise from the instrument itself—even the well-known error which is caused by difference of the diameter of the rings—are eliminated, even if the instrument is not placed in the middle between the staves, provided that the mean of the readings with the level above and below the telescope is used.

The reversible spirit-level, which is slightly ellipsoidal, is divided in the same way on the two opposite sides. The division shows upwards when it is used in the one position, and downwards when it is used in the other position.

Each of the reversible spirit-levels is encased by a glass tube, which not only serves as a dust-guard, but is mainly a guard against sudden differences in temperature which would otherwise affect the spirit-levels. The Hildebrand instrument was at first furnished with mirrors attached to the spirit-level, but these were removed, because the recorder, and not the operator, read off the spirit-level.

During the levelling the spirit-level was read at every sight, but, of course, the same reading of the spirit-level was not required for back sights and for fore sights, the correction being applied instead. This has, however, always been small; and especially so in the case of one party, which, as it appears, had tried always to keep the same reading of the spirit-level; here the correction was, most often, zero.

On the Fennel instrument (1st party) the division of the spirit-level starts from the eye-end of the level, whereas on the Hildebrand instrument the opposite is the case. This, of course, reverses the sign of the correction to be applied for each instrument.

On the Fennel instrument one division on the spirit-level amounts to 6·65 sec. of vertical arc, and on the Hildebrand instrument to 6·00 sec. Converted into linear measure the formula is as follows:—

$$x = \frac{u \times a}{206{,}265} \text{ m. or } \frac{u \times a}{206{,}265} \text{ mm.}$$

Where $u$ means one division of the spirit-level counted in seconds, $a$ means the distance from the instrument to the levelling staff, and $x$ means the correction to be applied to the reading of the staff.

For shortening the computation of the correction a table was prepared for distances from 10 to 14 m.

From this table the corrections for the staff readings were taken after the instrument had been placed about midway between the two places which were to be levelled, and approximate readings were taken both from the spirit-level and from the levelling staff. The back sight was first read, then the fore sight.

Verification of the instruments was often undertaken, and they were also frequently cleaned.

Both instruments have proved to be good ones; and a very reliable set of levellings could be obtained by means of the method described above—*viz.*, exact verification, short sights with the instrument placed

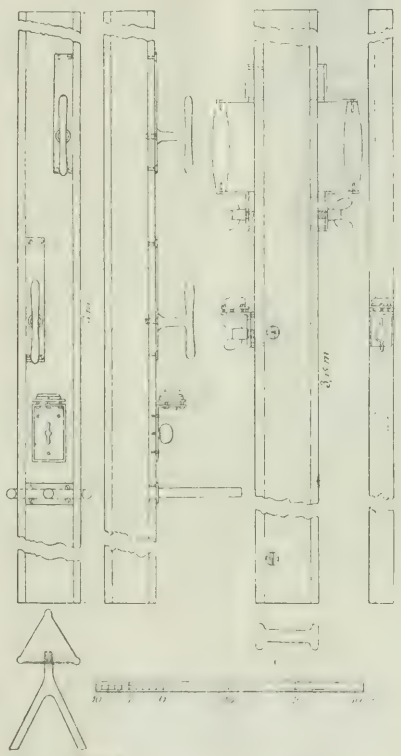


Fig. 6. (Danish.)

Fig. 7. (German.)

at equal distance from each sight, reading of the correction for the spirit-level, &c.—even with second-class instruments. But exact levelling can hardly be done with levelling staves that are not of the very best make. I realised this fact from the commencement.

Two sets of staves were procured. The one pair (Fig. 6) was made in this town by Mr. Hansen, sergeant-major of the general staff. The section of these is a triangle, like those employed by the major-triangulation staff; the other set (Fig. 7) were provided by Reiss, Liebenverda, Saxony. They have a rectangular section.

With respect to the first set no doubt of their excellence could be entertained, as Mr. Hansen formerly had made levelling staves for the purpose of the precision levelling undertaken by the parties of the major-triangulation, and these were then found to be of excellent construction. With respect to the German staves, by personal examination I satisfied myself that first-class workmanship was delivered by the firm.

Besides these two sets of levelling staves, of which the Danish ones were of a length of 3 m., and the German ones of a length of 3·15 m., two extra staves of a length of 1 m. were given to the parties, and they were used where cornices or other obstacles prevented the use of the longer ones. Cases were provided for all the staves.

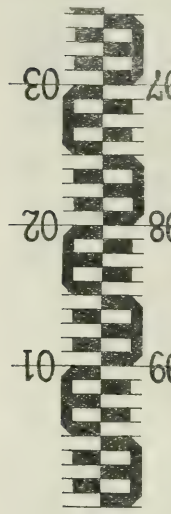



Fig. 8.

The scale on the staves (Fig. 8) is a somewhat modified form of that used by the major-triangulation and the general staff. By the new arrangement the advantage was obtained that it was easier to estimate the position of the spider-cross, whether it shows on a white or a red division.

The division between the numbers on the staff is ½ dm. This again is divided into ten divisions, each of the size of ½ cm. Decimals of these divisions are estimated, and experienced surveyors can do this pretty exactly. The last decimal gives the height in half-millimetres.

Opposite the original numbers, the complementary numbers were placed. They are marked with a cross, and in this manner the sight can be entered in the field book, with two numbers of which the sum must equal 10 (for instance, 3·986 + 6·014).

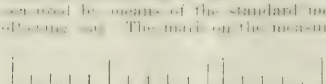
The other side of the staff is divided in the same manner, but differs from the first by being marked with black paint instead of red. Also, the zero point is different, so that the staff does not read, for instance, 4·000, but 0·116. This was done to prevent a mistake being repeated.

Before the staves were taken into use a minute examination of the divisions was made. It is of the utmost importance that the division should be exactly made. The examination was made by means of a standard measure. Of these we have at present three—*viz.*, the general staff's, that from the Veterinary College, and the one belonging to the Municipality of Copenhagen. The standard measure is a steel rod, of a little more than a meter's length, with thermometer attached; the section is a square (side, 1·5 cm.), and it is divided into cm. Both the zero point and the one-meter point are marked on an inlaid silver plate. On each side of these mark five subdivisions are engraved; the distance between the marks is 1·5mm.

The true length of the standard gauge is given at a temperature of 18 deg. Cent., and at this temperature the examination of the staves was made.

The examination was commenced on June 11, 1907, on the side of the Danish staff (No. 1), with the red divisions, was first verified. On each side of the staff the distance between two marks was measured, the marks are engraved in a circular silver plate, inlaid in a copper plate, the diameter of which is 2 cm. The diameter of the silver plate is 8 mm. and the mark in the centre. The distance between the marks is 1 m.

The distance between the cross marks was then measured by means of the standard measure in the following way. The mark on the measure was placed



Second reading. First reading. Second reading. First reading.

Fig. 9.

a little to the right of the mark on the staff, and the difference between the two marks was read off by means of the eye-piece at both ends of the tube. The two readings were noted down with a + sign. Next the standard measure was placed a little to the left of the mark and the readings were again recorded, but this time with negative sign. The sum of the 4 readings gave the correction in length of the staff for a part.

The difference between reading 2nd reading and reading 1st reading is the difference between the length between the two marks as read on the staff and the length of the standard measure. If the difference was positive the length between the marks was too long; if it was negative the length was too short.

The readings were recorded thus:

| Staff 1. | | Red numbers. |
|---|---|---|
| 2·8 | +3·3 = | 0·5 |
| −2·1 | −1·5 = | 0·6 |
| +0·7 | +1·8 | −1·1 decimals of mm. = 0·11 mm. |

In the same manner the distance was measured between 01-21, 02-22, 03-23, and 04-24, &c., until all the divisions on the red side of the staff had been verified. Then the same thing was done with the other side of the staff. The differences between the Danish and German staves were thus found by 40-45 measurements, and for the short staves by 9-10 measurements. The German staves have four standard marks in silver on the red side, and therefore three distances had to be verified on each of these staves.

In this way all the staves were found to be of excellent make.

The length of the divisions on each side, which ought to be 1 m., were thus compared with the standard measure; and, for instance, staff No. 1 (red side) was found to have a mean error of ±0·15, which meant that the meter length on the staff is 999·85 standard mm.

In a similar manner the mean of the differences of the distances between the marks was found, and we were then in a position to decide the difference between the meter on the staff and the distance between the marks:—

L − M = *a*, which may be regarded as a constant; *a* was then computed for one set of staves by taking the mean of the differences L − M. As an illustration I may quote the values found for the German staves:

| | | | |
|---|---|---|---|
| Staff 3 (1st measurement): | *a* = | 0·10 mm. | Mean reading = 0·08 |
| „ 3 (2nd „ ): | *a* = | 0·08 „ | |
| „ 4 (1st „ ): | *a* = | 0·08 „ | |
| „ 4 (2nd „ ): | *a* = | 0·07 „ | |

In the same manner the constant *a* was found for the Danish staves (1 and 2); it was ±0·05 for the long ones, and ±0·01 for the short one.

When *a* had been determined, it was only necessary to measure the distance between the marks to determine the length of the meter on the staff. In verifying the instruments, the temperature is of great importance, and must therefore be carefully recorded while the measurements are taken, so that the correction for the length of the standard measure can be applied for every observation. The German standard measures are all adjusted by the Kaiserliche Normal Eichungs Kommission in Berlin and Charlottenburg, and a certificate to this effect is given with every staff. This certificate gives a formula for the length (L) between the zero and meter mark at the temperature T.

The length of our municipal standard measure is found by this formula.

L. 1 m. + 0·12mm. + 0·011 (T − 18) mm.

Suppose the value of T to be 18 deg. Cent., then L will be: L = 1 m. + 0·12 mm. = 999·88 mm. This means that the correction is + 0·12 per meter. For the sake of shortness the correction was tabulated, so that it could be found at once for any temperature.

The final value of the meter length on the staff was found in this manner, and the differences between the standard measure and the meter on the staff were noted down. This gave six differences for the German instruments, the mean of which was taken. From the table the correction for temperature was added together with the constant *a*. The result thus obtained gave the final correction.

Owing to the daily alteration in length of the staves it is necessary in precision levelling to measure the distance between the marks on the staves frequently. Until this was done daily in the office, when the levelling parties returned from work, but lately standard rods were given to the parties who took them into the field.

From the daily measurements thus recorded it was found that the staves did not alter very much; nevertheless, it was found that the wood of the staves absorbed some moisture from the air during the warmer season.

The correction was not of much account where the difference in height was small but in some instances it was of some importance, and as the records are of some interest they were constantly taken. The loss of time caused by [illegible]

amounted only to about ten minutes daily for each party.

To each staff was attached a box-level, and these were frequently verified by means of the three vertical screws on which each rests. The distance from the instrument was about 50-60 m., so that a fairly long piece of the staff could be seen in the telescope. The vertical wire in the telescope secured the vertical position of the staff. When the vertical wire in the telescope coincided with the vertical axis of the staff, the box-level could be adjusted by means of the two screws. It was also of importance to guard against the staff leaning towards or from the operator. This error was observed by turning the edge of the staff against the telescope; the error on the box-level was eliminated by means of the third screw. This adjustment had to be made every day before work was commenced, and the staff man had to take good care that the bubble showed in the middle of the box, when a sight was read.

Fig. 10.

The staves were never laid down on the ground, but were placed on iron horses, as shown in Fig. 10.

The same rule was always followed regarding the order of using the staves: staves No. 1 and No. 3 were always used on the bench marks, and the two others, No. 2 and No. 4, were used alternately on the intermediate points.

Errors arising from inequality in the lengths of the staves were thus avoided—a matter of some importance.

As before mentioned, two short staves were procured for use where cornices or other projections on the buildings prevented the use of the ordinary staves. But even this precaution was not sufficient.

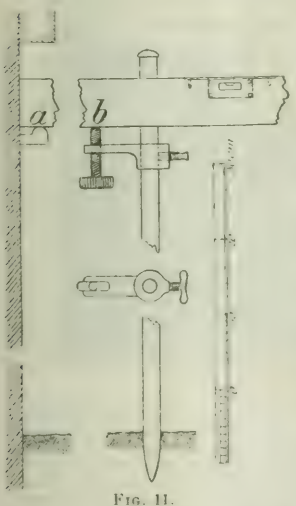



Fig. 11.

In some places, for instance, post-boxes, show-cases, or other things had been placed above the marks, and where these obstructions could not be removed, we had to invent other means for getting over the difficulty, so that the marks could be included in the levelling. The second party invented an appliance which overcame the difficulty, and which is illustrated in Fig. 11. A description is almost unnecessary.

The points *a* and *b* are provided by a spun-level to the same height, and therefore the staff can be placed on *b* instead of on *a*.

At the intermediate points iron-pegs of the pattern shown below were employed, (Fig. 12.

They were driven well in, but care had to be taken that the protective iron cap, while driving the nail

Fig. 12.

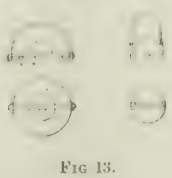


Fig 13.

down, did not touch the hemisphere on which the staff would have to be placed. In exceptional cases—for instance, in asphalt—the pegs shown in Fig. 13 were employed.

Where soft ground made it necessary, as for instance on Arnach Island, three heavy pegs were driven into the ground on which the tripod could be placed.

Besides the instruments already described, a well-equipped party had to take with them a large umbrella and a hand-carriage. The party consisted of the surveyor, a recorder, two staff men, and the umbrella man, who also drew the carriage and acted as a general assistant.

The surveyors employed for shorter or longer periods were Captain Heiberg-Jürgensen, First-Lieut. Landt, and Surveyor Jacobsen, and as reserve Captain Andersen, Forest-Officer Wielandt, Assistant Madsen, and A. Nielsen, C.E. The recorders were Carl Nielsen and A. Skafte. The staffmen were very trustworthy—a matter to which I attach great importance.

*(To be concluded.)*

## LOWER THAMES VALLEY DISTRICT SURVEYORS' ASSOCIATION.

### MEETING AT TWICKENHAM.

A meeting of the above association, presided over by the president, Mr. E. Willis, Assoc.M.Inst.C.E., engineer and surveyor to the Chiswick Urban District Council, was held at the Town Hall, Twickenham, on Saturday, the 30th ult., and was well attended.

A further discussion was raised on the motor-omnibus and similar kinds of traffic passing over all classes of roads. At the association's meeting on February 3rd last the following resolution was passed: "That, having regard to the great damage caused by motor-omnibuses and other similar vehicles passing over various classes of roads not originally constructed to carry such traffic, this association is of opinion that further powers should be conferred on local authorities enabling them to define the routes (other than county main roads) to be taken by any service of motor-omnibuses or other motor vehicles licensed for hire or for the carriage of goods into or through their respective districts." It was further resolved: "That a copy of the above resolution should be sent to the Institution of Municipal and County Engineers, and that the council of the institution should be requested to consider the subject-matter of such resolution and to take such action as they may deem necessary." The association received a letter from the secretary of the Institution of Municipal and County Engineers stating that the council had given careful consideration to the resolution, and that, on the recommendation of the Roads Committee, to which the matter was referred, the council had resolved with regret that the resolution is of so far-reaching a character as to lend itself to unreasonable application, and that, having regard to representations made by the institution to the Local Government Board, pressing for amendment of the Highways and Locomotives Act and the Heavy Motor Car Order of 1904, they could not see their way at present to take any further steps in the direction suggested by the resolution.

The association were unanimously of opinion that possibly the wording of the resolution had not sufficiently clearly marked the importance of the fact that it was intended to give powers to the local authorities for dealing with this class of traffic over district roads and not main roads, and recommended that the Institution of Municipal and County Engineers should be again asked to consider the matter apart from the wording, and to consider it in the spirit of the resolution. It was further resolved that the committee who had had this matter under consideration should be requested to allow the president of the association to interview them regarding the matter so as to be able to draw their attention to the views taken by this association, their feeling being that this matter is one of the greatest importance, more especially that, since passing the above resolution, the matter has been taken up on somewhat similar lines by the metropolitan borough councils.

The association also had under consideration the district nominations to the council of the Institution of Municipal and County Engineers.

The association also had under further discussion the visit to the sewage disposal works now in course of construction at Surbiton, when a vote of thanks was passed to Mr. Mather, the engineer, and it was decided to request him to read a paper with reference to the works at an early date in the next session.

Owing to shortness of time, several important matters which were included on the agenda were adjourned until the next meeting.

## THE WORKS FOR THE WATER SUPPLY OF BIRMINGHAM FROM MID-WALES.*

By E. L. Mansergh and W. L. Mansergh, MM.INST.C.E.

The Elan supply scheme was originated in 1880 by the late Mr. James Mansergh, F.R.S., M.INST.C.E., in consequence of the inadequacy of the then existing sources. These, consisting of five local streams and six wells in the new red sandstone, had proved insufficient to meet the needs of the city and district, which then had a population of about 648,000. Investigation having shown that no extension of the local sources would be satisfactory, the Welsh scheme was laid before Parliament in the session of 1892, and the necessary powers were obtained. The watershed of the Elan and Claerwen, which is situated in Radnorshire and Brecon-shire, has a gross area of about 71 square miles, and a mean rainfall of 65 in. The collectable rainfall is estimated by the authors at 37 in., giving an average yield of 102,000,000 gallons per diem. The first instalment only—that is, works for the supply of 25,000,000 gallons per day at Birmingham—and the prescribed quantity of compensation water to the river—namely, 27,000,000 gallons per day—has at present been constructed; but the powers granted cover the full utilisation of the yield of the watershed and works necessary for a total supply of 75,000,000 gallons per day to the city and district.

Three reservoirs have been constructed: the Caban Cöch, which is a combined supply and compensation reservoir, containing 7,815 million gallons, with a dam 122 ft. high; Pen-y-gareg, for supply only, containing 1,330 million gallons, with a dam 123 ft. high; and Craig Gôch, also for supply only, of 2,000 million gallons, with a dam 120 ft. high. These reservoirs are all on the river Elan, and three more on the Claerwen are contemplated when the demand for water justifies their construction. For one of the latter—the Dol-y-mynach reservoir—the foundations and lower part of the dam have been already built in order to get the work above flood level of the Caban Côch reservoir. A submerged dam has also been constructed in Caban Cöch reservoir to maintain such a water level as will charge the aqueduct to Birmingham. From the Claerwen Valley a tunnel has been driven connecting it with the latter reservoir above this submerged dam, in order to bring into supply the dry-weather flow of that river.

The compensation water which has to be discharged into the river day by day in a regular flow has been utilised to produce water under pressure to work a large number of valves in connection with the Caban Cöch dam and the valve tower at the head of the aqueduct, and also electricity for lighting and power purposes. The latter is required at the head of the aqueduct in connection with an installation of roughing filters, which had to be made in order to free the water from germs which elsewhere had been found to cause deposit in cast-iron pipes. A short permanent line of railway was constructed from the Mid-Wales Railway near Rhayader to the lowest dam, and while the works were in progress some 36 miles of main line and sidings were constantly in use. In addition, a number of ancillary works, such as roads, bridges, culverts, &c., were constructed on the watershed.

### DETAILS OF AQUEDUCT.

The aqueduct, which is nearly 74 miles in length, consists of two main classes of work: conduit in tunnel or cut-and-cover, and steel or cast-iron pipes under pressure crossing valleys. There are fifteen tunnels with an aggregate length of 12¾ miles, and the cut-and-cover conduit is about 23¾ miles in length. The inverted syphons, of which there are eleven in all, have an aggregate length of nearly 36¾ miles, and the pressures to which they are subject range between about 25 lb. and 250 lb. per square inch. The pipes in the syphons vary from 41 in. to 42 in. in internal diameter, according to the gradient obtainable, and are for the most part of cast-iron, but for pressures over 400 ft. of head welded steel pipes were used. Out of an ultimate total of six lines in each syphon two only have been laid for the first instalment. The ruling gradient for the conduits, which are haystack-shaped, approximately 8 ft. by 8 ft., is 1 in 1,000, and that for the pipe syphons is 1 in 1,760.

At the heads of all the syphons rather elaborate automatic arrangements are made to cut off the water in case of a pipe bursting, and also at the outlet ends to prevent water flowing back under similar circumstances. Sluice valves, air valves and washouts of the usual description are provided on the lines of pipes. With a few exceptions the pipes are carried over all streams and rivers crossed, and this has involved the construction of several large bridges, the chief of which is at the crossing of the river Severn between Bewdley and Arley, where the river itself is spanned by a handsome steel arch of 150 ft. span.

The aqueduct terminates at the Frankley service-reservoir, about 6 miles to the south-west of the centre of the city. This reservoir, which holds a little over 200,000,000 gallons, is semi-circular in plan, divided into two segments; it is about 30 ft. deep, and is constructed of concrete lined with asphalt and blue brickwork. Eighteen ordinary slow sand filters, having an aggregate area of about 14 acres, have also been installed, as all the water is filtered before use. Although the top water level of the reservoir, 603 ft. above ordnance datum, is high enough to supply water to the greater part of the city and district by gravitation, for certain parts pumping had to be resorted to. A pumping station is therefore provided to raise water to two high-level service reservoirs, the one about ¾ mile to the south, and the other about 3½ miles to the north of Frankley reservoir, each of about 1,250,000 gallons capacity. Approximately 18½ miles of 43-in. and 42-in. cast-iron mains have been laid to carry the water into the trunk mains in the city.

The works in the valleys were carried out by direct administration, and the remainder by contract, and the total cost of the whole of the works, including land, was, in round figures, £5,750,000.

* Abstract of paper read at the last meeting of the Institution of Civil Engineers.

## PRINCIPLES OF PROFESSIONAL PRACTICE.

### SUGGESTED CODE OF ETHICS FOR ARCHITECTS.

The question of drafting a code of ethics relating to matters of professional etiquette among architects was brought before the Society of Architects last night by Mr. C. McArthur, the secretary.

In his search for information, said Mr. McArthur, he had approached some fifty societies connected chiefly with architecture, engineering, and the allied professions at home and abroad. Proceeding, he made a brief reference to the practice and custom prevailing in other professions, and went on to consider what was being done by architectural bodies, subsequently making a reference to some of the main principles which it appeared to him should govern architectural practice, and finishing with some suggestions for procedure, and for the basis of a schedule of practice and a code of ethics.

In the absence of or in the anticipation of such a controlling body as would be constituted under a Registration Act, Mr. McArthur suggested the immediate formation by agreement between the architectural societies of a board of professional control, representing every architectural society in the United Kingdom in such proportion as might be arranged. This board would have no power to interfere in the domestic policy or procedure of the societies concerned, but would act, after due deliberation, with the weight of combined authority, on any questions of public or professional interests, and might also act as an appeal or advice court if required to do so by any architectural society in regard to any question affecting that particular society. By this means pressure could be brought to bear both on public bodies and members of the profession much more efficiently than under the present system, while it would be very difficult and highly undesirable for even the unattached architect to ignore the fiat of a body so constituted; indeed, in the author's opinion, one effect of the formation of such a body would be to encourage those outside to come into one or other of the societies. In other words, there would be unity of action and cohesion when there now existed weakness and impotency, and as, in his opinion, everything pointed to unity being presently secured under a Registration Act, he thought they might well in the meantime lay down certain principles of practice and be prepared with a code of ethics acceptable to the various societies, with a view to general adoption now and their incorporation in an Act of Parliament in due time.

# Colombo's Refuse Destructor.*

By CLIVE H. KILMISTER, Chief Assistant Engineer, Works Department, Colombo Municipality.

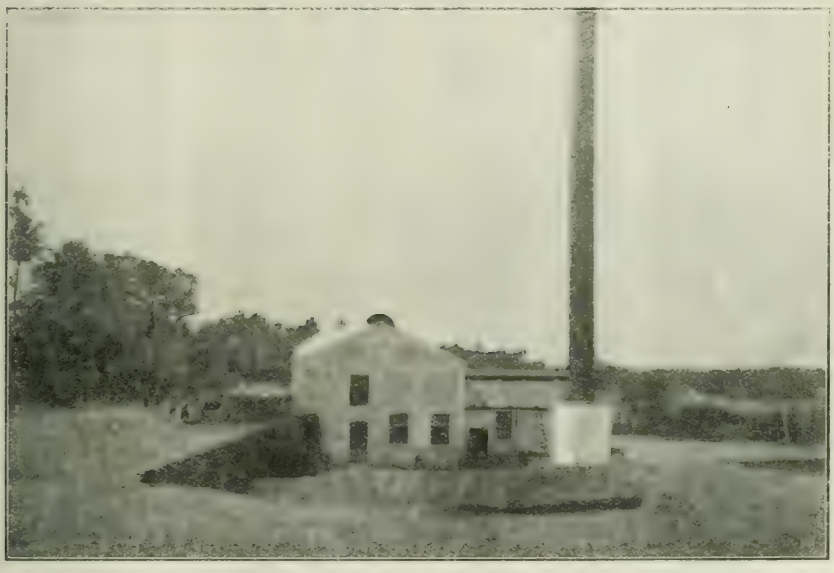
At the present time, in certain portions of Colombo, the house refuse of the city is disposed of by dumping it on to low-lying grounds on the fringe of the city. To say the least, this practice is extremely unhealthy, particularly in view of the fact that the only places available for dumping the rubbish are marshy lands which are liable to flooding.

In view of these facts and the fact that Colombo is expanding very rapidly, the municipal council decided upon the construction of a destructor in order to destroy all house refuse by incineration. Several proposals were considered, and the type finally selected was the Horsfall, and it is the author's intention to give below a brief description of the erection of the destructor.

The plant consists of six cells of what is known as the Horsfall patent back-feed type continuous-

From the accompanying plan it will be seen that the boiler is in the centre of the building, and the cells and cremators arranged on each side of it, so that either half of the plant may be isolated at any time for cleansing and repairs without interfering with the efficiency of the remainder of the plant, each set consisting of one cremator and three cells. On the eastern side provision has been made for duplicating the boiler if it is found that more heat is available.

The cells are fed from the storage hoppers on the northern side, and the clinkering floor is at the front of the cells opening out on to the yard, in order that the clinker may be quickly and easily removed by trucks. At the back of the boiler is placed the regenerative air heater, fixed in conjunction with the main flue, which runs through the engine-house to the [illegible]



Colombo Refuse Destructor

grate and each cell is capable of burning 10 tons in twenty-four hours. In addition to the cells there are two beast cremating chambers, to enable cattle, horses, dogs, &c., to be disposed of. The importance of these beast cremating chambers cannot be overestimated should at any time cattle murrain break out in the city, when it is essential that carcases should be disposed of with the least possible delay; and although it is unlikely that they will be called into play to any great extent under normal conditions, they are a very great safeguard and standby should there be a repetition of previous experience.

The approach to the destructor is on somewhat different lines to those generally adopted, for, instead of having an inclined roadway up which carts convey the refuse and tip into the hoppers, the building has been constructed on a lower plane to that of the approach roads. It was possible to do this owing to the combined scheme for the construction of a new 100-ft. roadway known as Maradana avenue, and two 50-ft. side roads, and the erection of the destructor taking place simultaneously, the result being that it obviated the necessity for providing an inclined roadway usual in most plants; thus considerable expenditure was avoided. The level of the tipping floor is 27 ft., and that of the ground floor 14 ft.—2 ft. above the highest known flood level.

* From a paper read before the Ceylon Engineering Association on February 20th last, Mr. Robert Skelton, Assoc.M.Inst.C.E., municipal engineer, Colombo, president, in the chair.

[illegible] to the chimney, at the base of which [illegible] dust catcher.

## DETAILS.

Having thus indicated generally the outline of the building, the author now proposes to describe in detail the various parts.

Each cell or furnace have a grate area of [illegible] and are lined throughout with 9-in. firebrick, closely jointed with fireclay mixed with a solution of silicate of soda. The entire block is faced with salt-glazed bricks set in lime mortar, pointed with a special composition made from gas-retort carbon and cement. The whole of the brickwork in the furnace blocks is braced together with heavy rolled-steel double buckstays, held in position by stout tie rods and steel washer blocks.

The feeding and clinkering doors are of heavy cast-iron "lift-up pattern," lined with firebricks manipulated with suspension gear and balance weights, and arranged as to allow of the doors opening to the desired width; these doors and frames have planed faces, thus making them perfectly tight-fitting when closed. To the clinkering doors are fitted small circular doors to be used for inserting the rakes for trimming the refuse evenly over the whole grate area without opening the heavy doors, in this manner preventing an undue rush of cold air into the cell.

The grate bars are cast in channel section the full length of the grate, perforated with small holes to prevent anything but the finest ash from falling through and to ensure a sufficient blowpipe effect

on the fire. Provision for the contraction and expansion of these bars is allowed for on the back dead plate, which is constructed on an incline, so that the bar is free to move up or down as the temperature varies.

To the sides of each cell patent air boxes are built in, through which is delivered a supply of hot air controlled by separate butterfly valves to each air box. These valves are for regulating the air supply to the cells, in accordance with the refuse under treatment at the time.

The air to the cells is supplied by two positive blowers of the Roots pattern, exhausted through a circular galvanised-iron overhead main, having its intake in the hoppers. By this means the foul gases given off from the refuse are drawn over with the cold air and forced through the regenerative air heater and underground ducts to the front of the furnace blocks; a 6-in. cast-iron pipe is built into these ducts and connected to the side boxes, delivering the heated air beneath the grate bars.

The blowers are belt driven by a Horsfall horizontal steam engine constructed for a working pressure of 100 lb. per square inch.

Should at any time an accident happen to the machine or it is stopped for any cause, an auxiliary oil engine of Messrs. Teasdale has been provided. The makers specify that it is capable of developing 36-brake horse power when running at a speed of 200 revolutions per minute.

There are four cooling tanks, 7 ft. 6 in. in height and 3 ft. 6 in. diameter, from which water is circulated through the water-jacket of the cylinder. A compression tank served by a pump driven off the engine, together with silencer for air and exhaust are embodied.

The engine has driving pulleys provided to which are attached belts for transmitting the power on to a 3-in. diameter polished-steel line shaft running at about 150 revolutions per minute, suspended on stout cast-iron brackets; to this shaft is fixed all necessary loose and fixed pulleys for transmitting the power to the blowers; each blower is fitted with two belts, one running crossed, the other open. With these blowers a strong and even blast is maintained under all conditions.

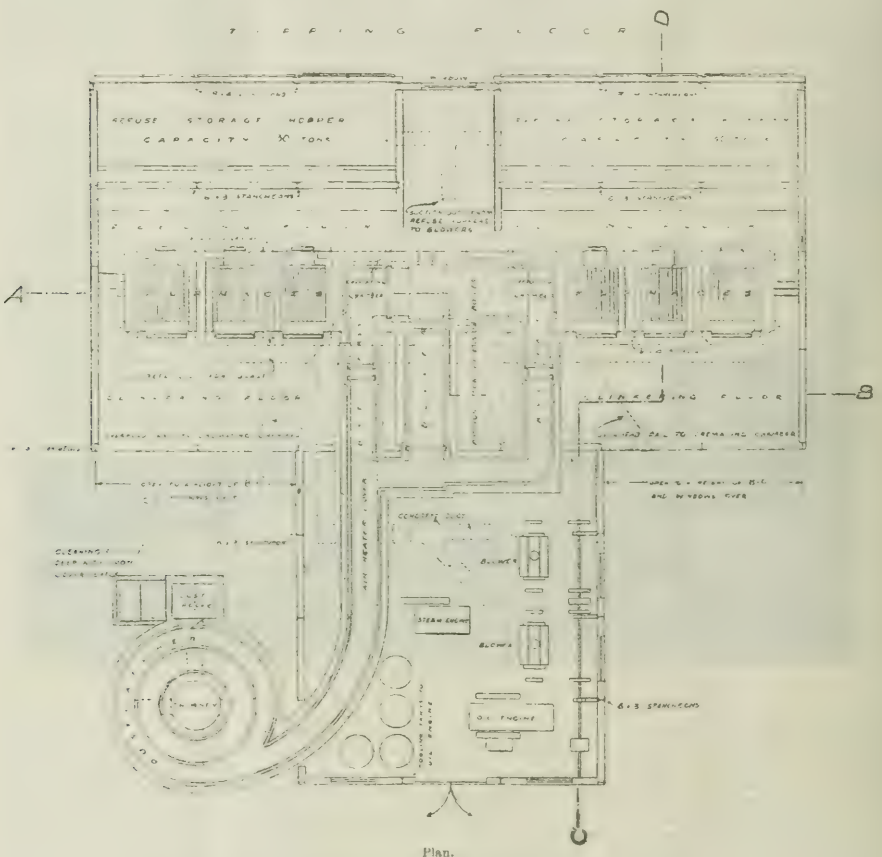
The hot gases given off from the burning refuse pass through the combustion and cremating chambers, which are of ample capacity and form part of the block of cells which are so arranged that the gases are thoroughly mixed, and perfect cremation and a constant flow of gases into the boiler at the highest temperature is thus insured.

The beast cremating chambers are constructed in similar firebrick to the cells, and are capable of receiving a cow or horse. At the top of these chambers are large cast-iron doors, lined with firebricks, having a water seal for preventing the hot gases from blowing out; these doors are counterbalanced so as to be readily opened by hand.

The carcases are hoisted by a pair of patent pulley blocks, mounted on a trolley fixed to H section steel joist placed in such a position as to enable the beast to be lifted from the clinkering floor, traversed over the top of the furnaces to the centre of the cremating chamber, and dropped in by cutting a rope without the necessity for handling the carcase.

The boiler was built by Messrs. Babcock & Wilcox, and has a heating surface of 983 sq. ft., with a working pressure of 120 lb. per square inch.

One of Messrs. Weirs' direct-acting feed pumps has been installed, capable of delivering 300 gallons per hour, with and against a pressure of 120 lb. per square inch, and 600 gallons per hour against emergency. The water feed for this pump is taken from a galvanised-iron feed tank of 600 gallons capacity, fixed on top of the boiler flues to the dust catcher, passing through the boiler-house, and an underground storage




Plan.

Colombo Refuse Destructor.

tank built of reinforced concrete, with a capacity of 12,000 gallons, has been provided in case of emergency.

All parts of the setting exposed to heat are lined with firebrick, and baffle walls are built for deflecting the gases in their passage to the main flue at the back of the boiler. There the gases pass through the numerous tubes of which the heater is constructed, thus coming in contact with the cold air being forced through the chamber by the blowers, and heating the air on its way to the cells. This heater is a very large one, chiefly provided because a hot blast has a powerful effect in drying wet refuse when first fed into the furnaces.

The gases travel along the flue to the dust catcher, which has a centrifugal action in dealing with the dust that may have been blown forward. The construction is so arranged that by using the swing door connected with the annular chamber the dust is driven into the dust pocket by centrifugal force, and facilities for cleaning the chamber out without interfering with the working of the plant have been provided.

The dust catcher is of the Accrington patent type, built of good local bricks in lime mortar and lined with firebricks set in fireclay cement and plastered in lime mortar on the outside to harmonise with the engine-house. The roof is covered with firebrick quarries, floated over with cement concrete to protect it from the weather. The gas passages have a bull-nose finish to all sharp angles in the interior. Hinged doors are built in, giving access to the chamber and to the cleaning pocket. The gases enter the chimney through four eyes opening out of the dust catcher.

### OIL-FIRING APPARATUS.

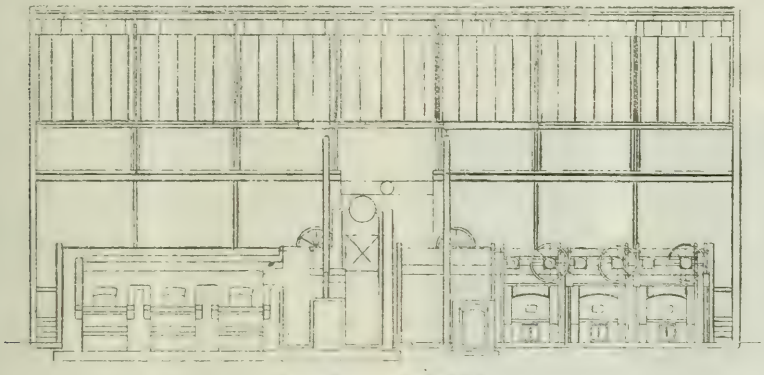
When the plant is working under normal conditions, it should require no outside combustible matter, such as wood or coal, to assist in consuming the refuse fed into it, but, in view of the heavy tropical rainstorms at times subjected to in Ceylon and the extraordinary nature of some of the refuse we shall be called upon to burn, including plantain trees and other vegetable matter, extremely difficult to burn, it was considered advisable to provide special oil jets. These are fixed to each cell on the feeding side, spraying into the cells oil in a vaporised form, which will considerably assist in burning the refuse; at the same time, it is hoped that it will not be found necessary to put them into use often. The boiler is supplied with one of these jets for raising steam until the cells are thoroughly hot.

The oil-firing apparatus is made by the Lucal Light and Heating Company, England. In the top burner the oil is sprayed by means of a jet of steam, this steam being highly superheated before reaching the spraying nozzle within the coil attached to the burner, and this coil receives its supply of heat from the flame of the burner. The oil, or as much as will gasify, is broken up into gas; that which will not do so is ejected along with the gas to burn as incandescent particles. At the same time air, in proper proportions, is drawn into the burner, being heated in its passage to mix with the gas, and thus the whole is brought into a condition to burst instantly into flame, without the aid of supplementary means, inside the cells or boiler.

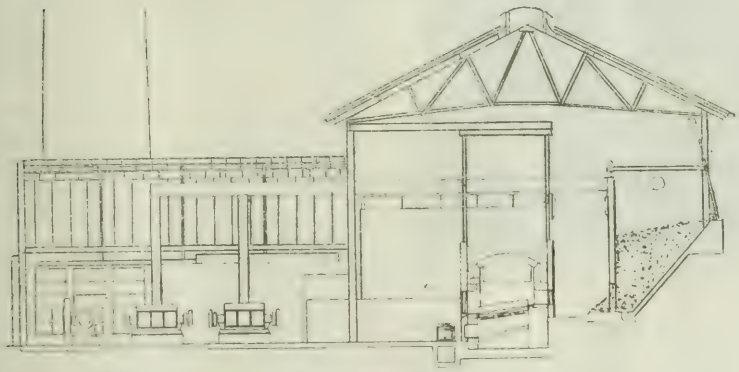
The amount of steam required for ejection and spraying is 1¼ per cent to the total steam formed.

The oil may be any burning oil, crude or refined. It enters the burner from the store tanks by gravitation. The oil needs no preparing; if it is too thick to run easily it should be slightly heated before use. According to tests made by Prof. Watkinson, the consumption of oil for evaporation is practically perfect—that is, 100 per cent. No heavy labour charges take place in the use of these burners. Once the apparatus is started, the man in charge has nothing to do but keep up the oil supply to the reservoirs.

Starters are supplied to this installation, by which steam in the boiler can be raised from cold water. These will only be used when the whole of the plant has been closed down for cleaning purposes or repairs. The appliances consist of a burner head and tank of water with means to put the boiler under a pressure



Sectional Elevation on Line A B.



Transverse Section on Line C D.

Colombo Refuse Destructor

of 60 lb. The water is conveyed to the starter head, which has already been coupled to the oil pipe, and the coils are then heated with a saturated piece of waste. When sufficiently hot the water is turned on and afterwards the oil. As the water runs through the coils it is instantly converted into steam necessary for ejecting the oil under the boiler until sufficient steam is generated in the boiler to feed the other jets in use.

The storage hoppers have a capacity of 30 tons. The hoppers are enclosed by means of a brick concrete ceiling and brick concrete walls 6 in. thick stiffened with H angle iron stanchions with angle iron cross bars, and are separated from each other in the centre by a space of 10 ft. The hopper is sloped to an angle of 50 deg., which shoots the refuse on to the feeding floors, at the bottom of which is a 12-in. drain covered with cast-iron checker plates to carry off as much moisture as possible from the rubbish. The sloping floor is constructed of 6-in. cement concrete reinforced with 3-in. mesh expanded metal sheeting. The feeding floor is also of concrete, but not reinforced. The tipping beam against which the bullock carts will back is of teakwood. The doors to the hoppers are of galvanised iron sheeting 20 B.W.G., with angle iron framing and braced with flat iron. They are hung with balance weights placed at the back of the wall.

Coming to the other side of the furnaces, the clinkering floor is constructed of 6 in. cement concrete. The flues leading to the chimney are built in good hard burnt local bricks and are lined on the inside with firebricks 4½ in. thick, bonded at intervals. The arches are built entirely of specially made end wedge firebricks covered over with common bricks not bonded to the firebrick work. The bottom of the flue is paved with firebricks on edge with common bricks laid flat as a foundation and the top is covered with firebrick quarries. All firebricks are set in special fireclay cement with an admixture of silicate of soda. The flues between furnaces and boilers are built with an air space between the lining and the outer walls to prevent loss of heat.

### THE CHIMNEY.

The chimney is 120 ft. high and is 6 ft. 6 in. in external diameter. The plates vary in thickness from [illegible] to ⅝ in., the thickness diminishing by ⅛ in. every 40 ft. in height of chimney. The plates were sent out from England in half sections 10 ft. in height, and are riveted together with ¾-in. rivets.

The base plate is a substantial casting, secured to the cement concrete base 4ft. 6 in. in depth and 18 ft. in diameter by four holding-down bolts. Owing to the splendid nature of the foundations, hard cabook earth, it was found possible to reduce the thickness of concrete shown on the drawings not only in the case of the chimney base, but throughout the building. Eighty feet from the ground the chimney is stayed by four 3¼-in. cir. steel wire guy ropes fixed to the ground 80 ft. from the chimney by holding-down bolts with shackles attached, fitted with tension screws, anchored to 12-ton concrete blocks to take the strain from wind pressure.

The lining of the chimney is of best quality Leeds segmental firebricks. A 14-in. wall is built at the base, carried up to the bottom of the ports, with a 9-in. wall to the top of the ports, and from there to the top of the chimney in 4½-in. brickwork, all of which is jointed with fireclay cement. A space of 1½ in. has been left between the brickwork and the inside of the steel plates to permit of any expansion [illegible] that may take place in the chimney, and also to prevent loss of heat.

The erection of the chimney proved to be the most interesting part of the construction of the plant from an engineering point of view. In this country, where it is difficult to obtain anything beyond bamboos for scaffolding, it was considered to be unsafe to attempt to hoist the steel plates into position with this kind of scaffold. The size of the plate made it a most difficult one to handle, and the problem was solved by Mr. Robert Skelton, the municipal engineer, who designed an appliance for the hoisting of the plates into position with the minimum of trouble and the greatest accuracy and safety. This appliance consists of a jib and cradle. The circular framework is of 2½-in. by 2½-in. by ¼-in. angle iron braced with 2-in. by ¼-in. flat iron, and fits into the inside of the steel chimney, allowing about 1 in. of play. The first three cylinders were fixed in position by means of a derrick [illegible] and [illegible]. The cradle was then hoisted [illegible] to the top of the 3rd section. Fixed inside the framework of the cradle is a 2-ft. 4-in. diameter circular band of 2½-in. by 2½-in. by ¼-in. angle iron, around which the jib is enabled to travel by means of four small rollers.

The centre of the revolving jib is such that the jib overhangs the chimney and lifts the half cylinder, the weight of which varied from 10 cwt. to 12 cwt., according to thickness, by means of a steel wire rope passing over pulley wheels and led down the chimney to a hand winch, which was manned by four coolies.

When the cylinder reached the top of the completed portion of the chimney, the jib was swung round so that the half cylinder came exactly into the proper position and was ready for riveting, service bolts being fixed to steady it, and these were removed as the rivets were driven home.

In this manner the plates were hoisted and fixed, and then, when ready for the next section, the jib and cradle were hoisted bodily up the completed portion of the chimney by means of pulley blocks and chains attached to two old rails placed across the top of the chimney. The whole arrangement worked freely and without jamming, and in order to avoid any danger of slipping the cradle was secured to the inside of the cylinder already in position by small diamond-shaped plates, through which ¾-in. holes were drilled to admit of service bolts being attached to the chimney plate. As an additional precaution, stout hooks were employed for hooking the cradle to the chimney. The rivets were hammered from the inside of the chimney, a light bamboo scaffolding being carried up outside for the men and forge to stand upon.

The firebrick lining was walled to the full height of the chimney, and carried up by means of a light bamboo scaffolding erected inside the chimney shaft. The masons worked by day, and occasionally by night, with lamps and candles. The erection of the steel plates in the manner described above occupied six weeks.

### THE DESTRUCTOR BUILDING.

The shell of the building consists of local common bricks, care having been taken to have only bricks of the very best burning. The internal work is pointed in lime mortar, and the external work has been plastered in lime mortar 2 to 1. Wherever possible hit-and-miss brickwork has been put in, in order to keep the building as cool as possible, together with diamond pattern cast-iron air inlets 12 in. by 6 in., fixed in the walls close to floor level. The doors and windows are of teak framing, with frosted glass glazing.

The roof is a double one of galvanised iron sheeting carried on light iron roof trusses, and its principal feature is the care given to air inlets, as, of course, in a tropical climate like that of Ceylon a building of this description requires to be built on the coolest possible lines. All gutters and downpipes are connected to underground stoneware drains, which are in turn connected to the main sewers.

The building will be lit by five Blanchard kerosine oil lamps of 500-candle power each.

A weighing machine with checker's room, for the purpose of checking the amount of rubbish brought to the destructor, has been installed immediately adjoining the hoppers. The machine is one of Messrs. Pooley & Company's, and is capable of registering loads up to 2 tons.

The total cost of the plant is approximately Rs.210,000, and the contractors for the various branches of the work were:—

Messrs. The Horsfall Refuse Destructor Company, Pershore, England, for the supply of plant, chimney, and all special firebricks, the erection being done by the council's own staff.

Messrs. C. A. Hutson & Company, Colombo, for the hoist.

Messrs. Walker, Sons & Company, Limited, Colombo, for the joinery work, and various earth and brickwork piecework contractors.

The late Mr. J. W. Wilson, who came out at the commencement of the work as Messrs. Horsfall's representative, died after only four months' residence in the Island. Messrs. Horsfall subsequently sent out another engineer, Mr. W. T. Wood, for the final test, and in the interim the author acted for Messrs. Horsfall & Company, in addition to his own duties as engineer-in-charge of the erection of the destructor, which has taken nine months to build.

### ADDENDUM.

Since writing the above description the plant has been working continuously night and day from January 19th last, so that the author is enabled to

...ers the following details with regard to the ...ency and working cost of the plant.

| | t. | c. | q. | lb. |
|---|---|---|---|---|
| Total amount of rubbish incinerated on Feb. 21, 1912, for 15 hours ... | 17 | 19 | 2 | 15 |

Amount of Residue.

| | t. | c. | q. | lb. | | | | |
|---|---|---|---|---|---|---|---|---|
| Broken tiles, bricks, tiles, &c. ... | 9 | 10 | 2 | 10 | | | | |
| Sand ... ... | 7 | 2 | 2 | 1 | | | | |
| Clinker ... | 2 | 4 | 1 | 16 | | | | |
| Fine ash ... ... | | 7 | 0 | 4 | | | | |
| | | | | | 19 | 4 | 2 | 3 |
| Amount converted into gas and discharged by chimney ... ... | | | | | 28 | 15 | 0 | 12 |

Water evaporated in the Babcock and Wilcox boiler per hour equals 150 gallons at 120 lb. pressure equals 1,500 lb., which gives a total approximate brake horse power of 75, from which it would appear that at the present time something like 50-horse power is available for other purposes. This result is derived from the full duty of four cells only; when the plant is worked to it's full capacity there should be a proportionate increase in the horse power available.

It will at once be apparent from the data given that the refuse contains a very large proportion of sand. In fact the author has rarely seen dirtier refuse, due, in his opinion, to the sweeping up of the cinnamon sand with the refuse collected from gardens, &c. This naturally makes the refuse more difficult to burn, and a larger proportion of fine ash than is usual comes away as residue; but it will be seen from the report furnished by the city analyst on the residual ash and clinker that there is a very small percentage, 1·4 and 0·5 respectively, loss on ignition, which indicates that the furnaces destroy practically the whole of the combustible material, in spite of the indifferent stoking which exists at present with the raw untrained coolie material available.

Dead bulls of average size placed in the cremating chambers took one hour to reduce to ashes, which is quite satisfactory.

The labour required to run the plant under normal conditions is: One supervisor, two shift engineers, two greasers, four head coolies, fourteen coolies stoking in eight-hour shifts to feeding floor, four coolies in eight-hour shifts to clinkering floor, five coolies removing, sorting, and picking out tins, cleaning up, &c.; and the nett working cost of the plant per day at present averages Rs.65, so that the cost of burning 1 ton of refuse averages Rs.1·33. To this daily cost must be credited the value of the steam power—namely, 50-horse power at, say, 50 cents per day, equals Rs.25 now—and with the plant in full work this may prove to be an asset of Rs.50, leaving a nett cost of running the plant at something between Rs.40 and Rs.25 per day. Also must be credited the receipts obtained from the incineration of dead animals, the charge being Rs.1·00 per head, and it is probable that a considerable sum will be earned from this source. Again, the value of the clinker must be taken into consideration for its worth as filling to road and footway foundations, &c. At the present time the filling is being used in the construction of the new road known as Mansergh-avenue.

Treasure trove also is an asset which would appear to be a point for consideration, for up to the present there has been found among the refuse shot into the hoppers such valuables as a necklace, valued at Rs.500; a till containing money; two dozen unopened ½-lb. tins of cocoa, and sundry articles of jewellery.

**Coke Oven Tars.**—In a circular issued by the United States Office of Public Roads the results of tests of coke oven tars are given, showing the percentages of free carbon and the percentage by volume of total distillate to 315 deg. Cent. The average percentages vary from 3·38 in the case of tar from ovens of the Koppers type to 17·17 tar from ovens of the United Otto and Rothberg type. The next lowest results were with tars from Semet-Solvay ovens, the average percentage being 6·74. The author of the circular, Mr. Prevost Hubbard, believes that by-product coke ovens will eventually play a most important part in the road-material industry in the United States. The tars which he examined were mostly below 1·20 in specific gravity, and the percentage of water exceeded 5 per cent in only three instances, the maximum being 10·1 per cent. Of the pitch residues remaining after distillation to 315 deg. Cent., no less than 14 were either soft or plastic.

## THE ROAD BOARD PERSONNEL.

### 8.—MR. J. WALKER SMITH.

Mr. J. Walker Smith, who is a member of the Engineering Advisory Committee of the Road Board, is chief engineering inspector to the Local Government Board of Scotland, to which position he was appointed in May, 1910.

Mr. Walker Smith is the second son of Mr. T. Jonah Smith, managing director of Messrs. Smith, Patterson & Co., of Blaydon-on-Tyne and London, and was born in November, 1874. He was educated at King's College, London, and served for a short period with a firm of ironfounders and engineers. He was articled in 1892 to Mr. O. Claude Robson, M.Inst.C.E., whom he subsequently served as an assistant engineer until 1898. During this period he was engaged principally upon the extensive sewerage works of the Brent district. From 1898 to 1901 he was chief engineering assistant to Mr. G. T. Lynam, M.Inst.C.E., borough engineer of Burton-upon-Trent, where he was engaged upon various large sewerage schemes.

In 1901 Mr. Walker Smith was appointed deputy engineer to the county borough of Barrow-in-Furness, and was engaged principally upon the scheme for water

Mr. J. Walker Smith, M.Inst.C.E., M.I.Mech.E., F.S.I.

supply from the River Duddon, and in 1902, upon the office becoming vacant through the death of his chief, Mr. W. H. Fox, Assoc.M.Inst.C.E., he was appointed borough engineer of Barrow-in-Furness. In this capacity he carried through the conversion of the steam tramways to electric traction, and extended certain routes. In association with the late Sir Benjamin Baker he carried through, from inception to completion, the bridge works in connection with the crossing of the Walney Channel. Among other important works which fell to his lot while at Barrow-in-Furness were those in connection with the model village of Vickerstown, the extension of the main sewerage, the refuse destructor, electricity and gasworks extensions, the laying-out of the public park, and the town-planning of large areas of the borough, which were facilitated by the extensive statutory powers which that borough possesses.

Many important and extensive street works were carried out during his period of borough engineership, and facilities for experimental work in improved and modern forms of road construction were freely afforded to Mr. Walker Smith by this progressive borough, one of the main streets of which was tarred in 1903.

In 1908 Mr. Walker Smith was appointed city engineer of Edinburgh, and prepared and carried out large sewerage and tramway works, and prepared town

planning schemes for this city, which has such magnificent examples of the Town Planning Act as practised in the early part of last century.

Mr. Walker Smith is a member of the Institution of Civil Engineers, and a "Telford" Gold Medallist—for his paper upon "The Improvement of Highways to Meet Modern Conditions of Traffic"—and a "Joule" Medallist and "Miller" Prizeman of that institution; a Fellow of the Surveyors' Institution, and a member of the Institution of Mechanical Engineers and of the Institution of Municipal and County Engineers, and is the author of "Dustless Roads - Tar-macadam."

## BITUMINOUS MATERIAL FOR ROAD CONSTRUCTION.

[Report of a special committee of the American Society of Civil Engineers, comprising Messrs. W. W. Crosby, chairman, Hubert K. Bishop, Arthur W. Dean, and Arthur H. Blanchard, secretary.]

Your committee believes that, in order to solve many of the problems of construction and maintenance, it is more necessary to have at hand physical data recorded along uniform lines for a relatively short period than to prove the correctness of certain fine theoretical points. Your committee, therefore, regrets an apparent tendency in some instances to ignore the opportunity offered by the committee for collaboration, which would result in mutual benefit, and deprecates any tendency to return to the former chaotic conditions which would ensue from individual, non-concurrent effort.

Your committee submits, under the following heads, recommendations relative to the use of bituminous materials in the construction and maintenance of roads:

TRAFFIC CENSUS.

Your committee desires to emphasise the fact that experience has demonstrated the value of traffic censuses taken, both preliminary and subsequent to the construction of a highway.

The traffic census should be considered one of the most important variable factors in the solution of that important problem, the selection of that type of road or pavement best suited to local conditions, considered from both the standpoints of economy and efficiency. In connection with the census returns on any road should be considered the traffic on cross and parallel highways, and the effect of improvement of these highways on the traffic of the highway under consideration.

It should not be taken for granted that the bald return of a traffic census should be the sole basis of the selection of the type of road or pavement, but it should be considered a guide in estimating the value of the type of construction adopted.

The form for a traffic census proposed by your committee has proved satisfactory, and its future use is recommended.

CROWN.

The investigations and observations of the committee to date have convinced it that the crown generally used in the construction of macadam roads is excessive when bituminous materials are used, and that a crown of even one-half inch to the foot should be avoided when a lesser crown can be secured without detriment to the surface drainage.

SUB-GRADES AND FOUNDATIONS.

Your committee believes that the use of any form of a bituminous surface does not preclude the necessity for the construction of a well-drained, thoroughly compacted, and adequate sub-grade. In fact, such improvement of the road surface frequently attracts heavier traffic and thus increase the stresses in the sub-grade.

[illegible] STANDARDS.

Your committee feels it is as yet too early to report specific data as to the [illegible] recommended [illegible] of the country.

Your committee desires to state, however, that it is essential to the desired [illegible] the following:

(a) The maximum amount of distillate in tar [illegible] up to 170° Cent., as determined by the test proposed by your committee, that can be satisfactorily allowed.

(b) The maximum percentage of free carbon that can be successfully allowed in a tar used for superficial treatment under varying climatic conditions.

(c) The maximum amount of residue and the hardness of penetration thereof that can be satisfactorily permitted in an asphaltic oil used for superficial treatment when such residue is obtained and tested under the evaporation test proposed by your committee for such materials at 170° Cent.

METHODS OF CONSTRUCTION.

(*a*) Your committee wishes to emphasise the fact that the selection of the method of construction to be used in a given case will depend upon the results of preliminary investigations, and that the recent and imminent development of mechanical appliances will affect the decision to a great degree.

(*b*) Your committee is of the opinion that, whatever method may be used in any case, it is essential, as in water-bound macadam construction, that a suitable quality of road metal be used.

(*c*) Your committee is of the opinion that, whatever method of construction is selected, the use of a bituminous material by no means justifies any lack of care in the ordinary details to be followed, but rather increases the need for thoroughness and skilled supervision.

CONSTRUCTION DETAILS.

Your committee recommends:—

(*a*) That trap rock in sizes greater than that passing a 2-in. screen should be used with caution in the construction of the upper course, unless the voids of the same are properly reduced, because of the liability of the individual stones to rock under traffic.

(*b*) That in the use of a heated aggregate for the construction of a bituminous pavement, non-uniformity or excess in the heating of stone, such as usually occurs with the use of flat plates or similar crude appliances for this purpose, should be avoided.

(*c*) The consideration of the use of a seal coat on bituminous pavements constructed by the mixing method, and which are subjected to a traffic of more than 10 horse-drawn commercial vehicles per day per foot of width of metalled surface.

COST DATA.

In the work of the committee, it has become apparent that conclusions may necessitate the use of cost data, recorded along uniform lines. It seems urgent that standards for arriving at costs be established and generally adopted as promptly as possible. Your committee therefore recommends to the attention of the profession this important feature of engineering work, with the hope that uniform methods will be generally adopted at an early date for reporting costs of construction, such as those proposed by the committee in its report forms.

NOMENCLATURE.

(*a*) Your committee wishes to advise strongly the discontinuance of the use of the terms "liquid asphalt" and "asphaltic contents," since these terms are meaningless in many cases, and unnecessary when proper tests, such as are recommended by your committee, are used.

(*b*) For the sake of convenience and uniformity, your committee advocates the adoption of the following definitions covering the present ordinary use of bituminous materials in road construction:—

"Bituminous surfaces" consist of superficial coats of bituminous materials with or without the addition of stone or slag chips, gravel, sand, or material of similar character.

"Bituminous pavements" are those composed of stone, gravel, sand, shell, or slag, or combination thereof, and bituminous materials incorporated together.

**Steel Piling.** We have received from the RansomeverMehr Machinery Company, Caxton House, Westminster, S.W., a copy of a booklet (No. 122) giving information with regard to that firm's type D piling, the design of which, it is claimed, is such as to afford the maximum possible advantage obtainable, both in strength and economy. The metal in the section is distributed so that the neutral axis of the section [illegible] the right [illegible] to be the neutral axis [illegible] an exceptional strength for a given weight of material, the practical result obtained, the makers contend, being that one ton of their piling when interlocked covers a greater surface area than can be obtained with any other section of equal strength. The type D section is suitable for all classes of sheeting work where timber might be used, and, in addition, for a number of duties where the adoption of timber would be impossible, both from an economic and practical point of view. Moreover, it is capable of piling round irregular areas, and can, if need be, form circular coffer-dams, such as are used for pot, butt, and column foundation work.

# Assistants' and Students' Section.

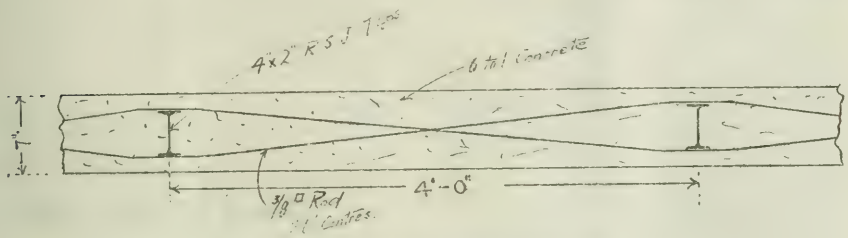
Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 24 Bride-lane Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

## QUESTIONS.

This week answers are invited to the following questions:—

**236. Reinforced Concrete Roof.**—Is the form of construction shown in the annexed figure suitable for a roof for a one-storey building, 9-in. walls? The roof may be used for storage purposes, and would as such have to carry in addition to its own weight 2½ cwts. per foot super. The spans vary from 6 ft. 6 in. to 9 ft., and all the bays are 17 ft. long. Fall in roof 6 in. In order to reduce the thickness of concrete to, say, 6 in., would R.S. joists 3 in. in depth be sufficient? If any reader can suggest a better form of construction (cost being a consideration), I should be much obliged. ("Hotel de Ville.")

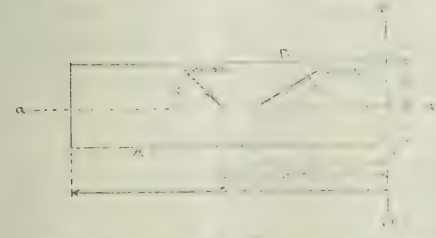



Reinforced Concrete Roof Construction.

**237. Egg-shaped Sewer.**—State a formula for obtaining the discharge of an egg-shaped sewer, also show how to obtain the hydraulic mean depth of same. (F. B., *Hereford.*)

**238. Small Sewage Disposal Installation.**—Sketch and describe an installation consisting of a septic tank and filters for dealing with the soil sewage of about 750 persons, showing all the calculations for size of filters, &c. The filters are to be arranged so as to be capable of being enlarged if required. It is possible to have land treatment afterwards on about ½ acre to ¾ acre of land. The effluent is to discharge into a ditch, and must be kept to a high standard. The scheme is not meant to be permanent, and is only required for a period of about six years, until sufficient assessable value is created to apply for a sewer loan to connect to a now existing sewerage system. ("Somerset.")

**239. Stresses in a Beam.** A B is part of a beam, of which *pq* is a cross-section, cut by the plane P Q. *a a* is the axis of the beam. Forces of 4,000 lb. and




12,000 lb. act at the inclinations and distances shown. The moment of inertia of the section is 12 in. units, and its area is 4½ sq. in. Find the total compressive and tensile stresses in the section *pq*. (E. A. B., *Leicester.*)

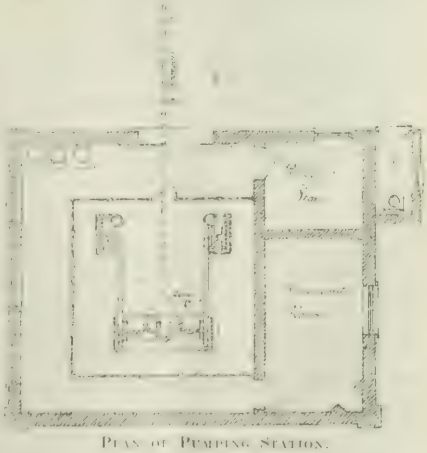
**240. Pipe Joints.**—Sketch and describe some forms of joint suitable for stoneware pipes to be laid in waterlogged ground. (T. R.)

## REPLIES TO QUESTIONS.

**234. Pumping Station.**—Sketch and describe a small pumping station capable of lifting 100,000 gallons of water daily from a borehole in the rock and delivering through a rising main 500 yds. long into a reservoir, the total vertical lift being 100 ft. After working out the theoretical horse power required, state the brake horse power and type of engine you recommend, and give your reasons. (M. and C.E.)

It is assumed that the borehole is about 500 ft. deep and 12 in. in diameter, and that the water rises to within 5 ft. of the surface. First a well, say 9 ft. diameter, should be sunk (with borehole as centre) to a depth of about 40 ft. Then the pumping station itself may be built so as to enclose the well, and when this is completed the staging for the pumps to rest on must be fixed in the well so that the pumps shall be at the permanent water level. The deeper the well the better, because the water is at a much greater hydraulic pressure at, say, 30 ft. deep than 5 ft. It would probably be advisable to fix the pumps themselves not more than 5 ft. from the surface (the pumps not being capable of lifting more than 25 ft. vertical).

To determine the diameter of the pump barrel, assuming it to have a 1 ft. 6 in. stroke, and making



Plan of Pumping Station.

50 revolutions per minute and number of gallons per minute is 100,000 ÷ 1,440 = 70 approximately.

$$d = \sqrt{\frac{70}{0341 \times 1\cdot5 \times 50}} = \sqrt{27\cdot5} = 5\tfrac{1}{4} \text{ in.}$$

Allowing for leakage, &c., a 6-in. barrel would suffice.

Again, I have found that the delivery and suction

pipes would have a 5 in. diameter suction (for maximum discharge of about 100 gallons per minute).

The motive power might be oil engines or producer gas engines, both being very economical and demanding little attention.

The pumps should be belt-driven, or if more convenient they may be coupled direct.

The theoretical horse-power required would be:

$$\frac{\text{Weight of water per minute} \times \text{height to be raised}}{33{,}000}$$

$$\frac{2{,}000 \times 10}{33{,}000} = 2 \text{ h.p. (say)}.$$

In practice an engine of that horse-power would, of course, be insufficient, but two engines of 5 b.h.p. fixed in duplicate, and driving duplicate sets of gearing to the top of the well and directly connected with the pumps, would suffice.

The best kind of pumps would be double-acting deep well pumps with 1 ft. valve to each suction.

The specification for each well therefore would be:

Two oil engines of 5 b.h.p.

Two double-acting deep well pumps, 6-in. barrel, 1-ft. 6-in. stroke, and making 50 revolutions per minute.

Two sets of gearing in same frames.

Two sets of guides with rods complete.

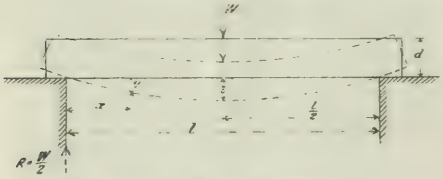
Two foot valves attached to pump barrels.

Two reflux valves.

A sketch plan of station is appended. (A. R. M.)

**235. Elasticity of Steel.**—A rectangular steel bar, 3 in. by 2 in., is placed on edge between bearings 3 ft. apart. What load placed at the centre will deflect the bar $\frac{1}{8}$ of an inch? Assume E = 30,000,000 lb. per square inch. (M.R.S.I.)

In connection with this question, it will not perhaps be out of place to show the manner in which the equation for determining the deflection of a beam supported at the ends and carrying a concentrated load midway between the supports is derived mathematically from the fundamental beam formulæ.




Let W = concentrated load in pounds.
$l$ = span in inches.
$b$ = breadth of beam in inches.
$d$ = depth of beam in inches.
I = second moment of section.
E = modulus of elasticity.
R = radius of curvature at any point.
$x$ = distance from any point from one support.
$y$ = deflection of beam at such point.
$\delta$ = maximum deflection.
M = bending moment round section.

$$y = \frac{d}{2}$$

From mechanical laws we have

$$\frac{M}{I} = \frac{f}{R}$$

$$\therefore \frac{EI}{R} = M \quad \ldots \quad (1)$$

Now R can be easily proved (see any work on the calculus such as Perry or Lodge) that $\frac{1}{R} = \frac{d^2y}{dx^2}$. This is not the theoretically true expression, but it is sufficiently accurate, considering the curve of deflection is very flat and has but little slope.

The value of $\frac{1}{R}$ must now be substituted in (1), and the value of the bending moment be stated in terms of $x$.

For $x$ between the centre and span, $M = \frac{W}{2}x$ until $x > \frac{l}{2}$, and the bending moment is a minimum at the centre to give a positive value to the deflection.

Equation 1 now reads

$$EI\frac{d^2y}{dx^2} = \frac{Wx}{2} \quad \ldots \quad (2)$$

By integration,

$$EI\frac{dy}{dx} = \frac{Wx^2}{4} + C \quad \ldots \quad (3)$$

(C is a constant of integration).

To find C, the slope must be known at some place. Well, the slope immediately under the load—*i.e.*, at $\frac{l}{2}$—is nil, so when $\frac{dy}{dx} = 0$ then $x = \frac{l}{2}$. Put these values substitute in (2).

Then (2) reads

$$0 = \frac{W}{4}\left(\frac{l}{2}\right)^2 + C \text{ (from which } C = -\frac{Wl^2}{16}\text{)}$$

Equation (2) thus becomes

$$EI\frac{dy}{dx} = \frac{Wx^2}{4} - \frac{Wl^2}{16}$$

from which the slope at any point can be calculated.

Again integrate, then

$$EIy = \frac{Wx^3}{12} - \frac{Wl^2}{16}x + K \quad \ldots \quad (3)$$

(K is another constant).

To find K.—From the figure when $x = 0$, $y = 0$, which by substitution in (3) gives K = 0.

Equation (3) can now be put

$$y = \frac{1}{EI}\left(\frac{Wx^3}{12} - \frac{Wl^2}{16}x\right) \quad \ldots \quad (4)$$

This equation gives the deflection $y$ at any point $x$ along the half span, so by inserting a value of $x$ not exceeding $\frac{l}{2}$ in (4) a curve of deflection for the half span can be drawn, the other half span will be a similar curve.

The maximum deflection ($\delta$) occurs immediately under the load, so substitute $\frac{l}{2}$ for $x$ in (4).

$$\text{Then } \delta = \frac{1}{EI}\left(\frac{Wl^3}{32} - \frac{Wl^3}{96}\right)$$

$$\therefore \delta = \frac{Wl^3}{48EI} \quad \ldots \quad (5)$$

which is the very form given by Unwin, the beam remains elastic under the load.

Considering the bar in question is mild steel, with a value of E, 30 × 10⁶, the deflection appears somewhat considerable. To test this, assume a value for the elastic limit of 20 tons per square inch, and find the load to give this stress.

$$\text{Now } M = \frac{1}{y} \text{ and } M = \frac{W}{4}l$$

$$\therefore \frac{1}{y} = \frac{\frac{W}{4}l}{\frac{bd^3}{12}}$$

$$\frac{W}{4}l = \frac{2}{3}\frac{bd^2}{l}$$

$$\therefore W = \frac{2}{3}\frac{bd^2}{l^2}$$

$$W = \frac{2 \times 2 \times 3^2 \times 20}{3 \times 36} = 6 \text{ tons.}$$

*i.e.* 15,000 lb.

Inserting this value of W = 30 in determining the deflection due to this load.

$$\text{Then } \delta = \frac{15{,}000 \times 36 \times 36 \times 36 \times 12}{48 \times 30{,}000{,}000 \times 2 \times 27} = 1 \text{ inches}$$

thus showing that the beam when its deflection has reached $\frac{1}{8}$ in. has been loaded beyond its elastic limit. The only way to determine the required load is for the actual experiment to be performed, as these formulæ are not applicable when the elastic limit has been exceeded, as in this instance. (H. F. W., *Tottenham*.)

**What Town Planning Means.**—A pamphlet with this title by George L. Pepler, F.S.I., has been issued by the Garden Cities and Town Planning Association. Mr. Pepler combines knowledge of the Act with experience, and his pamphlet is so well planned [illegible] and [illegible] that the pamphlet sums up Mr. Lough's measure in a way that has not before been attempted, and that within the scope of seven pages it presents the most valuable features of the Act and indicates the way in which its opportunities may be taken advantage of. Copies of the pamphlet, price 1d., or 2d. post free, may be obtained from the Garden Cities and Town Planning Association, 3 Gray's Inn-place, W.C.

The Surveyor
And Municipal and County Engineer.

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## DUBLIN SPRING SHOW EXHIBITS.

On Stand No. 90 at the Royal Dublin Society's Spring Show, the exhibit of Messrs. Marshall, Sons & Co., Limited, Gainsborough, will make a strong appeal to all interested in the use of power plant for agricultural purposes, as the group includes a traction engine and threshing machine, and one of the firm's oil tractors, which have already well demonstrated their efficiency and economy in agricultural work.

The oil tractor is the Class "E" size, rated at 16-horse power draw-bar load—*i.e.*, equivalent to the haulage power of sixteen ordinary farm horses—but it is capable of developing 30 to 35 b.h.p. when belt-driving stationary machinery. Its power, generated by a two-cylinder internal combustion engine fitted with Ackroyd-Stuart gear, is transmitted to the driving wheels by chain and bevel gearing running in an oil bath, all making for easy running and reduction of working stresses and vibration. The tractor is provided with gearing for speeds of 2½ and 4 miles per hour, the former being used for ploughing and similar work, and the latter for ordinary haulage purposes. A winding drum carrying 50 yds. of wire rope is also fitted on the axle. Ordinary paraffin or petrol can be used, and the carburetter is easily adjusted for either kind of fuel. Engines of this type are now successfully working in several parts of this country.

The firm's 4-ton trailer wagon forms a useful adjunct to the oil tractor. Its sides and ends are arranged to let down, it is mounted on springs and wrought-iron wheels, and its construction generally is of the strongest and most serviceable description.

Messrs. Marshall's 6-horse power traction engine is of the single-cylinder type, with boiler suitable for a working pressure of 150 lb. per sq. in. The cylinder is 8-in. diameter by 10-in. stroke, and a mechanically-operated oil pump ensures its efficient lubrication. The equipment includes a winding drum carrying 50 yds. of wire rope, water lifter, feed pump, quick-speed governor, and four-pinion differential motion. The last-named item is an excellent feature, as it enables the engine to turn sharp curves when travelling on the roads, without unduly stressing the hind axle or damaging the road surface. The engine is finely finished in all details, and conforms to the high standard which the firm always maintain with their productions.

A special single-cylinder portable engine, of a highly economical type, will be shown driving a stone-breaker on the stand of Messrs. the Hadfield Steel Foundry Company, Limited (No. 111). The engine is suitable for a working pressure of 160 lb. per square inch, and is fitted with Rider valve gear, ring oiler bearings, feed-water heater, injector, &c.

## CORRESPONDENCE.

*"Men are never so likely to settle a question rightly as when they discuss it freely."* MACAULAY'S "Critical and Historical Essays."

### SOUTH-EASTERN DISTRICT: INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*To the Editor of* THE SURVEYOR.

SIR,—The action of Mr. Maybury and the Kent Association of Surveyors with respect to the nominations for the appointment of representative chairman and secretary for the South-Eastern District appears to have done good work in stirring up a lively interest in so important a matter. I quite agree with Mr. Prescott that it was the duty of the institution to convene a meeting of all the members of the South-Eastern District and other districts, if a meeting was necessary. Mr. Maybury, as a member of the elected council, does not represent either one particular county or district, and it must be altogether outside his duties that he should be responsible for the convening of a meeting and the ultimate filling of the new appointments, otherwise a district so unfortunate as to be unrepresented on the council would be without the machinery to carry out that object.

The institution having taken no steps to convene a meeting, and it being no part of Mr. Maybury's duty to do so, I take it Mr. Maybury, as chairman of the Kent Association of Surveyors, did that which anyone else similarly placed would have done—namely, ascertained the opinion of the Kent surveyors, individually and collectively. It was unanimously agreed to nominate three gentlemen for the offices, and, further, that Mr. Maybury should be heartily thanked for the time, trouble and expense he had incurred in the matter, and asked that he would notify the whole of the members in the South-Eastern District of the course taken, and I may say it was up to the other counties to do the same if they so desired.

The personal element did not enter into the considerations in the slightest degree; in fact the proposals of the division of the offices and having a candidate with a live policy was so good that I with many others anticipated unanimous approval.

That something is still wanting in the institution beyond the millennium in pipe joints and concrete slabs may be gathered from the number of letters received from members notifying their support of Mr. Redfern, the following communications from two influential members being an example:—

"In reply to your letter, I shall only be too pleased to form a unit of the phalanx (solid, I trust) of the voters who should secure Mr. Redfern's election. That the members of the municipal and county service should, after all these years, be without security of tenure or provision for superannuation can only be ascribed, I fear, to their individual inertia and *lassez-faire* attitude, and not to the demerits of their claim. It is refreshing to see vigour imported into the question, and I trust you may not be disappointed by the lukewarm support on the part of the surveyors whose cause you are championing. It has long been felt, I believe, by a not negligible portion of its members, that the institution has not exhibited (more especially in the matter of superannuation) that driving force which should belong to a body boasting of 1,200 members. As an insignificant and helpless member of that institution I can only hope that your attempt to galvanise it into vigorous action will be enthusiastically supported and that the desired result will eventually be attained."

"In reply to your circular letter of the 11th inst. re the 'Municipal Engineers,' I shall have much pleasure in supporting Mr. Redfern when I receive the 'form' &c., from the secretary. I do not know Mr. Redfern personally, but am quite agreeable to accept your recommendation, and I am glad you have been able to find so suitable a gentleman to advocate the views expressed in your letter as to the more material objects for which the institution exists (or ought to exist), and I am heartily in accord with the expression of opinion given in your letter in this connection. I am afraid I have not taken so much interest perhaps as I ought in the 'Municipal Engineers,' very largely on account of want of time, and also very largely because I have felt a little out of sympathy with the 'policy' (if there has been one)—*e.g.*, the 'things *that really matter*' do not seem to have any effectual attention, so far as can be *judged by tangible results*. I have on several occasions wondered whether it was worth my while continuing to pay my annual subscription, the 'Proceedings' being the only return one gets, which thus becomes an expensive volume compared with the market value of such literature. I hope every Kent surveyor and engineer will vote for the policy you advocate."

The Kent surveyors have certainly no desire to arrogate power or appear to be dictatorial, but claim the right to express their views and give them the support they consider necessary. Our loyalty to the institu-

tion is undoubted, and our allies in Surrey and Sussex may reckon on our support in any matter for its well-being. Owing possibly to the great demand on the time of the members of the council *re* the pipe joint, &c., the little necessary details with respect to the proper initiation of the new *régime* have been overlooked, but we must forgive as we hope to be forgiven. —Yours, &c.,

Frank Harris,
Hon. Secretary Kent Surveyors' Association.

Broadway, Southborough.
April 8, 1912.

## WEATHER FORECASTS.

*To the Editor of* The Surveyor.

Sir,—I have to thank you for the prominence given my letter and your special note in "Minutes of Proceedings" upon it in your issue of March 29th. If you accept no further portion of the letter, I feel in justice to myself I cannot let the insinuation stand uncontradicted that I am taking up a position—if I may use the expression—of "puffing" the weather of Tunbridge Wells. I live in one of those "common villages" in the neighbourhood of a watering-place, but beyond that I am very little interested in its welfare; I am out for facts and common sense.

You will note that my letter referred to a forecast stated by a Chiswick firm to have been supplied them by special arrangement with the Meteorological Society, and therefore, I presume, for a consideration (I sent you the cutting from the daily paper). It turned out that that "specially arranged forecast" was in absolute contradiction of the actual fact, and my point is that here is an instance of a forecast being supplied by "special arrangement" and turning out a "special failure," for the firm appear to have dropped this "special arrangement" since.

In answer to your request for criticism "when the weather is worse than the forecast," I have pleasure in giving it for the week ending March 23rd last. It was altogether an abnormally wet week, but, with the exception of the 20th, there was no indication of it in the forecast:—

| | Forecast. | Weather. | Rainfall. |
|---|---|---|---|
| March 17. | Squally, unsettled. | Rain all day. | ·43. |
| ,, 18. | Squally, bright intervals. | Rain all day. | ·48. |
| 19. | Heavy showers, bright intervals. | Fine morning, wet afternoon. | ·20. |
| 20. | Squally, changeable, heavy rain, hail or snow. | Squall, with rain, hail and snow. | ·54. |
| 21. | Fine morning, rain afternoon. | Heavy rain showers, frequent intervals. | ·45. |
| 22. | Sunny periods, heavy squalls, rain or hail at times, mostly fair. | Fine morning, rain afternoon. | ·24. |
| ,, 23. | Local showers. | Rain all day. | ·32. |

Sitting in a luxurious city office and writing about the weather is quite a different thing from that of experiencing its changeable character by being out in it from morning till night; it is only in this way one can appreciate the difference between the forecast and the actual article.

As an instance of the variations, the following is an interesting return of the rainfall for the year 1911 in this district, obtained from reliable sources:—

Sevenoaks would practically be due north of Crowborough, and about twelve miles distant, the other places mentioned intervening:—

| | Rainfall. | Number of days on which rain fell. |
|---|---|---|
| Sevenoaks ... ... ... ... | 33·24 | |
| Penshurst ... ... ... ... | 28·92 | 150 |
| Hadlow | 29·12 | 171 |
| Southborough | 30·17 | 135 |
| Tunbridge Wells | 31·38 | 181 |
| Crowborough ... ... ... | 40·71 | — |

I see no reason why you should not publish this letter, but you can certainly do so if you think it of sufficient interest. Personally, I consider the whole thing of little interest to the surveyor, but I do think that the covert sneer as to the standpoint of my observations is not worthy of The Surveyor or justice to myself.—Yours, &c.,

Frank Harris.

Broadway, Southborough,
Tunbridge Wells.
April 2, 1912.

[We are very much obliged to Mr. Harris for his letter, and gladly avail ourselves of his permission to publish it. The remark to which he refers can be regarded as more than a suggestion that Mr. Harris might be one of those fortunate individuals on whom fine weather makes a stronger impression than wet weather. We believe that a favourable position does in many cases result in a watering-place enjoying somewhat better weather than the average for the locality, but if surveyors were responsible for the reports sent to newspapers these would, we are sure, be more accurate and less optimistic than those very cheerful accounts which we are accustomed to see in the papers.—Ed. Surveyor.]

## ESTIMATING.

*To the Editor of* The Surveyor.

Sir,—The prices in my article on "Estimating" are based on actual working. As to pitch-grouted macadam, to which your correspondent "Contributor" takes exception in last week's issue, I have seen costs quoted by other road surveyors at 2s. 9d. to 3s. 3d. per square yard for the class of granite and thickness of coat referred to. The cost as carried out by the Kent County Council on the Road Board's experimental section is given as 2s. 9d. per square yard for a 3-in. coat with granite at 12s. per ton, as compared with 1s. 9d. for water-bound macadam for the same class of granite, 2¾-in. coat. For a 3-in. coat with granite at 12s. 6d. per ton, as in my article, the price will work out at just over 1s. 11d. per square yard for water-bound macadam, which I think you will agree is a fairly low figure. Can "Contributor" lay down pitch-grouted macadam of the same thickness, with granite, at the same price, and with pitch at 50s. per ton, for 2s. per square yard—less than 1d. per yard above that of water-bound macadam? If so, if he will explain how, and set out the cost in detail, I shall be pleased to learn.

The prices, however, do not form the main point of my article, and I have no desire to enter into any controversy concerning them, as I have given them in such detail that anyone who has had experience of the work can adjust them for himself. What I wish to lay stress on is that where the cost of anything is known in detail, and one of the factors affecting the cost varies while the others remain constant, a diagram as indicated is very useful for quick estimating. If "Contributor" is not satisfied with my figures, it will not be much trouble for him to construct a similar diagram, using such figures as he thinks, from his own experience, more suitable. Yours, &c.,

J. Eastwood.

April 6, 1912

**Catalogue.**—Messrs. E. H. Shorland & Brother, of Manchester, have issued a new catalogue (No. 30) of their warm-air ventilating patent "Manchester" grates, patent "Manchester" stoves with open fires, patent exhaust roof and special inlet ventilators. The catalogue is divided into three sections so as to facilitate easy reference, the patent "Manchester" grates being on white paper at the front, the patent exhaust roof and inlet ventilators on red paper in the centre, and the patent "Manchester" stoves on blue paper at the end of the book, a few words of introduction being given at the commencement of each of the three sections. There are also several coloured illustrations of patent "Manchester" grates and stoves in the catalogue. The first series of "Manchester" grates illustrated are those with the firm's latest patent low fire projecting back. These grates having no bars to interfere with the radiating properties of the fire, better results are consequently attained. The next series of "Manchester" grates illustrated are those which have bars, as many of Messrs. Shorland's clients prefer "Manchester" grates with bars. These grates are fitted with the improved projecting back. In the catalogue is given a list of some of the buildings to which patent "Manchester" grates, stoves or ventilators have been supplied, the list being embellished with illustrations of a few of the buildings. The patent "Manchester" stoves in the last section of the catalogue are now fitted with the firm's latest patent warm-air mixing chamber, which greatly increases the heating capacity of the stove, without any additional consumption of fuel. These patent "Manchester" stoves are made either single or double fronted, and with ascending or descending smoke flues, thus allowing the stove to be fixed in the most desirable position. The stoves are supplied in a variety of designs and finishes, from the most elaborate type, encased in richly glazed Faience in any colour, down to the plainer "Manchester" one of cast iron, but the internal construction is the same irrespective of the design and finish selected.

# Law Notes.

Edited by J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

*The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries which should be written legibly on foolscap paper, one side only, should be addressed to "The Law Editor," at the office of* The Surveyor, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction**—*i.e.*, **without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

Waterworks: Damage by Burst Main: Liability. —An important question as to the liability for damage done by the bursting of a water main was raised in *Stewart* v. *Metropolitan Water Board* (King's Bench Division, Mr. Justice Horridge and a jury, March 27th). The plaintiff was a clothier and outfitter carrying on business at premises in Essex-road, Islington. The board's main water pipe laid underneath the Essex-road burst and a piece of the pipe measuring 3 ft. by 2 ft. was carried, with an immense volume of water, through the cellar wall of the plaintiff's shop. The premises were flooded and a great quantity of the stock was washed out into an adjoining street. Mr. Restler, the board's chief engineer, gave evidence in defence, and stated that, in his opinion, the accident was due to localised expansion caused by change of the temperature of the water. Mr. Justice Horridge directed the jury that the board were not liable unless it was proved that they had been guilty of some omission to take reasonable care and had exercised their powers negligently. The jury found that the burst was not occasioned by a pre-existing fracture, but by some other cause, which the board could not have been reasonably expected to discover. Judgment was given for the board with costs, but a stay of execution was granted with a view to an appeal, and it is possible that the case may be heard of again.

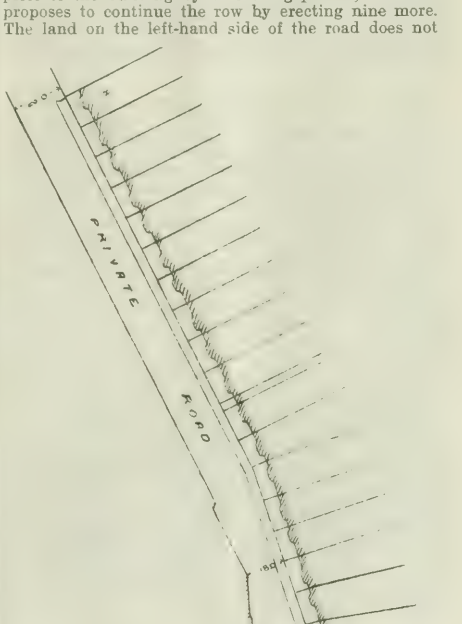
## QUERIES AND REPLIES.

*In order to avoid confusion querists are requested to use distinctive words as* noms de plume. *The letter* X, *combinations such as* X.Y.Z., *and words such as* "engineer" *and* "surveyor," *should never be used.*

Laying Out New Streets. "Urens" writes: A public grass-surfaced footpath, about 9 ft. wide, in an urban district runs through fields, and is bounded at intervals on one side only by field hedges and tarred board fences. It is connected at intervals to a public main road, running parallel with it by short "occupation" roads, which are now repairable by the public. There is one cottage near the centre of one of the fields, to which access is gained through these occupation roads. About 300 yds. along the grass footpath from the end of one "occupation" road a person proposes to erect a house, complying with the Model By-law as to front air space by setting back a sufficient distance from the public path. He will also throw out about 10 ft. as a cartway alongside the public footpath. Other persons are proposing to do likewise, but on the same side of the footpath only. Will you very kindly inform me whether—(1) In order (under the by-laws) to form the "principal approach or means of access" to his proposed new building, an owner is obliged also to construct a "new street" of the specified width—*viz.*, 36 ft.? (2) Is an owner constructing a "street" of illegal width, according to such by-laws, by simply throwing out 10 ft. width of his land to use as a cartway? (3) If these answers are in the negative, do you consider the street making and application of new street by-laws are in abeyance until building commences on the opposite side or normal road making, with kerbing, &c., on both sides commenced? (4) Must the "new street" commence from the public main road or from the "occupation" road only? (5) Have the owners of the "occupation" road power in an urban district to take steps under sec. 23 of the Highway Act 1870, for transforming it into a public highway to the urban authority, without complying with the public health by-law provisions for making "new streets"? (6) Is the "occupation" road subject to the provisions of sec. 150 of the Public Health Act, 1875? My apology for these very lengthy queries is that your highly esteemed opinion thereon will probably be of almost universal interest to municipal surveyors at the present time.

(1) A person who builds a house is not bound to form any approach to it. He may put it in the middle of a field and go across the field to and from the house. But if he does lay out a street (whether as an approach to a house or not) it must be of the specified width. (2) The question whether a new street is being laid out is always a question of fact, depending upon all the circumstances. In the case, and is frequently very difficult to decide. Where a 15 ft. occupation road was widened by an owner the question arose if he set back the land, it was held that he had not laid out a new street (*Fellowes* v. *Sedgeley Urban District Council*, 70 J.P. 412). But the present is a different case. There is no road in front of the proposed house, but simply a grass footpath, and I think the appropriation of 10 ft. of the land as a cartway would in all probability be held to constitute the laying out of a new street, and to be a contravention of the by-laws as to the width of new streets. (3) The by-laws as to the width of new streets must be complied with whenever a new street is laid out. (4) The laying out of a new street by the appropriation of 10 ft. alongside the footpath would not constitute the laying out of the occupation road as a new street, nor oblige the owner to widen that road. (5) No; because that section requires the road to have been made to the satisfaction of the surveyor—*i.e.*, now the district council. (6) Yes, assuming that it is not repairable by the inhabitants at large.

Laying Out a New Street.—"H. R. S." writes: B erected eighteen houses on the right-hand side of the private road shown on the accompanying sketch prior to the building by-laws being passed, and now proposes to continue the row by erecting nine more. The land on the left-hand side of the road does not




belong to B. The road is 25 ft. wide, narrowing down in places to 18 ft. Can the council compel B in erecting the additional houses to put them back so as to make it a new street, 36 ft. wide, or should the houses be allowed to be erected in the same line as those already built? There is a possibility at some future time that the road may be taken over by the council.

B cannot be compelled to widen the road unless he is laying it out as a new street. The question whether a new street is being laid out is always a question of fact, depending upon all the circumstances of the case. The following operations have been held *not* to constitute the laying out of an existing road as a new street:—Substituting a wall for a wooden fence next a road, with the intention of building a house inside the wall (*Bushell* v. *Croer*, 64 J.P., 600); building two houses adjoining a road (*Leggett* v. *Waldon Urban Sanitary Authority*, 1894, 1 Q.B., 347); building three cottages fronting on a public road, the side of one cottage abutting on an 8 ft. lane leading out of the road (*St. George's Local Board* v. *Bullard*, 1895, 1 Q.B., 702); building houses on a triangular piece of land bounded on two sides by roads without removing the fences, but making openings to give access to the houses (*Devonport Corporation* v. *Tozer*, 1903, 1 Ch., 759); erecting houses 6 ft. back from a road and then removing the hedge (*Fellowes* v. *Sedgeley Urban District Council*, 70 J.P., 412).

By-product Coke Ovens.—"E. G. M." writes: (1) Can the local authority object to the erection of two batteries of by-product coke ovens, on the ground of

the fumes being carried by the prevailing (west) wind on to the houses in proximity? The ovens will be of the latest and best approved type. The property owners have already complained of existing beehive ovens on the ground of the steam from the quenching. It is alleged that the fumes discolour metal—such as irons, &c., in dwellings. Does this constitute a nuisance, or must it be proved that the fumes are injurious to health? (2) Is it necessary to submit plans for the proposed new ovens and plant to the local authority? (3) If such plans are submitted to the local authority and approved, can the coke making be afterwards stopped by the authority, or the property owners, if the process is deemed to be a nuisance?

(1) If the batteries are likely to be a public nuisance the local authority could, with the concurrence of the Attorney-General, apply for an injunction to prevent their erection. But in every doubtful case would have to be made out to prove the certainty, or at any rate the high probability, of a substantial public nuisance being caused and it is by no means certain that an injunction would be granted. (See "The Law of Nuisances," by E. W. and H. G. Garrett, 3rd Edition, p. 395 *et seq.*). If the batteries, when erected, are certified by the medical officer of health or by the legally qualified medical practitioners or the inhabitants to be a nuisance, the local authority could proceed under sec. 114 of the Public Health Act, 1875, if the effluvia should cause annoyance and discomfort it would be within this section, even if not injurious to health (*Mallon Board of Health* v. *Midland Farmers' Manure Company*, 4 Ex.D., 302). (2) Plans must be submitted if the proposed erections are "new buildings" within the meaning of the by-laws. (3) If the plans were in conformity with the by-laws the local authority would be bound to approve them (*Regina* v. *Newcastle-on-Tyne Corporation*, 53 J.P., 788); and such approval would not, in my opinion, preclude the authority from subsequently taking proceedings in the event of a nuisance arising. The approval of the plans would certainly in no way affect the rights of the property owners.

Housing, &c., Act, 1909: Entry on Premises. "W. H. E." writes: I have been appointed by my council as the officer to make the necessary inspections under Part I. of the above Act by the terms of the following resolution—*viz.*: "That the inspector of nuisances be appointed the inspector for the purposes of Part I. of the Act." Does such an appointment authorise me to serve notices under sec. 15 upon the occupiers of premises to which the section applies, in cases where I am refused admission for the purposes of inspection? I am desirous of inspecting an unoccupied house which I have reason to suspect is very damp and probably unfit for human habitation. Difficulty, however, is experienced in obtaining access to the premises, as the owner holds the key. May I serve notice upon the owner under sec. 36 (c) requiring him to admit me to the premises?

(1) Sec. 15, subsec. 2, of this act empowers any one authorised by the local authority in writing, after twenty-four hours' notice to the occupier, to enter any house, &c., to which that section applies. To avoid any question as to whether the resolution is a sufficient authority in writing within the meaning of the section it would be better for a separate written authority to be given with respect to each house to be dealt with. (2) Sec. 36 empowers anyone authorised in writing, stating the particular purpose or purposes for which entry is authorised by the local authority or the Local Government Board, after twenty-four hours' notice to the occupier and to the owner (if known), to enter any house, &c., for the purpose (*inter alia*) of survey and examination where it appears to the authority or board that this is necessary, in order to determine whether any powers under the Housing Acts should be exercised. "Housing Acts" means the Housing, &c., Act, 1890, and any Act amending it, including the Act of 1909. I do not think the resolution by itself is a sufficient authority within the meaning of this section. A special written authority should be given stating the particular purpose for which entry is authorised.

Highway: Material for Road Repair. "Rural" writes: The owner of a large estate in this part has for many years past allowed the highway board and rural district council to obtain road stone from several of the quarries upon his estate. The quarries form part of the fields, and are not fenced or set out in any way. The district council pay the sum of 3d. per ton for every ton of stone taken from the quarries. The owner now wishes to sell the fields wherein the quarries are situated. Will you please say if the owner or the person who buys the fields can stop the council obtaining stone from the quarries, and if so, what notice will be required?

By the combined operation of sections 55 and 56 of the Highway Act, 1864, if sufficient materials for road repair cannot be obtained from wastes and commons, the council can apply to the magistrates for a licence authorising them to get materials from private lands (other than gardens, lawns, parks, &c.), making satisfaction for the materials and the damage done to the land by getting them. A month's notice of the application must be given both to the owner and to the occupier.

**We have to draw the attention of querists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6 in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.**

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Ashton-in-Makerfield U.D.C.** (March 20th. Mr. R. H. Bicknell).—£627 for the provision of a fire station, store-yard and buildings in Council-avenue; £327 for the purpose of street lighting; and sums amounting to £5,348 for extensions of gas mains and culverting of a brook at the gasworks.—The clerk, Mr. A. Sykes, said so far as the public street lighting was concerned it had all been met previously out of revenue; but with regard to future extensions it was proposed to borrow £327 for fixing lamp columns, &c. The cost would be £2 5s. 9d. per lamp. Referring to the third application, Mr. Sykes said they would not be able to do the work immediately. It would extend over two or three years.

**Bosmere and Claydon (Suffolk) R.D.C.** (April 3rd. Mr. A. A. G. Malet). £1,000 for the purposes of water supply for the parish of Bramford.—It was stated by the clerk, Mr. R. W. Cook, that as the borough of Ipswich was not yet in a position to supply the water under their Act, negotiations were opened for a supply by private agreement in bulk. Under this agreement the borough agreed to supply a quantity not exceeding 50,000 gallons per day. The cost would be 1s. per 1,000 gallons. Mr. H. Smith, surveyor and inspector of nuisances, stated that the scheme provided for laying a cast-iron pipe 4 in. in diameter. The total cost would be £869.

**Brighton T.C.** (April 4th. Mr. F. O. Stanford).—£19,500 for the construction of a new sewer for the disposal of the sewerage from the Lewes-road district.—The deputy town clerk, Mr. C. N. T. Jeffreys, stated that the reasons for the application were that the corporation proposed to construct a new sewer along Upper Lewes-road, Park Crescent-road, Park-crescent, across the Level, and under the pathway on the northern and western sides of St. Peter's Church, connecting up to the existing sewer at the bottom of Trafalgar-street on the London-road. By that means the existing sewer in Lewes-road, which was laid in or about 1868, would not be interfered with, but it would be relieved of a large quantity of storm water, which at present went into it from an area of about 296 acres in Preston. This proved too much for the existing sewer, and caused it to flood. At the time the Lewes-road sewer was constructed it was ample for the demands, but since 1873, when the borough was extended, and Preston was included in the borough boundary, and since additional buildings had been erected, the sewer was quite inadequate. It was also proposed to relay the sewers in Robertson-road and South-road, Preston.—The borough surveyor, Mr. H. Fillistone, described the present construction of the sewers, and pointed out that the proposed construction would cost less than relaying the present sewer along Lewes-road, where the tramway would have to be interfered with.—It was requested that the repayments should extend over a period of thirty years.

**Doncaster T.C.** (April 1st. Mr. Edward Leonard).—This was an inquiry into the proposal of the Doncaster Corporation, under the provisions of the Housing of the Working Classes Act and the Doncaster Corporation Acts of 1904 and 1908, to carry out a rehousing scheme on sites at Wheatley, Balby and Carr House with Elmfield.—The town clerk, Mr. R. A. H. Tovey, stated that the inquiry was really the continuation of an application which was made to the board, and in respect of which an inquiry was held in January of last year. The result of that inquiry the inspector knew, and following that inquiry the corporation submitted to the Local Government Board sites for the erection of 160 dwellings. The plans sanctioned showed 60 houses at Balby, 64 at Carr House, and 36 or 34, as the case might be, at Wheatley. All these three sites were corporation property, and had belonged to the corporation for a long time. The cost of the dwellings, including roads and sewers, was: Balby, £12,066; Carr House, £12,920; Wheatley, £5,157 for cottages and £3,833 for flats. That made a total of £30,142, or taking the flats instead of the houses at Wheatley, £28,818. The value of the land was taken at 2s. 6d. a yard, except at Wheatley, where it was put down at 4s. They asked the board to allow them to appropriate it and pay the value back either by way of rent or some charge on the estate. The borough surveyor, Mr. F. O. Kirby, said the area at the Wheatley site was now proposed to

use for the terrace houses was 3,830 sq. yds., and for the flats 2,950 sq. yds. The roads would be of tar-macadam. There were paved crossings to the back passages over the footpaths, and the flagging consisted of concrete flags 2½ in. thick, and Yorkshire stone kerbing and channelling, kerbing 12 in. by 8 in., and channelling 14 in. by 6 in. The width of the carriageway was 28 ft., and the footpath 7 ft. The rural district only required 36-ft. streets, but the corporation had made them 42 ft. in every case except the street in the Wheatley area, which was already laid out to 36 ft. It was requested that the loan should be granted for the full term.

**Lewes T.C.** (April 3rd. Mr. F. O. Stanford).—£290 for works of sewerage in Malling-hill and Mill-road, Lewes.—The borough surveyor, Mr. David Roberts, explained the details, and said the extension would be for a distance of 505 yds.

**Llanrwst U.D.C.** (March 27th. Mr. P. M. Crosthwaite).—£5,000 for purposes of sewerage and sewage disposal, and also for the compulsory acquirement of land for sewage disposal works.—At present all the sewage of the town is discharged untreated into the river Conway, as the result of which an injunction was obtained against the council last year requiring them to cease this pollution. By this intended scheme the sewage will gravitate to a pumping station below the town, from whence it will be pumped electrically into tanks and filters. Mr. Harry W. Taylor, Assoc.M.Inst.C.E. (Messrs. Taylor & Wallin), Newcastle-upon-Tyne and Birmingham, explained the proposed works at the inquiry. Acquisition of the site was opposed by the landowner.

**Paignton U.D.C.** (April 4th. Mr. Edgar Dudley).—£1,173 for the purchase of land and the construction of new roads at Preston.—The surveyor, Mr. C. O. Baines, explained the details of the scheme. He stated that the proposals of the council had arisen in consequence of the rapid and continuous development of Preston. The land was obtained at the rate of £750 per acre, and the council considered that the residue would be worth about £200.

**Spalding U.D.C.** (April 2nd. Mr. A. A. G. Malet).—£4,000 for improvements in plant at the gasworks and new mains. It was stated that the proposed improvements would effect a saving of £900 a year.

### APPLICATIONS FOR LOANS.

**Barnet R.D.C.**—£1,234, a further loan for the Finchley sewerage scheme.

**Beaconsfield U.D.C.**—£1,000 for the purchase of the northern water undertaking.

**Bournemouth T.C.**—£12,170 for the construction of new low cliff roads, and £1,250 for alterations to the cliff path to the beach.

**Bridlington T.C.**—£1,600 for street improvement purposes, and £500 for the extension of the cemetery.

**Camberley U.D.C.**—£1,430 for tar-paving footpaths.

**Chertsey U.D.C.**—£700 for the purchase of a Mann's patent steam cart.

**Essex C.C.**—£2,290 for the enlargement of a school at Grays and £2,000 for a site for a secondary school at Brentwood.

**Lowestoft T.C.**—£2,000 for electric house services.

**Midhurst (Sussex) R.D.C.**—£1,100 for experimental boring purposes.

**Prestatyn U.D.C.**—£500 for laying-out the Coronation Gardens.

**Rhyl U.D.C.**—£52,780 for the repair and extension of Rhyl Pier.

**Stafford T.C.**—£3,200 for the provision of twenty houses.

**Swansea T.C.**—£900 for tar-paving works.

**Wallasey T.C.**—£1,898 for road improvement purposes.

### LOANS SANCTIONED.

**Belfast T.C.**—£5,000 for interim expenditure in connection with the new housing scheme.

**Brumby and Frodingham U.D.C.**—£1,166 for a water-softening plant.

**Cannock U.D.C.**—£665 for the enlargement of the council offices.

**Chingford U.D.C.**—£4,000 for sewerage works.

**Clonakilty U.D.C.**—£1,800 for the erection of working-class lodging-houses.

**Coalville U.D.C.**—£2,100 for paving purposes.

**Dukinfield T.C.**—£3,740 for street works.

**Halesowen R.D.C.**—£300 for sewerage work.

**Holme Cultram U.D.C.**—£5,600 for repairs and extensions of Silloth sea-wall.

**Langholm T.C.**—£6,000 for the extension of the water supply.

**Runcorn U.D.C.**—£1,806 for water mains.

**Skipton R.D.C.**—£195 for sewerage purposes.

**Swansea T.C.**—£6,550 for the Cwm-road building scheme, and £10,167 for the Trewydda Common building scheme.

**Torquay T.C.**—£770 for public conveniences and shelter.

### FORTHCOMING INQUIRIES.

| APRIL. | £ |
|---|---|
| 15.—**Barking Town.** For street improvement purposes (Mr. F. H. Tulloch) ... ... | 930 |
| 15. **Salford.** For the provision of a recreation ground and destructor depot (Mr. R. H. Bicknell) ... ... ... ... | 11,144 |
| 16.—**Alnwick.** For water supply works (Mr. H. R. Hooper) ... ... ... ... ... | 550 |
| 16.—**Banbury.** For works of sewerage (Mr. A. A. G. Malet) ... ... ... | 200 |
| 16.—**Chadderton.** For sewerage purposes (Mr. R. H. Bicknell) ... ... ... | 1,245 |
| 16.—**Epsom.** For sewage disposal purposes (Mr. F. O. Stanford) ... ... ... ... | — |
| 16.—**Haslingden.** For private street works (Major J. Stewart) ... ... | 5,250 |
| 16.—**Huncoat.** For the provision of a recreation ground and allotments (Mr. Edgar Dudley) ... ... | 1,730 |
| 16. **Merton.** For private street works (Mr. W. O. E. Meade-King) ... ... ... | 880 |
| 16.—**Sale.** For the extension of the refuse tip (Mr. R. H. Bicknell) ... ... | 200 |
| 17. **Barrowford.** For street improvement purposes (Mr. Edgar Dudley) ... ... | 350 |
| 17.—**Brighouse.** For the provision of baths and mortuary (Major J. Stewart) ... ... | 5,850 |
| 17.—**Saltash.** For private street works (Mr. A. W. Brightmore) ... ... ... | 915 |
| 17 **Sunderland.** For the provision of a pumping station (Mr. W. H. Hepple) ... | 551 |
| 17 **Woodford.** For sewage disposal purposes (Mr. F. O. Stanford) ... ... ... ... | 2,300 |
| 18. **Camborne.** For sewerage and recreation ground purposes (Mr. A. W. Brightmore) | 25,600 |
| 18. **Darlington.** For the extension of the gasworks (Mr. H. R. Hooper) ... ... ... | — |
| 18.—**Heaton Norris.** For private street works (Major J. Stewart) ... ... ... | 2,402 |
| 18. **Maidenhead.** For street widening purposes (Mr. M. K. North) ... ... | 300 |
| 18. **Maldon.** For water supply purposes (Mr. F. O. Stanford) ... ... ... | 600 |
| 18.—**Worcester.** For the provision of a refuse tip (Mr. A. A. G. Malet) ... ... | 900 |
| 19.—**Eccles.** For private street works (Major J. Stewart) ... ... ... | 6,819 |
| 19.—**Guildford.** For street and sewage disposal purposes (Mr. F. O. Stanford) ... | 4,695 |

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**Institution of Water Engineers.**—The summer meeting of this body will be held at Cheltenham from June 6th to 8th next.

**Loans for Housing Schemes.** The President of the Local Government Board, replying in the Parliamentary papers to Sir Arthur Griffith-Boscawen, gives a list of the loans sanctioned by the board for the erection of houses for the working classes under Part III. of the Housing of Working Classes Act, 1890, from 1900 up to date. It appears that in 1900 the loans sanctioned amounted to £354,923, a greater amount than has ever been sanctioned since. The second largest sum was £230,889 in 1901. In 1904 the amount was £207,273. In 1909 the figure was as low as £49,254, but in the following year it rose to £124,778. The sum of £111,289 was sanctioned in 1911. For the first three months of the present year £133,975 has been sanctioned.

# Municipal Work in Progress and Projected.

*The Editor invites the co-operation of* Surveyor *readers with a view to making this column more complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Arbroath £2,000, Leeds £1,650, Littlehampton, Newcastle-upon-Tyne, Rhyl £52,780, Wimbledon £1,650; housing and town planning—Belfast, Chertsey £1,935, Stafford, Taunton; refuse collection and disposal—Dartmouth, Shanklin; roads and materials—North Riding £7,000, Wednesfield, Wimbledon £2,280; sewerage and sewage disposal—Hexham; water, gas and electricity—Newport (Mon.).—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

## ADMINISTRATION.

**Southport T.C.**—The Special Committee appointed by the corporation to inquire into the wages and conditions of corporation employees recommend a minimum wage of 26s. per week for all efficient employees of twenty-one years of age and upwards.

## BUILDINGS.

**Arbroath T.C.**—The Corn Exchange and market buildings are to be reconstructed at a cost of £2,000.

**Braintree U.D.C.**—The tender of Messrs. A. Brown & Sons, of Braintree, at £527, has been accepted for building a new swimming bath.

**Coleraine U.D.C.**—It has been agreed to provide a public bathing-place in Anderson Park, at a cost not exceeding £200.

**Croydon T.C.**—The tenders of Messrs. James Smith & Sons, Limited, of South Norwood, at £1,710 and £2,235, have been accepted for building a boiler-house chimney at the borough hospital, and additions to the boiler-house at the Surrey-street waterworks.

**East Preston (Sussex) R.D.C.**—It has been decided to advertise for tenders for the erection of a breast work on the west side of the mill wall at Rustington.—For the erection of a 300-ft. timber groyne at Rustington, the tender of Messrs. Burrell & Standen at £165 has been accepted.

**Hove T.C.**—The Park and Gardens Committee recommend the council to accept Mr. Macfarlane & Co.'s tender of £210 for the erection of a bandstand in St. Ann's Well Gardens.

**Leeds T.C.**—Alterations are to be carried out at the town hall at an estimated cost of £1,650.

**Littlehampton U.D.C.**—The Highways and Lighting Committee have received permission to acquire a central site for a fire station.—With reference to the specifications for the stables and cottages, the surveyor, Mr. Harry Howard, has received instructions to reduce the specification of the two cottages to cost not more than £750 the pair, and Messrs. Linfield & Sons have been asked to give an amended price for the council's consideration after making allowance for the alterations.

**Newcastle-upon-Tyne T.C.**—The Baths Committee have been requested to report upon the provision of new public baths for Heaton.

**Newquay U.D.C.**—With respect to the proposal to borrow £4,250 for the provision of a pavilion and shelter on the sea front, the Local Government Board have written stating that in their view it would be a mistake to erect any building of the character proposed on the site in question, which appears to them to be a valuable asset to the town as an open space. Apart, however, from this question, it appears that there was some prospect of a pavilion building being erected in close proximity to the site, and in the circumstances the council would no doubt desire to reconsider their proposal to erect a pavilion.

**Rhyl U.D.C.**—Mr. W. T. Douglass, engineer, has presented a report in which he values the Rhyl Pier structure as it now stands at £7,210. He estimated the cost of putting it in thorough repair at £25,400, extending it to deep water (including £2,000 for a tramway), £19,100, and of widening £23,900, making a total outlay, including the purchase of the pier, of £75,610. Mr. Douglass has since submitted a modified scheme, which included the repairing of the existing structure, extension to deep water, and widening by 10 ft. over one-fifth of the length of the pier, at a total cost of £52,780. This latter scheme the council have decided to carry out.

**Short Heath (Staffs) U.D.C.**—A plot of land has been purchased for the erection of a new council chamber.

**Sutton Coldfield T.C.**—Public baths are to be provided at a cost of £400.

**Wimbledon T.C.**—A public swimming bath is to be provided in Wandle Park at a cost of £1,650.

## HOUSING AND TOWN PLANNING.

**Belfast T.C.** In giving sanction for the interim expenditure of £5,000 in connection with the new housing scheme, the Local Government Board for Ireland write that while there is a good supply of houses for the working classes, at rents of 3s. 6d. a week, the number of vacant houses in good condition in the immediate neighbourhood is inadequate to meet the need of persons who will be dispossessed under the improvement scheme. Consequently they have directed the corporation to provide 252 tenements, instead of, as proposed by the corporation, sixty-four tenements of two rooms each in four districts of the city.

**Chertsey R.D.C.**—It is proposed to erect twelve houses at Thorpe at an estimated cost of £1,935.

**Cuckfield U.D.C.**—A number of workmen's dwellings are to be erected by the council in London-lane.

**Dromore U.D.C.**—A committee has been formed to formulate a scheme for the erection of from ten to twenty workmen's dwellings.

**Halifax T.C.**—Application is to be made to the Local Government Board for authority to prepare a town planning scheme in respect to 880 acres of land in the Ovenden district, and 756 acres in the Warley district. It is proposed that the corporation should plan the districts and not that they should lay them out.

**Newry U.D.C.** The tender of Mr. John Graham, Dromore, at £4,784, has been accepted for the erection of two blocks of artisans' dwellings in Kiln-street.

**Ripley U.D.C.**—The clerk and the surveyor (Mr. G. W. Bird) have been instructed to prepare details of a scheme for the erection of twenty-five houses suitable for the working classes.

**Stafford T.C.**—It has been agreed to erect twenty small dwellings, to be let at 4s. and 3s. 6d. a week.

**Taunton T.C.**—The borough surveyor, Mr. D. Edwards, has prepared an estimate for building four-roomed houses, at a cost of £170 each, or an annual cost of £11 6s. 4d. The land on which these houses are proposed to be built belongs to the corporation, and is now let as garden allotments. The rent proposed to be charged for each house is 4s. 6d. per week. It has been decided to advertise for possible tenants from among residents in the courts occupying houses at rents not exceeding 3s. 9d. per week. In the event of there being a sufficient number of applicants for the proposed houses, the Health Committee will be authorised to take all necessary steps to obtain tenders for the erection of twelve houses on the land before mentioned, at the estimated cost of £170 for each house, including the value of the land.

## PARKS AND OPEN SPACES.

**Preston T.C.** The estimated cost of laying-out Haslam Park, which has been given to the town by Miss Haslam, is £10,647, the principal items of which are: Forming new paths and roads, £1,819; excavation of lake, puddling, and formation of banks, £1,363; grading, levelling, trenching, and resoiling spaces to be planted with forest trees and shrubs, £891; forming bowling greens, tennis grounds, and flower beds round bandstand, and forming other lawns, returfing or sowing with grass seed, £940; plantations, £841; bridges, £426; boat landing and boat-house, £225; bandstand, £560; and pavilion shelter, £720. Miss Haslam will contribute £4,000 towards the cost of the works.

**Wallasey T.C.**—The extension to the Oakdale Recreation Ground at Seacombe has been formally opened. It comprises a quoiting-ground, a bowling-green, and children's gymnasia.

## REFUSE COLLECTION AND DISPOSAL.

**Dartmouth T.C.**—The borough surveyor, Mr. W. G. Lane, has been instructed to prepare the plan of a site for a refuse destructor, and an estimate of cost.

**Shanklin U.D.C.**—The question of the provision of a refuse destructor is to be considered by the council in committee.

## ROADS AND MATERIALS.

**Argyll C.C.**—A deputation from the council have interviewed the Road Board with a view to securing adequate grants for the roads in Argyll. It is understood that the representations made by the deputation had the favourable consideration of the board, and substantial grants were promised for the improvement of the main roads in Kintyre and Lorn districts.

**Brighton T.C.**—Councillor Teesdale at the council meeting last week in moving the adoption of the report of the Works Committee, stated that a memorial requesting that red brick paving may be laid in all residential thoroughfares, where new paving has to be laid, had been referred to a sub-committee, and, after looking at the matter in all its bearings, they had come to the conclusion that, as the life of the brick paving was only five years, and that of cement fifteen years, they could not very well recommend it, except for steep gradients. He thought they should have as many cement pavements as possible. Cement pavements had many advantages. The only advantage of red brick paving was that on steep gradients it provided a better foothold.

**Carnoustie T.C.**—A sum of £650 is to be spent on the improvement of the Links-parade.

**Easingwold R.D.C.**—At the request of the county council the surveyor, Mr. G. Thompson, has prepared an estimate for submission to the Road Board of the cost of improving a dangerous corner at Crayke. The improvement will involve the demolition of four cottages and outbuildings, and will probably cost £175.

**Haddingtonshire C.C.**—The Road Board have written to the Western District Committee that they are prepared to make an immediate grant of £2,000 if that will assist the county council to carry out this year the whole of the proposed scheme for the improvement of the Coast-road, estimated at £12,300. If the council, however, intend to carry out only a section of the scheme this year, the board's grant will be £800. The District Committee had before them the improvement of the greater part of the road from Port Seton to near Aberlady, at a cost of £3,319. It was agreed that the work should be done in one year, the money being borrowed over five years.

**Hampton Wick U.D.C.**—For carting and housing the tenders of Mr. J. Downs, for horse, cart and man, at 8s. per day, and for the removal of house and garden refuse at £156 for the year, have been accepted.

**Harrogate T.C.**—The corporation have again ordered the Akonia treatment of their roads within the town. This is the fifth year of treatment.

**Kensington B.C.**—The Works Committee recommend the purchase from Messrs. John I. Thornycroft & Co., Limited, of two motor wagons, subject to the company agreeing to extend the guarantee for the tyres to be fitted on such wagons from 10,000 miles in the first twelve months to 12,000 miles in the first eighteen months. The borough engineer, Mr. A. R. Finch, has been authorised to arrange for adapting two of the council's present vans for use as trailers with the motor wagons to be purchased, at an estimated cost of £14. The price of the two motor wagons is £1,360 and the cost for five years' maintenance is £520.

**Littlehampton U.D.C.**—The surveyor, Mr. Harry Howard, has been directed to prepare specifications and advertise tenders for the relaying of the paving on the Esplanade.

**North Riding C.C.**—A length of about 6 miles of the York and Malton road is to be treated with tar-grouted macadam at a cost of about £7,000, the expenditure to be met by a grant from the Road Board.

**Penybont R.D.C.**—Street works of an extensive character are to be carried out at an early date.

**Perthshire C.C.**—For this year the Road Board have allocated £2,500 to Perthshire, against £12,000 last year. On this basis the grant falling to Perthshire Highland District Committee is £418, which is too small a sum to complete the improvement of the road to the county march, as originally contemplated. Probably the committee will endeavour to get the grant chiefly expended in tar-spraying and improving the surface of the main north road. The reduction of the grant is understood to be due to the increased grants for road improvements in the neighbourhood of some of the larger towns.

**Poole T.C.**—The tender of the Poole Brush Company has been accepted for a supply of road sweeping brushes at 25s. 6d. per dozen.

**St. Helens (Isle of Wight) U.D.C.**—A tar-spraying machine is to be purchased from Messrs. W. Weeks & Son for £35.

**Stockton T.C.**—The improvement of Norton-road is to be carried out, at an estimated cost of £1,488.

**Sunbury U.D.C.**—It has been decided to tar-paint part of Staines-road, at an estimated cost of £100, and to treat Station-road similarly.

**Sunderland R.D.C.**—Road improvements, estimated to cost £2,800, have been approved.

**Wednesfield (Staffs) U.D.C.**—The surveyor, Mr. E. Rogers, has advised the purchase of a tractor for the haulage of slag, and the clerk has been instructed to communicate with the Local Government Board with the object of obtaining a loan for the purpose of purchasing the vehicle should the council decide to buy one.

**Wembley U.D.C.**—Mr. Cecil Chapman, the surveyor, is again using Akonia for dust prevention on the district roads.

**Wimbledon T.C.**—Approval has been given to the plan and estimate of Mr. C. H. Cooper, the borough surveyor, for paving with soft-wood blocks the margins of Worple and other roads, at a cost of £2,280, towards which the Surrey County Council will be recommended by the county surveyor, Mr. A. Dryland, to contribute two-thirds.—It has been decided not to substitute mechanically propelled vehicles for horse-drawn vehicles for street watering and scavenging.

## SEWERAGE AND SEWAGE DISPOSAL.

**Ealing T.C.**—The report, reproduced in our issue of the 22nd ult., to the effect that the town council of Ealing have obtained a loan of £1,700 for bacteria beds and sprinkling apparatus, is, we are informed, incorrect.

**Hexham R.D.C.**—Fourteen sets of plans have been sent in in competition for the prizes offered by the council for the best scheme for sewage disposal at Corbridge. The scheme sent in under the *nom de plume* "Toujours l'esperance No. 2," has been awarded the first prize, on the report of Mr. H. W. Taylor, engineer, Newcastle, the adjudicator. Mr. Taylor reported that by this scheme a considerable proportion of the sewage on the north side of the river required to be pumped and all sewage on the south side. The annual cost would be £496 per annum, including £368, repayment of capital and interest at 3¾ per cent for thirty years. This would be equal to a rate of 9d. in the £. The author of the *nom de plume* proved to be Mr. Harry Jackson, ASSOC.M.INST.C.E., Birmingham. The scheme placed second was that sent in by Mr. Fred J. Rodwell, ASSOC.M.INST.C.E., Leeds, which was estimated to cost £7,990, or a total annual cost of £520. The other two schemes recommended by the Corbridge Committee and reported upon by Mr. Taylor were: "Finis Coronat Opus," £6,199, Mr. C. E. Dixon, Leeds, and "Finis omnis pura," £6,326, Mr. J. E. Parker, Newcastle.

**North Bromsgrove U.D.C.**—At a meeting of the council last week instructions were given to Mr. Robert Green, M.INST.C.E. (Birmingham), to prepare a scheme of sewerage and sewage disposal for the district of Rubery to submit to the Local Government Board as soon as possible.

**Portmadoc U.D.C.**—A letter has been received from the Local Government Board in reference to the inquiry held by their inspector last December into the council's application for sanction to borrow £11,500 for a sewage scheme. The board stated they did not consider the site selected for the disposal works to be suitable, involving, as it did, the construction of works in a considerable depth of made ground, resting on a foreshore of mud. They requested the council to reconsider the matter, as well as the scheme for the extension of the Borthygest outfall sewer. The council discussed the letter in committee.

**Stepney B.C.**—The council have agreed to undertake the responsibility for the repair, construction, and future maintenance of the gullies over main sewers in the borough on payment by the London County Council of the sum of £1,200.

## WATER, GAS, AND ELECTRICITY.

**Aberdeen T.C.**—New electric plant is to be provided, at an estimated cost of £6,215.

**Felixstowe U.D.C.**—The whole of the Promenade lights are to be converted from arc lamps to metal-filament glow lamps, at a cost of £120.

**Horsham U.D.C.**—The electrical engineer, Mr. J. B. Morgan, last week reported that on Saturday, March 23rd, the coal stock amounted to 96 tons, or approximately eight week's supply. In view of the unsettled conditions, he suggested consideration of the advisability of burning the house refuse in the present boiler, in order to economise the coal. To that end he had carried out a short trial run, on a small load of refuse, and although the furnaces were not constructed to obtain the best results from a heat efficiency point of view, he was able to destroy the refuse into a thoroughly hard clinker, and at the same time generate sufficient steam on one of the small boilers to give a half-load on the small set. In other words, the amount of house refuse they could burn would find more than enough steam to keep the street lighting going. The burning of the refuse was free from fumes, and the chimney merely emitted a small quantity of white-grey smoke. Instructions were given for a continuance of this practice.

**Newport (Mon.) T.C.**—The Waterworks Committee recommend the acceptance of the tender of Mr. Cowlin, of Bristol, at £1,300, for the construction of the new reservoir in Beechwood Park. The new reservoir will have a capacity of 500,000 gallons.

**Ripley U.D.C.**—The plans of the surveyor, Mr. G. W. Bird, for coupling up the town water supply with the Derwent Valley scheme, at an estimated cost of £320, have been approved.

**Tunbridge Wells T.C.**—The Lighting Committee propose during the summer to replace the remaining old-pattern arc lamps in the streets by incandescent electric lamps.

## MISCELLANEOUS.

**Leigh (Essex) U.D.C.**—The surveyor, Mr. J. W. Liversedge, has been directed to submit a scheme for the drainage of the cliff by means of chalk cutting.

## PERSONAL.

Mr. H. Tillstone, borough surveyor of Brighton, has had his salary raised from £400 to £500 per annum.

Mr. R. G. H. Clements, deputy borough surveyor of Brighton, has had his salary increased from £250 to £300, rising to £350.

Mr. Stanley Osborn has resigned the position of assistant engineer and surveyor to the Swansea Corporation with the object of proceeding to the Colonies.

Mr. David Richards Jones, of Aberayron, has been appointed surveyor and assistant overseer to the Aberayron Urban District Council, at a salary of £62 per annum.

Mr. A. E. Barton, surveyor and sanitary inspector to the East Cowes Urban District Council, has had his salary increased by £20 as from April 1st—namely, £10 as surveyor and £20 as inspector of nuisances.

Mr. L. A. Cozens has been appointed chief surveyor to the Isle of Wight Rural District Council, at a salary of £200 per annum, and two assistants are to be appointed to act under him at a salary of £80 per annum each.

Mr. A. W. Lloyd, who has held the position of engineering assistant to the Watford Urban District Council since 1905, has, we understand, been appointed assistant engineer under the Black Sluice Drainage and Navigation Commissioners.

Mr. John A. Bensel, M.Am.Soc.C.E., State engineer of New York, on March 27th, delivered an illustrated lecture on "The Construction and Maintenance of the State Roads of New York," before the graduate students in highway engineering at Columbia University.

Mr. J. H. Dixon, Assoc.M.Inst.C.E., who has for the past three years been in charge of large Government works in Mexico, leaves for England in May by the Hamburg-American liner "Corcovado." Mr. Dixon was at one time an assistant to the borough engineer at Southampton.

Messrs. E. A. Stickland, Assoc.M.Inst.C.E., borough surveyor of Windsor; A. E. Prescott, borough surveyor, Eastbourne; and H. J. Farmer, borough surveyor, Christchurch, have been appointed by the Institution of Municipal Engineers as delegates to the General Organising Council of the International Road Congress, 1913.

Mr. Stanley Davies has been appointed an assistant in the office of the borough surveyor of Swansea, at a salary of £104 per annum. In order to cope with the increasing work of the department, the borough surveyor has asked the town council that an assistant at a salary of £100, and a junior at £50, should be appointed. The matter has been referred to a sub-committee with plenary powers.

Messrs. D. G. Bevan, borough engineer's office, Darlington; J. M. Blizard, town hall, Colombo, Ceylon; C. Clegg, Masham, Yorks; J. M. Cobb, Bridge Works, Warrington; G. Cooper, Port of London Authority; R. E. Ford, borough surveyor's office, Doncaster; A. De Courcy Meade, Manchester; G. Plummer, council offices, Haywards Heath; A. J. Price, borough engineer's department, Eccles; J. W. Smith, waterworks engineer, Bury; W. B. Smith, council offices, Surbiton; H. E. Tasman, town hall, Islington; W. C. West, town hall, Newport, Mon.; and A. C. Willcocks, town hall, St. Helens, have been elected associate members of the Institution of Civil Engineers. Mr. E. H. Whiteford, resident engineer, Derwent reservoir works, has been transferred from the class of associate member to that of member; and Messrs. W. S. Pain, borough engineer's office, Folkestone, and T. R. M. Westgate, borough engineer's office, South Shields, have been admitted as students of the institution.


## FOR OTHER ADVERTISEMENTS

See End of Paper.

BOROUGH OF WORKINGTON.

APPOINTMENT OF WASTE WATER INSPECTOR.

Applications are invited for the post of Waste Water Inspector under the Corporation of Workington, at a commencing salary of £80 per annum, rising by annual increments of £5 until a maximum of £100 is reached.

Full particulars as to duties, &c., may be obtained on application to the Water Engineer, Town Hall, Workington.

Application, endorsed "Inspector," and accompanied by copies of not more than three recent testimonials (which will not be returned), may be sent to the undersigned on or before the 23rd instant.

JOHN WARWICK,
Town Clerk.

Town Hall, Workington.
April 10, 1912.

DAVENTRY RURAL DISTRICT COUNCIL.

WEEDON BECK SEWERAGE.

The Rural District Council of Daventry invite Tenders for Constructing Sewers and Sewage Disposal Works, comprising Sewers, Sedimentation and Storm-water Tanks, Percolating Filter-beds, Pumping Machinery, Manholes, and other appurtenant Works, in the Parish of Weedon Beck.

Drawings may be seen, and Specifications, Schedule of Quantities, Form of Tender and other particulars obtained, on application to the Engineer to the Council, Mr. J. B. Williams, The Moot Hall, Daventry, during office hours, upon payment of Five Guineas, which will be returned upon receipt of a *bonâ-fide* Tender and return of all documents.

Sealed Tenders, upon the Forms supplied, endorsed "Weedon Beck Sewerage," must be delivered at my Office not later than 12 o'clock on Tuesday, the 30th instant.

The Council do not pledge themselves to accept the lowest or any Tender.

(By order)
J. D. SPEARING,
Clerk of the Council.

The Moot Hall,
Daventry.
April 10, 1912.

CORRESPONDENCE COACHING, Evening Working.—Required, gentleman to assist in Royal San. Inst. and Municipal and County Exams.—Reply immediately to R. W., office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

# Some Recent Publications.*

Fergusson's "Percentage Unit" of Angular Measurement, with Logarithms for its Use and for Degrees, Minutes and Seconds. By John C. Fergusson, M.Inst.C.E. Price £3 3s. nett. London: Longmans, Green & Co.

This work, which is the result of no less than nineteen years' research and labour, embodies the author's original mathematical discovery of the "percentage unit" of angular measurement, together with a complete series of logarithmic tables, specially compiled for use in its application to various practical problems. The author claims, and it appears to us justly so, that the application of his discovery will effect a tremendous saving in all angular computations as compared with the labour involved if the units of the degree or grade be used. The definite object of the "percentage unit," as stated by its inventor, is "to simplify plane trigonometry and reduce it to arithmetic by a new method of numbering angles, so that the angle numbers will bring clearly to the mind the nature of an inclined line and the ratio of the sides of an angle to one another." The new unit enables the operator to express the amount of divergency between two lines, emanating from a point, in terms of a percentage of the radius, the exact amount of which percentage is expressed by the number of the angle itself; and the problem has been solved by Mr. Fergusson by the centesimal division of each octant of the circle. It is impossible here to enter into any discussion or full explanation of the "percentage unit." Suffice it to say that, in our opinion, it is no mere mathematical novelty or freak, but a real contribution to the evolution of mathematical science. It has been applied practically to the science of surveying by means of Fergusson's percentage theodolite, which enables the engineer in one setting to determine the direction of the course, the distance of the course, the latitude and departure of the course, and the difference in level between stations. Moreover, with this instrument no traverse tables or tables for the reduction of inclined sights are required. There is little doubt that in due time the percentage unit idea will be generally adopted in the execution of survey work to which it is applicable.

Reinforced Concrete Design. By Oscar Faber, B.Sc., &c., and P. G. Bowie. Price 12s. 6d. nett. London: Edward Arnold.

The design of reinforced concrete is a matter which cannot be worked out on purely mathematical considerations, owing to the very wide range of alternatives which are open to the engineer. The actual selection of a type for a given work must depend very largely upon practical considerations, and it is therefore eminently desirable that those who seek to instruct others in regard to reinforced concrete practice should themselves have had wide experience of the use of the material. This important qualification is possessed by both the authors of this book, who, in their experience as contractors' engineers, have had a most thorough training in the practical aspects of their subject. The mathematical and theoretical part of the work, too, is written clearly, a good deal of the more advanced portions being relegated to an appendix which contains mathematical analyses of beams under various conditions of loading and fixing. The first chapter of the book deals with general principles and materials, and the remainder of the work is divided into four parts, which deal respectively with the calculation of stresses under known forces and moments, the design of columns, the design of beams and slabs, and applications and general notes. The authors have covered the whole field of reinforced concrete design, and their book, which is well illustrated and adequately indexed, should certainly find a place on the bookshelves of every reinforced concrete practitioner.

Local Legislation, 1909 to 1911. By F. N. Keen, LL.B., Barrister-at-Law. Price 5s. nett. London: Walter Southwood & Co., Limited.

In this book the author has grouped according to subject-matter, and classified under suitable headings most of the provisions contained in those private Acts of Parliament obtained in the Sessions 1909, 1910 and 1911 by provincial corporations and urban district councils in England and Wales, the Bills for which were considered by the Local Legislation Committee of the House of Commons. This Committee each year gets through a great volume of legislative work which does not come prominently into public notice; and there can be no doubt as to the great usefulness of such a careful classification of the various provisions which it has sanctioned as that which Mr. Keen has compiled. A reference to this book is sufficient to enable one to see the trend of modern local legislation, and the particular directions in which increased control is being found desirable. Many of these provisions, though contained in private Acts, are of general interest, particularly as precedents for other authorities who may contemplate seeking similar powers. The subjects comprised in the 2,300 sections which are given include Sanitation, Building Regulations, Infectious Disease, Water Supply, Lighting, Tramways and Railless Traction, Superannuation, Rating, Local Government Finance, and many others.

Engineering Work in Public Buildings. By R. Owen Allsop. Price 12s. 6d. nett. London: E. and F. N. Spon, Limited.

The provision of power, heating, lighting, ventilation, and water supply in hospitals, asylums, and other communal buildings is a matter which falls rather within the province of the specialist engineer, but with which the architect is, nevertheless, often called upon to deal without expert advice or assistance. Mr. Allsop's book, which is a reprint of a series of articles which originally appeared in an engineering journal, will be found of great value as a work of reference to all who are responsible for carrying out the particular works with which it is concerned. The matters dealt with include the lay-out of the engineer's department, the various types of boiler, methods of heating, ventilation, water supply, baths, laundry installation, kitchen arrangements, and lighting and electrical machinery. The text is copiously illustrated throughout, and a good index is provided. The whole work is conceived on the basal principle that the first essential is centralisation of the plant; and it contains a wealth of practical suggestion which cannot fail to be helpful in the design and execution of any scheme of the kind with which it deals.

A Winter Holiday in Portugal. By Captain B. Granville Baker. Price 12s. 6d. nett. London: Stanley Paul & Co.

Portugal has great attractions for the holiday maker, and with this book in his possession the seeker after scenery, or health, or a complete change of general surroundings, should find his pleasure vastly enhanced. Captain Baker has familiarised himself with Portuguese history, and he weaves it about many a thing seen which might otherwise be commonplace or meaningless to the casual tourist. One should certainly follow his footsteps in Portugal—but in the winter. In summer this picturesque land of stagnation is impossible—except, perhaps, in the larger seaboard towns from Lisbon to Oporto. Inland, myriads of fleas make the summer nights restless periods of torture—especially to the "tenderfoot." A coloured frontispiece, and forty original wash-drawings by the author—who draws as charmingly as he writes—add to the attractions of a work which has nothing about it of the conventional guide book.

Lockwood's Builders' and Contractors' Price Book, 1912. Edited by F. T. W. Miller, A.R.I.B.A. Price 4s. London: Crosby Lockwood & Son.

The new edition of "Lockwood" contains all the familiar information brought carefully and thoroughly up to date. Many sections, too, have been amplified so as to embrace the requirements of modern developments in the building trade. The appendices will be found of special usefulness, as containing in a concise and convenient form legal notes and memoranda, including the most important judicial decisions and Parliamentary enactments. In its new edition "Lockwood" fully maintains the excellent reputation which it has hitherto enjoyed among architects, surveyors, builders, and all who are connected with the building trade.

The Civil Engineers' Cost Book. By T. E. Coleman. Price 5s. nett. London: E. & F. N. Spon.

This little price book, which is arranged on the alphabetical or encyclopædic principle, forms a concise and at the same time comprehensive pocket remembrancer, and is eminently suited to meet the requirements of the municipal engineer or the civil

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

engineer in general practice. It will be found of special value in making preliminary estimates of a rough character, or in arriving at a prompt decision as to the relative cost of two or more methods of executing some particular work. To take an example at random, under the heading "Gasworks" we find for large and small towns respectively prices per head of population per 1,000,000 cub. ft. produced each year, and per ton of coal carbonising capacity required each year. The actual cost of several existing works is also given. The book covers the cost both of engineering works and of plant and machinery, and all the matter is so arranged as to render any desired item easy of reference.

## THE ECONOMY OF THE GAS ENGINE.

### ITS EXTENDING APPLICATION.

In a lecture on the economy of gas power over steam, before the Society of Engineers and Metallurgists, Mr. Alan Chorlton, of the firm of Mather & Platt, Limited, Manchester, claimed that so completely satisfactory and reliable had the gas engine now become that every day saw its application extended to duties so difficult and onerous that only a few years ago they would have been thought impossible of achievement. The invention of the producer, its progress and improvement to date, had, of course, extended the field of the gas engine enormously. Mechanical and thermal efficiencies had steadily increased in recent years, and the reliability of the gas engine had been brought up to the standard of the one-time omnipotent steam engine.

A waste gas that was at present receiving more attention even than that from blast-furnaces was that which was obtained from the by-product coke ovens. These ovens were now at work, or being laid down, in considerable numbers in this country; but even in this matter we were far behind the expansion that was taking place in Germany. Such was this expansion that with the typical German ability of working together, the coke-oven owners were now selling large quantities of waste gas from these ovens for illuminating purposes in the adjacent towns. In this country the only place where such illumination was carried out was Little Hulton.

Mr. Chorlton predicted that when further progress of this nature took place in districts adjacent to coalfields, it would last of all affect Sheffield, which already compared favourably in the price of gas supplied retail (11d.) with that supplied in gross by the German concerns (8½d.).

**War Office Order.** The War Office have placed with Messrs. Hill & Smith, Limited, Brierley Hill Ironworks, Staffordshire, the order for the construction and erection of a shed for airships at Farnborough. The shed will be 300 ft. long, 80 ft. high, and 114 ft. wide, and will be constructed of lattice stanchions and roof principals, and covered with galvanised sheets.

**Institution of Civil Engineers: Students' Meeting.**—At a students' meeting held at the Institution of Civil Engineers on Friday, March 29th, Mr. C. R. S. Kirkpatrick, M.Inst.C.E., in the chair, a paper on "The Eastern Wharf Recon truction, Dundee," was read by Mr. C. R. Sherbrick, stud.M.Inst.C.E. After a general description of the structure, the author gave many interesting details of the manner in which the practical difficulties in the erection of such structures in tidal waters had been overcome in the particular case. The paper was well illustrated by a number of slides. Mr. A. J. Hart and Mr. W. J. Barling took part in the subsequent discussion.

**Trade Note.**—Messrs. Kerner-Greenwood & Co., King's Lynn, write: "We shall be glad if you will kindly put a notice in your paper to save correspondents the trouble of writing for information with reference to 'Pudlo,' which makes cement waterproof. We may say that cement with 'Pudlo' is just the same as cement without 'Pudlo,' except that the rendering or concrete will never show any efflorescence. Many people ask whether 'Pudlo' makes the work greasy, or whether it affects the setting of the cement, and to all these questions we say, No! The cement is just the same whether the 'Pudlo' is in or not."

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President*—Mr. Albert D. Greatorex, M.Inst.C.E., Borough Engineer and Surveyor of West Bromwich.

### FORTHCOMING MEETINGS.

The following meetings have been arranged:—

April 27th.—Council meeting.
May 4th.—Exmouth.
May 11th.—Nuneaton.
May 24th—29th.—Paris.
June 1st.—Council meeting.
June 7th—8th.—Stirling.
June 15th.—East Ham.
June 22nd.—Lowestoft.
June 29th.—Bridlington.
July 6th.—Stourbridge.
July 11th—13th.—Annual meeting, London.

Provincial members who propose to take part in the visit to Paris will, in cases where the journey exceeds a distance of 30 miles, be able to obtain return tickets to London at a single fare and a quarter.

Thomas Cole,
11 Victoria-street, S.W. *Secretary.*

## INSTITUTION OF MUNICIPAL ENGINEERS.

*President*—Mr. E. A. Stickland, Assoc.M.Inst.C.E., Borough Surveyor, Windsor.

### NORTH-WESTERN DISTRICT.

To-morrow (Saturday) a visit will be paid to the Heywood sewage works, when the manager, Mr. R. J. McKenn, will explain the works.

Conveyances will wait at station to convey the party to the sewage and refuse destructor works. After tea a discussion on county council grants for road works will be opened by Mr. J. W. Gleave.

J. Hayes,
*Hon. District Secretary.*

147 Church-street,
Westhoughton.
March 30, 1912.

## ROYAL SANITARY INSTITUTE.

### PROVINCIAL SESSIONAL MEETING AT CARDIFF.

A meeting of the Royal Sanitary Institute will be held to-day (Friday) in the Council Chamber, City Hall, Cardiff, when a discussion will take place on

The Development of Cardiff Waterworks,

to be opened by Mr. C. H. Priestley, M.Inst.C.E., waterworks engineer, Cardiff.

Among those who are expected to take part in the discussion are Prof. W. S. Boulton, B.Sc., Professor of Geology, University of Wales; Alderman C. H. Bird, J.P., chairman, Waterworks Committee, Cardiff; Councillor J. Robinson, J.P., L.R.C.P., chairman, Health Committee, Cardiff; Messrs. Herbert E. Allen, M.Inst.C.E.; W. Harpur, M.Inst.C.E., F.S.I., city engineer, Cardiff; B. E. Harvey, M.Inst.C.E., borough engineer, Merthyr; J. Howard-Jones, M.D., D.P.H., medical officer of health, Newport (Mon.); D. E. Roberts, M.Inst.C.E.; J. H. Sugden, M.Sc., F.I.C., and E. Walford, M.D., D.P.H., medical officer of health, Cardiff.

The chair will be taken at 5 p.m. by Mr. W. Whitaker, B.A., F.R.S., F.G.S.

To-morrow a visit will be paid to Cardiff reservoir in the Taff Fawr Valley, Brecon-shire.

### MEETING AT BLACKPOOL.

On May 24th next, at Blackpool Town Hall, discussions will take place on "The Card Index System as applied to Public Health Work," to be opened by E. W. Rees-Jones, M.D., D.P.H., M.O.H., and on "A Description of the Joint Scheme of Sewerage for Thornton-le-Fylde, Bispham-with-Norbreck, and Carleton," by Arthur Hindle, Assoc.M.Inst.C.E. On Saturday, May 25th, visits will be arranged to the new promenades, the new main sewerage works for Thornton-le-Fylde, Bispham-with-Norbreck, and Carleton, and the new main drainage works of the Fleetwood Urban District Council.

## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No.* 1359 *Holborn), subject to later confirmation by letter.*

SANITARY INSPECTOR.—April 13th.—Lewisham Borough Council. £150—£200.—Mr. E. Wright, town clerk.

INSPECTOR OF NUISANCES.—April 13th.—Tilbury Urban District Council. £120 per annum.—Mr. J. Beck, clerk, *pro tem.*

SURVEYOR.—April 13th.—Tilbury Urban District Council. £208 per annum. Mr. J. Beck, clerk, *pro tem.*

LAND VALUER.—April 15th.—Board of Trustees for the Improvement of Calcutta. 1,250 rupees per mensem, rising to 1,500 rupees.—Mr. C. H. Bompas, chairman, 5 Clive-street, Calcutta.

SURVEYOR AND WATER ENGINEER.—April 15th. Wath-upon-Dearne Urban District Council. £160—£190.—Messrs. Nicholson & Co., solicitors.

ASSISTANT SURVEYORS OF HIGHWAYS (2).—April 15th.—Isle of Wight Rural District Council. £80 per annum.—Mr. H. Eldridge Stratton, clerk.

CLERK OF WORKS.—April 16th.—Wembley Urban District Council. £3 3s. per week.—Mr. F. W. Rodd, clerk.

ASSISTANT SANITARY INSPECTOR.—April 17th.—Chiswick Urban District Council. £100—£150 per annum.—Mr. E. F. Collins, clerk.

SEWERS FOREMAN. — April 18th. — Lambeth Borough Council. 50s. per week.—Mr. H. J. Smith, town clerk.

SURVEYOR.—April 20th.—Corporation of Newark. £250 a year.—Mr. G. Tallents, town clerk.

CLERK OF WORKS.—April 23rd.—Chingford Urban District Council.—Mr. L. C. Bowen, clerk.

BOROUGH SURVEYOR'S JUNIOR ASSISTANT.—May 1st.—Corporation of Stoke-on-Trent. £65 per annum.—Mr. A. Burton, borough engineer.

## MUNICIPAL COMPETITIONS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No.* 1359 *Holborn), subject to later confirmation by letter.*

RATHDRUM.—April 13th.—Plan for a sewage treatment system in Kilpedder, for the rural district council. A premium of £50 is offered.—Mr. Bernard Manning, clerk.

BIRMINGHAM.—April 13th.—Designs of new public baths, for the Corporation of Birmingham. Premiums of 20 and 10 guineas are offered for the second and third designs.—Mr. J. Cox, superintendent engineer, Kent-street, Birmingham.

WOMBWELL.—May 1st.—Designs for public swimming bath, for the urban district council.—Prizes of £40, £30 and £20 are offered.—Mr. W. Quest, surveyor.

HALE.—June 28th.—Designs for a town planning scheme for the urban district council. Premiums of £50 and £25 are offered.—The Clerk.

DUSSELDORF.—July 1st.—Plan for the extension of the city. Premiums of £1,000 and £375 are offered.—The Chief Burgomaster.

## MUNICIPAL CONTRACTS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No.* 1359 *Holborn), subject to later confirmation by letter.*

### Buildings.

COVENTRY.—April 13th.—For the conversion of a building into slipper baths, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

MANCHESTER.—April 13th.—For the erection of a school, for the Education Committee.—Accountant, Education Offices, Deansgate.

EAST SUFFOLK.—April 13th—29th.—For the erection of a school, for the Education Committee.—Mr. J. Webb, surveyor, Education Office, County Hall, Ipswich.

DERBYSHIRE.—April 15th.—For the construction of three schools and alterations to existing schools, for the Education Committee.—Mr. George H. Widdows, architect, St. Mary's-gate, Derby.

BEDFORD.—April 15th—24th.—For the erection of a school at Limbury, for the county council.—Mr. W. W. Marks, clerk, Shire Hall, Bedford.

GLASGOW.—April 15th.—For the erection of buildings in Irongate, for the corporation.—Mr. J. Lindsay, town clerk.

INVERKEITHING.—April 15th.—For the construction of ferro-concrete water tank, enclosure walls and footpaths, for the corporation.—Mr. John R. Menzies, town clerk.

NOTTINGHAM.—April 15th.—For the erection of a school, for the Education Committee.—Mr. W. J. Abel, clerk.

SOUTHEND-ON-SEA.—April 15th.—For the erection of a secondary school for girls, for the Rochford Education Sub-Committee.—Mr. H. Bell, clerk, County Chambers, Southend-on-Sea.

ABERSYCHAN.—April 16th.—For the erection of workmen's dwellings, for the urban district council.—Mr. W. H. V. Bythway, clerk, Pontypool.

ANGLESEY.—April 17th.—Alterations and additions to a school, for the Education Committee.—Mr. R. H. Williams, Education Offices, Llangefni.

BIRMINGHAM.—April 17th.—For the erection of three cottages, for the Tame and Rea District Drainage Board.—Mr. John D. Watson, engineer, Tyburn, Birmingham.

SHEFFIELD.—April 17th.—For the extension of school buildings, for the Education Committee.—City Architect.

KING'S LYNN.—April 18th.—For the erection of a mortuary, for the corporation.—Mr. Alfred J. Smith, borough surveyor.

MANCHESTER.—April 18th.—For the erection of mess-room and lavatories, for the Gas Committee.—Mr. J. G. Newbiggin, engineer, Rochdale-road Station.

CROYDON.—April 18th.—For the erection of a handicraft centre, for the corporation.—Mr. James Smyth, clerk to Education Committee.

WALLASEY.—April 18th.—For the construction of purifier-house at gas-works, for the corporation.—Mr. H. W. Cook, town clerk.

FINCHLEY.—April 19th.—For an installation to deal with house and trade refuse, for the urban district council.—Mr. E. H. Lister, clerk.

KENT.—April 19th.—For alterations and additions at Barming Heath Asylum, for the county council.—Mr. Francis R. Howlett, clerk to the County Asylums Committee, 9A King-street, Maidstone.

BENLEY.—April 20th.—For the erection of a branch library, for the urban district council.—The Clerk.

MONMOUTH.—April 20th.—For the erection of a school, for the Education Committee.—Mr. C. Dauncey, secretary, County Council Offices, Newport.

NORTHUMBERLAND.—April 22nd.—For the erection of a school at Hazelrigg, for the Education Committee.—Mr. C. Williams, secretary, Moothall, Newcastle-upon-Tyne.

BOOTLE.—April 24th.—For the erection of electric light station, for the corporation.—Mr. J. Henry Farmer, town clerk.

BEDFORDSHIRE.—April 24th.—For the erection of a school, for the county council.—The Clerk.

BOOTLE.—April 24th.—For the erection of brick chimney shaft, for the corporation.—Mr. J. Henry Farmer, town clerk.

ASHTON-UNDER-LYNE.—April 24th.—For alterations to electricity works, for the corporation.—Mr. John Neal, borough comptroller.

PONTYPOOL.—April 27th.—For the erection of 100 dwellings, for the urban district council.—Mr. H. H. Haden, clerk.

### Iron and Steel.

LONDON.—April 16th.—For the supply of 484 tons rolled-steel bar, special section, for magnetic brakes, for the county council.—The Clerk.

MARGATE.—April 17th.—For the supply of cast-iron fencing, for the corporation.—Mr. E. A. Borg, borough surveyor.

HORNSEY.—April 22nd.—For the erection of a boiler and slab-making machinery, for the borough council.—Mr. F. D. Askey, town clerk.

STIRLING.—April 22nd.—For laying cast-iron water pipes and constructing foundation for steel tank, for the county council.—Mr. Thomas Lupton, district clerk, 22 King-street, Stirling.

MANCHESTER.—April 22nd.—For supplying and fixing wrought-iron railings and gates, for the Education Committee.—Mr. Thomas Hudson, town clerk.

## Roads.

HAVERHILL.—April 13th.—For the supply of granite, slag, tarred-macadam, and basalt, for the urban district council.—Mr. W. H. Eley, surveyor.

LEEDS.—April 15th.—For paving and flagging certain streets, also tar-macadamising, for the Highways Committee.—Town Clerk.

ASHFORD.—April 15th.—For the supply of gravel, flint, and Kentish ragstone, for the rural district council.—The Clerk.

SKIPTON.—April 15th.—For making up two roads, for the urban district council.—Mr. Richard Wilson, clerk.

PORT GLASGOW.—April 15th.—For making-up work, for the corporation.—Mr. J. Murray, burgh surveyor, Anderson-street.

WANDSWORTH.—April 15th.—For flagging the footway of part of Upper Richmond-road, for the borough council.—Mr. Henry George Hills, town clerk.

SOUTHALL-NORWOOD.—April 15th.—For tarring carriageway surfaces, for the urban district council.—Mr. R. Brown, engineer, Town Hall.

BRIGHOUSE. — April 15th. — For the supply of granite setts, for the corporation.—Mr. S. S. Heywood, borough engineer.

ILKLEY.—April 16th.—For the supply of limestone, granite, and tar-macadam, for the urban district council.—Mr. F. S. Eckersley, clerk.

LONDON.—April 16th.—For paving works in several streets, for the corporation.—Town Clerk.

LEWISHAM.—April 16th.—For making up certain streets, for the borough council.—The Town Clerk.

EPSOM.—April 16th.—For the supply of a 10-ton double-speed steam roller and scarifier, for the urban district council.—Mr. E. G. Wilson, clerk.

URMSTON.—April 16th.—For paving, flagging and improvement works, for the urban district council.—Mr. James Heath, surveyor.

WHITLEY.—April 17th.—For the construction of back street, laying wood blocks, and construction of footway, for the urban district council.—Mr. A. Whitehorn, clerk, 60 Saville-street, North Shields.

MARKET BOSWORTH.—April 17th.—For the supply of broken granite and team labour, for the rural district council.—Mr. Frank Bouskell, clerk.

CARSHALTON.—April 17th.—For making up a road and approaches, for the urban district council.—Mr. W. W. Gale, surveyor.

GLOUCESTER.—April 17th.—For the supply of stone and haulage, for the rural district council.—Mr. F. E. Weaver, Berkeley House, Berkeley-street, Gloucester.

RAWTENSTALL.—April 17th.—For works of paving and sewering, for the corporation.—Mr. J. Whalley, town clerk.

ROCHDALE. — April 17th. — For making up two streets, for the corporation.—Mr. J. Bowen, borough engineer and surveyor.

HEBDEN BRIDGE.—April 17th.—For tar-spraying and laying setts, for the urban district council.—Mr. S. Ogden, clerk.

LIMEHURST.—April 17th.—For the supply of broken granite, and limestone or granite chippings, for the rural district council.—Mr. J. Taylor, clerk, 113 Old-street, Ashton-under-Lyne.

SOUTHGATE.—April 17th.—For work of surface tarring, for the urban district council.—Mr. W. M. Ellenor, clerk.

MARCH.—April 18th.—For the supply of broken granite and gravel, for the urban district council.—Mr. C. Greenwood, clerk.

FINCHLEY.—April 19th.—For the supply of from 300 to 400 tons of gritting material, for the urban district council.—Mr. E. H. Lister, clerk.

STANDISH-WITH-LANGTREE.—April 20th. — For laying 6,465 yds. of flags, for the urban district council. Mr. J. H. Richards, clerk.

HOUGHTON-LE-SPRING. — April 20th. — For the supply of road materials, for the rural district council. —Mr. D. Balfour, surveyor.

HALE.—April 22nd.—For making up Nursery-avenue, for the urban district council.—Mr. J. G. Whyatt, clerk.

MARYLEBONE.—April 22nd.—For the supply of Fletton bricks and wood blocks, for the borough council.—Mr. James Wilson, town clerk.

ILFORD.—April 22nd.—For making up a road, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

RUSHDEN.—April 22nd.—For the supply of granite and slag, for the urban district council.—Mr. W. B. Madin, engineer and surveyor.

WALSALL.—April 22nd.—For the supply of granite setts, for the corporation.—Mr. J. R. Cooper, town clerk.

CLUTTON.—April 23rd.—For the construction of a footpath, for the rural district council.—Mr. J. S. Dury, Temple Cloud, near Bristol.

ELY.—April 24th.—For the supply of coarse clunch and coarse-screened gravel, for the rural district council.—Mr. E. B. Claxton, clerk.

BRIGHTON.—April 24th.—For the supply of flints and broken granite, for the corporation. — Mr. H. Talbot, town clerk.

WOODHALL SPA.—April 24th.—For the supply of granite, for the urban district council. — Mr. J. E. Chatterton, clerk, 4 Church-lane, Horncastle.

HETTON-LE-HOLE.—April 25th.—For the supply of whinstone and slag, for the urban district council.—Mr. G. Young, clerk, William-street, Houghton-le-Spring, Durham.

SICCA.—April 25th.—For the carting of stone and gravel, for the rural district council.—Mr. Stanley C. Warden, clerk, Stratford-on-Avon.

FAREHAM.—April 25th.—For the supply of granite, basalt, or other hard stone, for the urban district council.—Mr. Walter Butler, surveyor.

BRIGHTON.—April 26th.—For laying wood and Lithofalt blocks, for the corporation.—Mr. H. Talbot, town clerk.

HORSHAM.—May 6th.—For making up Victoria-road, Albany-road, and Princess-road, Crawley, for the rural district council.—Mr. W. Dengate, 58 Park-street, Horsham, surveyor.

## Sanitary.

PERTH.—April 13th.—For works of drainage, for the corporation.—Mr. John Begg, town clerk.

MATLOCK.—April 15th.—For the construction of main outfall and subsidiary sewers of earthenware, steel and cast-iron pipes, manholes, detritus tanks, percolating filters and effluent drains, for the urban district council.—Mr. R. Taylor, clerk.

BEDWELLTY.—April 15th.—For draining and fencing works, for the urban district council.—Mr. T. J. Thomas, clerk, 36 High-street, Bargoed.

CHERITON.—April 15th.—For the collection and removal of refuse, for the urban district council.—Mr. Arthur Atkinson, clerk.

LEITH.—April 15th.—For laying sewer, for the corporation.—Burgh Surveyor.

SWANSEA.—April 15th.—For the construction of surface drainage, for the rural district council.—Mr. E. Harris, clerk.

RAUNDS.—April 15th.—For extensions to sewage disposal works, for the urban district council.—Mr. W. F. Corby, clerk.

MALDENS AND COOMBE.—April 16th.—For the construction of stoneware pipe sewer, for the urban district council. — Mr. J. W. Johnson, clerk, New Maldon.

BARNOLDSWICK.—April 16th.—For sewerage extension works, for the urban district council.—Mr. W. Bennett, engineer and surveyor.

BELFAST.—April 16th.—For the construction of brick and glazed earthenware pipe sewers, for the corporation.—Mr. R. Meyer, town clerk.

LIMEHURST.—April 17th.—For the supply of stoneware pipes, and bends and junctions, for the rural district council.—Mr. J. Taylor, clerk, 113 Old-street, Ashton-under-Lyne.

STOCKPORT.—April 18th.—For sewering work in Lilling-road for the corporation.—Borough Surveyor.

MANSFIELD.—April 18th.—For laying 2,450 yds. of stoneware pipe sewers and manholes, for the corporation.—Mr. J. Harrop White, town clerk.

WESTHAMPNETT.—April 19th.—For work of scavenging, for the rural district council.—Mr. W. D. Rasell, acting clerk, 5 South-street, Chichester.

BACUP.—April 20th.—For work of sewerage, for the corporation.—Mr. J. Entwistle, town clerk.

SEVENOAKS.—April 24th.—For the construction of sewerage works at Edenbridge, for the rural district council.—Mr. F. H. Vibert, clerk.

BRIGHTON.—April 26th.—For the construction of sewers and other works, for the corporation.—Borough Surveyor.

HASTINGS.—April 29th.—For laying pipe sewer, for the corporation.—Town Clerk.

TEDDINGTON.—May 15th.—For the erection of sewage disposal and refuse destructor works, for the urban district council.—Mr. G. H. Salmons, clerk.

MATLOCK.—The date for receiving tenders for the sewerage and sewage disposal works has been extended to April 29th.

## Stores.

GLASGOW.—April 13th.—For the supply of special castings, valves for gravitation supply, pipes and special castings for hydraulic supply, carting, fire-clay pipes, and paints, for the corporation.—Mr. J. Lindsay, town clerk.

WALLASEY.—April 13th.—For the supply of coal, shovels, bolts, meters and cable, for the electricity works.—Mr. H. W. Cook, town clerk.

FALKIRK.—April 15th.—For the supply of gas stores, for the corporation.—Mr. A. B. Gray, town clerk.

WIGAN.—April 16th.—For the supply of stores, for the Gas Committee.—Mr. W. H. Tyrer, town clerk.

NEWMARKET.—April 16th.—For the supply of brooms, shovels, skips, disinfecting fluid and powder, picks, and scarifier points, for the urban district council.—Mr. S. J. Ennion, clerk.

PRESCOT.—April 20th.—For the supply of pipes, grids, manhole covers, gullies, Yorkshire flags, Yorkshire setts, macadam and Portland cement, for the urban district council.—Mr. Henry Cross, clerk.

## Miscellaneous.

BURY.—April 15th.—For the supply of 400 tons of sulphuric acid, for the corporation.—Town Clerk.

WILTS.—April 22nd.—For the supply or hire of motor cars, for the county council.—The clerk, County Offices, Trowbridge.

# TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BAKEWELL.—For the construction of sewers, manholes, &c., for the rural district council :—

| | |
|---|---|
| W. W. Bateman, Chesterfield | £248 |
| J. Allsop & Son, Bakewell | 245 |
| A. Marsden, Youlgreave | 194 |
| W. Toft & Co., Youlgreave * | 188 |

BELPER.—The following tenders are recommended for acceptance to the rural district council :—

Granite.—Ellis & Everard, J. Carr & Co., Groby Granite Company, and Salisbury & Wood.

Furnace slag.—Stanton Iron Company, Butterley Company, J. Case & Co., Derby Iron Company, and Farnah Company.

Limestone.—Clay Cross Company, T. Shaw, Bowers & Shaw, Longcliffe Limestone Company, J. Smart & Son, Drabble, Greenwood & Co, and A. E. Arthurton & Co.

Carting.—G. Lockley, Hagnes Brothers, T. Marshall, T. Thorpe, S. Burton, F. Davis, G. Pearson, H. Lowe, T. Booth, W. Bennett, C. J. Hool, A. Marshall, T. Sanders, G. Taylor, I. Buxton, A. E. Greatorex, J. Walbank, S. Shaw, R. Lomas, J. Gregory, J. Wholey, Mrs. Brown, H. Swift, Mrs. Spendlove, J. Howard, J. Miller, S. Oakley, E. Ford, S. Clarke, J. Morris, C. Hill, Narwin Brothers, S. Sheldon, J. N. Gore, and E. Woolley.

MERTON.—The following tenders have been accepted :—

Portland Cement.—Barry & Co., New Malden.

Farnham gravel, sand, &c.—T. Patterson, Farnham.

Broken flints.—T. Patterson and Smeed, Dean & Co., Limited, Sittingbourne.

Granite.—London Granite Company, Limited, Great Tower-street, and W. Griffiths & Co., Limited, London.

Granite kerb and channel.—Western Brothers, Limited, London.

Tar-paving for footpaths.—Constable, Hart & Co., Limited, London.

Tar-paving for carriageways.—C. Dalley & Co., Bridgar.

Other kinds of tar-paving and limestone dust and slag dust, untarred.—J. Smart & Son, London.

Manhole covers and frames, and gully gratings and frames.—Brentford Foundry Company, Limited, Brentford.

Stoneware goods.—J. Knowles & Co. (London), Limited, St. Pancras Ironmongery.—W. G. Sudbury & Sons, New Malden.

Brooms.—J. Jonas, Kingston.

Super-alumina and alumino-ferric.—Alumina Company, Limited, Widnes, and P. Spence & Sons, Limited, Manchester.

Oil.—Vacuum Oil Company, Limited, Westminster.

Cotton Waste.—F. How & Co., Stratford.

MAIDSTONE.—Accepted for the supply of road materials, for the corporation.—T. L. Bunting, borough surveyor :—

| | | £ | s. | d. | |
|---|---|---|---|---|---|
| 990 tons | 2-in. Guernsey granite, Fry Brothers | 0 | 11 | 3 | per ton. |
| 50 ,, | 1-in. ,, ,, | 0 | 11 | 0 | ,, |
| 50 ,, | ¾-in. ,, ,, | 0 | 7 | 3 | ,, |
| 620 ,, | 2-in. Penlee Elvan, Lavender & Bateman | 0 | 12 | 0 | ,, |
| 50 ,, | 1-in. ,, ,, ,, | 0 | 11 | 9 | ,, |
| 50 ,, | ¾-in. ,, ,, ,, | 0 | 9 | 0 | ,, |
| 880 ,, | 2-in. Cherbourg quartzite, Road Maintenance Company | 0 | 11 | 11 | ,, |
| 50 ,, | 1-in. Cherbourg Quartzite, Road Maintenance Company | 0 | 10 | 11 | ,, |

Kentish Ragstone.

| | | | | | |
|---|---|---|---|---|---|
| 100 yds. | Penenden-street Depot, J. W. Bridge | 0 | 4 | 0 | per c.yd. |
| 165 ,, | Asylum-road, Hudsons, Limited | 0 | 4 | 5 | ,, |
| 540 ,, | Tonbridge-road, Hudsons, Limited | 0 | 4 | 5 | ,, |
| 75 ,, | Mill-street Depot, J. W. Bridge | 0 | 3 | 10 | ,, |
| 25 ,, | Tovil flat, Hudsons, Limited | 0 | 3 | 10 | ,, |
| 30 ,, | Stockett-lane, Constable Hart & Co. | 0 | 4 | 0 | ,, |
| 35 ,, | Farleigh-hill, Hudsons, Limited | 0 | 4 | 0 | ,, |

Surface Picked Flints.

| | | | | | |
|---|---|---|---|---|---|
| 50 yds. | Boxley-road, W. H. Hooker | 0 | 5 | 5 | per c.yd. |
| 30 ,, | Heath-road, W. H. Hooker | 0 | 5 | 5 | ,, |
| 110 ,, | Penenden-street Depot, W. H. Hooker | 0 | 5 | 5 | ,, |
| 25 ,, | Tovil-flat, W. H. Hooker | 0 | 5 | 11 | ,, |
| 50 ,, | Stockett-lane, W. H. Hooker | 0 | 5 | 11 | ,, |
| 1,410 ,, | Aylesford Pit Flints, Silas Wagon | 0 | 4 | 0 | ,, |
| 300 tons | 2½-in. Tarred Ragstone Macadam, W. H. Bensted & Son | 0 | 12 | 3 | per ton. |
| 60 yds. | Coarse Tarred Ragstone Concrete 1½-in., W. H. Bensted & Son | 0 | 12 | 0 | per c.yd. |
| 50 ,, | Fine Tarred Ragstone Concrete, ¾-in., W. H. Bensted & Son | 0 | 14 | 0 | ,, |
| 700 ,, | Aylesford Sharp Yellow Sand, Silas Wagon | 0 | 3 | 0 | ,, |
| 200 ,, | Aylesford Gravel (fine & coarse) ,, (part) | 0 | 3 | 0 | ,, |
| | A. Hutson (part) | 0 | 2 | 3 | ,, |
| 500 ,, | Ballast (Thames or Brightlingsea), A. Hutson | 0 | 3 | 4 | ,, |
| 20 tons | 4-in. Ragstone Paving Setts, W. H. Bensted & Son | 0 | 17 | 6 | per ton. |
| 1,000 feet run | 12-in. × 6-in. Ragstone Kerb, W. H. Bensted & Son | 0 | 0 | 9½ | per ft. |
| 100 tons | Portland Cement, Trechmann, Weekes & Co., Limited | 1 | 6 | 4 | per ton. |

OSWESTRY.—For the execution of the Weston Rhyn Sewerage, for the rural district council.—Messrs. Berrington, Son and Watney, engineers :—

| | |
|---|---|
| Braithwaite & Co. | £3,356 |
| G. P. Trentham | 2,918 |
| Jones & Evans | 2,880 |
| W. H. Thomas | 2,790 |
| M. A. Boswell* | 2,700 |

Engineer's estimate, £2,750.

POCKLINGTON.—Accepted for the supply of blue stone and slag, for the rural district council :—

Whinstone.

| | Tons. |
|---|---|
| M. Appleby, Embleton | 2,000 |
| Cradock, Allison & Co., Eaglescliffe | 1,500 |
| J. N. Smith & Co., Leeds | 1,500 |
| Brouzhton Quarries Company, Settle | 875 |
| G. Bradley, Norton | 750 |
| Brookes, Limited, Halifax | 570 |
| Ord & Maddison, Darlington | 246 |

Slag.

| | |
|---|---|
| G. Bradley, Norton | 1,700 |
| W. H. Musgrave, Middlesbro' | 814 |
| Shackleton & Son, Goole | 595 |
| G. Firth & Co., Selby | 411 |

ROMFORD.—For the supply of Guernsey granite, for the urban district council.—Mr. J. Turvey, surveyor :—

| | Per ton. s. d. |
|---|---|
| Mowlem & Co., Westminster | 13 11 |
| Fry Brothers, Greenwich | 13 11 |
| A. & F. Manuelle, Gracechurch-street | 13 8 |
| W. Griffiths & Co., Bishopsgate* | 13 6 |
| Brookes, Limited, Westminster | 13 2 |

TICEHURST.—Accepted for the supply of broken granite, unbroken Kentish ragstone, and broken Sevenoaks stone, for the rural district council.—Mr. W. N. Wood, surveyor :—

Granite.

| | Per ton. s. d. |
|---|---|
| Mountsorrel Granite Company, Limited Leicester | 14 3 to 16 3 |
| Rowe & Mitchell, London Bridge | 12 7 to 14 6 |
| J. R. White & Co., London | 11 9 to 13 9 |

Kentish Ragstone.

| | |
|---|---|
| W. H. Bensted & Son, Maidstone (for 2½-in. | 7 9 to 9 0 |
| ,, ,, ,, (for unbroken) | 6 2 to 7 6 |

Sevenoaks Stone.

W. Arnold & Sons, Paddock Wood, 2½-in. broken, 8s. to 9s, 7d. per yard.

UXBRIDGE.—Accepted for the supply of granite, gravel, flints and haulage, for the rural district council.—Mr. J. W. Harrison, engineer and surveyor :—

Cliffe Hill Granite Company, Limited, Markfield, from 11s. to 12s. 9d. per ton, according to station.

W. Ireland, Atherstone, from 11s. 7d. to 12s. per ton, according to canal wharf.

# MEETINGS.

*Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.*

APRIL.

12.—Institution of Civil Engineers: Students' Meeting: Mr. H. G. Hoskings on "Exminster Sewage Disposal Works," 8 p.m.

12-13.—Royal Sanitary Institute: Meeting at Cardiff; Discussion on "The Development of Cardiff Waterworks"; visit to waterworks extension at Brecon Beacons.

13.—Institution of Municipal Engineers: Visit to Heywood Sewage Works.

15.—Surveyors' Institution: Mr. R. M. Kearns on "The Cost of Labour in Connection with the Erection and Maintenance of Buildings." 8 p.m.

APRIL.

16.—Institution of Civil Engineers: Papers by Sir Francis J. E. Spring and H. H. Gordon Mitchell on "Madras Harbour Remodelling." 8 p.m.
17.—Institution of Civil Engineers: Students' visit to constructional steelworks of Messrs. Joseph Westwood & Co., Millwall.
17.—Junior Institution of Engineers: Mr. B. Kilburn Scott, Assoc.M. Inst.C.E., M.I.E.E., on "The Layout and Erection of Electric Power Plant." Institution of Electrical Engineers. 8 p.m.
18.—Institution of Mechanical Engineers: Annual Dinner, Hotel Cecil.
23.—Surveyors' Institution: Annual Dinner, Whitehall Rooms. 7 p.m.
25.—Roads Improvement Association: Annual General Meeting, Caxton House, Westminster. 5.30 p.m.
27.—Institution of Municipal and County Engineers: Council Meeting.

MAY.

4.—Institution of Municipal and County Engineers: Meeting at Exmouth.
4.—Lower Thames Valley District Surveyors' Association: Annual Meeting and Dinner.
11.—Institution of Municipal and County Engineers: Meeting at Nuneaton.
24-29.—Institution of Municipal and County Engineers: Visit to Paris.
24.—Royal Sanitary Institute: Meeting at Blackpool; Mr. A. Hindle, Assoc.M.Inst.C.E., on "The Joint Scheme of Sewerage for Thornton-le-Fylde, Bispham-with-Norbreck and Carleton;" Mr. E. W. Rees Jones on "The Card Index System as Applied to Public Health Work," Town Hall. 7.30 p.m.

JUNE.

1.—Institution of Municipal and County Engineers: Council Meeting.
7-8.—Institution of Municipal and County Engineers: Meeting at Stirling.
15.—Institution of Municipal and County Engineers: Meeting at East Ham.
22.—Institution of Municipal and County Engineers: Meeting at Lowestoft.
29.—Institution of Municipal and County Engineers: Meeting at Bridlington.

JULY.

6.—Institution of Municipal and County Engineers: Meeting at Stourbridge.
11-13. Institution of Municipal and County Engineers: Annual Meeting, London.

## APPOINTMENTS OPEN.

BOROUGH ENGINEER AND SURVEYOR (A.M.Inst.C.E.) of large town in the Midlands (40,000) has vacancy for Pupil. Address Box 1,144, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

VALUER AND SURVEYOR, VALUATION OFFICE, IRELAND.

FORTHCOMING EXAMINATION.

Applications must be received at the Civil Service Commission, London, not later than the 18th April, on printed Forms, to be obtained, with particulars, from the Secretary, Civil Service Commission, Burlington-gardens, London, W.

CITY OF LICHFIELD.

Articled Pupil required by the undersigned. A thorough training given in the various branches of the profession under direct personal supervision.

Further particulars given on application.

W. B. CHANCELLOR,
City Engineer and Surveyor.

The Guildhall,
Lichfield.
March 29, 1912.

TEMPORARY ASSISTANT required by Surveyor to small town on South-East Coast. Engagement in first instance for about three months. None but good draughtsmen having experience of large sewerage contracts need apply. Commencing salary 27s. 6d. per week.—Apply H. B., office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

SURVEYOR AND SANITARY INSPECTOR to an important Rural District near London is open to take Resident Pupil for 2 or 3 years; moderate premium required.—Apply Box 1,148, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

WEMBLEY URBAN DISTRICT COUNCIL.

CLERK OF WORKS.

The above Council requires the services of a competent Clerk of Works, temporarily, to supervise under the directions of the Surveyor to the Council the work of making up Private Streets, &c. Wages three guineas per week. Applications in writing, stating age and experience, together with the names and addresses of three persons for references, to be delivered at my Office in a sealed envelope, endorsed "Application, Clerk of Works," not later than Tuesday, the 16th April, 1912.

FREDK. W. RODD,
Clerk.

Public Offices, Wembley.
April 4, 1912.

COUNTY BOROUGH OF STOKE-ON-TRENT.

BOROUGH SURVEYOR'S DEPARTMENT.

The Corporation invite applications for the appointment of a Junior Assistant in the Borough Surveyor's Office at a salary of £65 per annum.

Applicants must be neat and expeditious Draughtsmen and accurate Surveyors and Levellers.

Preference will be given to candidates who have had a good experience in the preparation of plans and apportionments for the making up of Streets under the Private Street Works Act, 1892, and who have been trained in a Borough Surveyor's Office.

Applications, stating age and experience, accompanied by not more than three recent testimonials, and endorsed "Junior Assistant," must be sent to me on or before 1st May, 1912.

Canvassing, directly or indirectly, will be a disqualification.

A. BURTON, A.M.I.C.E., F.S.I.
Town Hall,
Stoke-on-Trent.
April 4, 1912.

ISLE OF WIGHT RURAL DISTRICT COUNCIL.

TWO ASSISTANT SURVEYORS OF HIGHWAYS.

Applications are invited for the Appointment of Two Assistant Surveyors of Highways for the Rural District, at a salary of £80 per annum each.

The Assistants appointed will be required to devote the whole of their time to their duties, to be good cyclists, and to reside where directed by the Council.

Candidates must be between the ages of 18 and 30 years.

Applications, in the handwriting of the candidates, accompanied by copies of not more than three recent testimonials (endorsed "Assistant Surveyor"), must be made on Official Forms, to be obtained from me, and must be delivered at the undermentioned Offices not later than Monday, 15th instant.

Selected candidates will have notice to attend a Meeting of the Council, and reasonable travelling expenses will be allowed.

Canvassing Members of the Council will be considered a disqualification.

(By order)
H. ELDRIDGE STRATTON,
Clerk to the Council.

Rural District Council Offices,
30 Pyle-street, Newport,
Isle of Wight.
April 4, 1912.

## TENDERS WANTED.

TEDDINGTON URBAN DISTRICT COUNCIL.

SEWAGE DISPOSAL AND REFUSE DESTRUCTOR WORKS.

CONTRACT No. 1.

The Council are prepared to receive Tenders for the Construction of Buildings, Chimney Shaft, Roadways, Sewers, Tanks, Filters and other works, comprised in the above contract, in connection with their Sewage Disposal Works at Broom-road, Teddington, Middlesex.

Drawings and Specification of the proposed works may be inspected on application at the office of Mr. Marshall Hainsworth, Surveyor to the Council, Public Offices, Teddington, and also at the office of Mr. William Fairley, M.Inst.C.E., Parliament Mansions, Victoria-street, Westminster.

A copy of the Bill of Quantities and Form of Tender may be obtained on deposit of a crossed cheque for Five Guineas, made payable to the Council, which deposit will be returned on receipt by the Council of a *bonâ-fide* Tender.

Sealed Tenders, on the forms provided by the Council, are to be delivered to the undersigned not later than noon on Wednesday, the 15th day of May, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
G. H. SALMONS,
Clerk to the Council.

Public Offices, Teddington
March 27, 1912.

## HORSHAM RURAL DISTRICT COUNCIL.

### PRIVATE STREET WORKS.

### TO ROAD CONTRACTORS.

The Council invite Tenders from experienced Contractors for the Making Up of Victoria-road, Albany-road and Princess-road, Crawley. Copies of the Specification, Bills of Quantities and Form of Tender may be obtained of Mr. W. Dengate, 58 Park-street, Horsham, the Surveyor to the Council, on payment of £1, which amount will be returned on receipt of a *bonâ-fide* Tender, and the Plan and Sections may be seen at his Office by appointment. Sealed Tenders, endorsed "Tender for Roads, Crawley," must reach me, at my Office, not later than 5 p.m. on Monday, May 6th. The Council does not bind itself to accept the lowest or any Tender.

A. C. COOLE,
Clerk.

9 Carfax, Horsham.
March 26, 1912.

## SEVENOAKS RURAL DISTRICT COUNCIL.

### EDENBRIDGE SEWERAGE.

The Rural District Council of Sevenoaks invite Tenders for the Construction of these Works, consisting of about 1,288 yards of 9-in. Stoneware Pipe Sewers, with Manholes, &c., in connection.

Drawings and Specifications may be seen, and copies of the latter with Form of Tender obtained, at the office of the Surveyor, Mr. John N. Prior, Woodgrange, Marlpit Hill, Edenbridge, on payment of a deposit of £1 1s., which will be returned on the receipt of a *bonâ-fide* Tender.

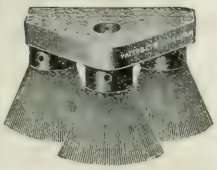
Tenders must be on the form provided, and must be forwarded, sealed and endorsed outside, to the undersigned on or before Wednesday, the 24th instant.

The District Council will not necessarily accept the lowest or any Tender.

(By order)
F. H. VIBERT,
Clerk of the Council.

Bank Chambers, Sevenoaks.
April 3, 1912

JOHN YATES & CO., Ltd.,
Aston Manor, BIRMINGHAM.
TELEGRAMS: "Yatonian, Birmingham."
PHONE: Birmingham East 400, 401 & 402
Private Branch Exchange.
EST. 1804.



TAR BOILERS AND TOOLS.
MACADAM FORKS.
ASPHALTE RAKES.
Also CORPORATION TOOLS OF ALL KINDS.

TAR SPRAYERS BRUSHES, BUCKETS, CARRIERS, CANS, etc.

All Engineers and Surveyors interested in Public Works should send a card for BOOKLET

No. 122

containing information about Ransome TYPE D PILING.

— Obtained from —

RANSOME-verMEHR MACHINERY CO.

TELEPHONE: 2188 VICTORIA.
509 Caxton House, LONDON, S.W.
TELEGRAMS: "VERMEHRICO, LONDON."

BOROUGH OF BOOTLE.

ELECTRIC LIGHT STATION.

The Corporation of Bootle invite Tenders for the Erection of Steel Frame and Brick Buildings for a new Electric Light Station.

Bill of quantities and further particulars may be obtained on application at the Borough Engineer's office, where the Plans and Specification may be seen.

Tenders, sealed and endorsed "New Electric Light Station Buildings," must be sent in to the undersigned not later than 9 a.m. on Wednesday, the 24th day of April, 1912.

The sum of One Guinea will be required as a deposit, which sum will be returned on receipt of a *bonâ-fide* Tender.

The Corporation do not bind themselves to accept the lowest or any Tender.

(By order)
J. HENRY FARMER.
Town Clerk.

Town Clerk's Office, Bootle.
April 10, 1912.

FAREHAM URBAN DISTRICT COUNCIL

TENDERS FOR MACADAM.

Tenders are invited by the above Council for the Supply of Granite, Basalt, or other Hard Stone, required for the year ending March 31st, 1913.

Form of Tender may be obtained on application from the undersigned.

Tenders, sealed and endorsed "Tenders for Macadam," together with samples of stone, to be delivered to me on or before April 25th, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

WALTER BUTLER.
Surveyor.

Council Offices,
Quay-street,
Fareham, Hants.

## APPOINTMENTS WANTED.

ASSISTANT seeks Appointment. Served Articles with Surveyor R.D.C.; holds certificate Board of Education for Building Construction and Drawing; elected Student of the Institution of Municipal Engineers.—Morrison, 105 Springfield-road, Brighton.

## MISCELLANEOUS.

FIRE-ENGINE, by Merryweather, in good working order, on wheels, fore-carriage, pole and horse gear. To throw two powerful jets. Price £75. Can be seen and tried at Lynn by arrangement.—Apply to Dodman & Co., Limited, Highgate, King's Lynn.

ECONOMICS OF FEEDING HORSES. By Harold Woodruff, M.R.C.V.S., Professor of Veterinary Medicine, and lately of Hygiene and Dietetics, Royal Veterinary College, London. It explains how to get the maximum of efficiency at the minimum of cost. Pp. x. + 116. Price 3s. 6d. nett (postage 3d. extra). — Bailliere, Tindall & Cox, 8 Henrietta-street, Covent Garden, London.

WANTED, Set of Coaching Papers for the Examination of the Institution of Municipal and County Engineers.—Box 1,147, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

QUANTITIES, &c., LITHOGRAPHED accurately and with despatch.

**METCHIM & SON,**

**Abbey Buildings, Princes Street, Westminster, S.W., and 32 Clements Lane, E.C.**

Telephone Nos.: Victoria 1,734 and Avenue 1,048.

Surveyors' Diary and Tables 1912, 6d., post 7d., leather 1s.


# SURVEYORS' INSTITUTION

# EXAMINATIONS

**COMPLETE COURSES OF PREPARATION** in all Divisions and Sub-divisions of these EXAMINATIONS are given, either in Class, by Correspondence, or in Office, by

## Messrs. PARRY, BLAKE & PARRY.

The TWELVE MONTHS' and TWO YEARS' COURSES for the next two Examinations are just commencing.

These Courses have been taken by the great majority of the successful Candidates in these Examinations for very many years past, including the winners of ninety out of the one hundred and twenty prizes awarded during the last seventeen years.

These Courses were established twenty-one years ago, and since that time no stone has been left unturned to raise them to, and maintain them at, the highest standard of efficiency.

*For particulars of the Courses or Work or for any advice with respect to the Examinations, apply to—*

**Messrs. PARRY, BLAKE & PARRY,**

*Telephone: Gerrard 5880.*

**82 VICTORIA STREET, WESTMINSTER.**

# The Surveyor

And Municipal and County Engineer.

Vol. XLI. APRIL 19, 1912. No. 1,057.

## Minutes of Proceedings.

**The Roads Improvement Association.**

In the annual report of the Roads Improvement Association, some extracts from which will be found on another page, it is stated that the establishment of the Road Board has rendered it necessary for the Association, as the representative body in highway matters of all classes of road users, to take action to ensure that the views of road users are efficiently formulated and placed before the proper authorities. We are, however, unable to admit that the Association is at present representative of the whole body of road users, though we welcome indications that with an increase in its influence the Association is beginning to show signs of a sense of responsibility over a wider field than that which has up to quite recently limited its activities. As a sign of the bias of the Association in the direction of an advocacy of what is desirable from the point of view of the owners of motor vehicles, we may quote the following, with reference to complaints of the slipperiness of tarred roads for horse traffic: "From information at present available it would appear that the complaints are not very extensive . . ." Some of the complaints which we have heard have been "frequent and painful and free," and we are bound to say that the greasiness of tarred roads on a break-up of fine weather in the autumn may be a very serious trouble. The attitude of the Association, practically, in this matter is, however, a sane and reasonable one, as is evinced by the extracts from the report, to be found elsewhere in the present issue.

With regard to the efforts of the Association to induce the authorities to have lighting and tramway standards removed from the centre to the side of the carriageway, we are fully in sympathy with this, so long as it is not applied to really busy city streets in which the standard is best placed in a small island refuge. We repeat that the plan of dividing up the traffic by island refuges is a very good one in really busy city streets, but utterly to be condemned on all other classes of roads. The matter is not one of degree; there is an essential difference which ought to be generally recognised. With regard to the policy of making the grass margins of country roads accessible to traffic, there should, we think, be a distinction between narrow roads or lanes where the margin is normally used for passing, and wider roads where the margins should be reserved for emergencies, and not made too easy of access. The continual cutting up of margins is becoming a serious abuse and expense on some main roads which are quite wide enough for all reasonable road users. In such cases the use of the road margin should be accompanied by an awkward jolt, sufficient to deter the driver of a fast vehicle from using it merely because he is impatient of a little delay. The damage is done by all classes of carts and carriages in fine weather, but in wet weather the chief offenders are the drivers of motor carriages, who can use the turf when it is too soft for other carriages and carts.

We trust that the present year will see a genuine extension of the Association's scope, to include the recognition of the needs of all classes of road users, including pedestrians, and we venture to suggest that the best results will be obtained by a cordial support of the Road Board and a repudiation of the claims of those who pay the petrol tax to any special favour as regards the manner in which roads are to be improved. If any distinction were made it is quite clear that those who pay rates and taxes but do not own vehicles of any kind have the strongest claim to the services of a body really representative of road users.

* * *

**Electrolytic Sewage Disposal.**

The *Engineering News* of March 21st supplies a description of electrolytic sewage disposal works recently installed at Oklahoma City. It also contains a very interesting review of the attempts made in the past to use electricity in sewage purification, together with a long editorial article upon the same subject. This article condemns in very plain terms certain electrical sewage disposal works lately constructed in America, which we are told are overloaded with "crude pseudo-scientific promoting humbugging." We gather that, in the opinion of our contemporary, the Oklahoma works are an improvement on these only in the fact that certain useless "contraptions" have been omitted. It will be remembered that twenty-five years ago Mr. Webster carried out an interesting experiment at Crossness, wherein sewage was passed through channels containing longitudinal ironplates. Alternate plates were connected to the positive and negative terminals of a dynamo. The sewage passing through the channels was split up by the electric action. The matters in suspension were precipitated, and the soluble organic matter was oxidised by the nascent oxygen, chlorine and oxides evolved. The chief drawback to the system was the cost. As far as the treatment of crude sewage or of liquid containing much organic matter in suspension is concerned, very little progress has been made since the date of these experiments.

As far as can be gathered, the electrical works at Oklahoma and elsewhere in America are nothing but the Webster system revived. If they were merely experimental works they would probably

be useful, but the *Engineering News* is certainly right in giving a warning against the outlay of public money on schemes of this sort. In the review of the uses of electricity in sewage and water purification, it does not appear that entire justice has been done to the use of electrolosis to produce a solution for use in sewage treatment. A great deal of useful work has been done, and, as we have often shown in these pages, the electrolytic fluid, such as is used by Dr. Alexander at Poplar, possesses many advantages over a chloride of lime solution, and its practical and economical use in Poplar for various purposes of disinfection shows its value. If it is economical to use it for one purpose, why should it be uneconomical to use it for another ? The advantages of electrolytic hypochlorite are not as yet sufficiently understood. Its superior efficiency, its ease of application, its cheapness, and its many other advantages over bleaching powder have been dealt with so often in these pages as to make repetition unnecessary. The uses of electricity in sewage disposal as shown by experience up to the present are limited to the final purification of effluents. For this purpose where an effluent of altogether exceptional purity is required its value has been proved. Unfortunately such work as has been done in the past has been carried out by persons whose electrical knowledge or whose chemical and bacteriological attainments were superior to their knowledge of practical methods of sewage disposal, and it is probably largely due to this fact that electricity has not been more successfully employed.

* * *

**Electrical Thawing of Frozen Mains.**

The manner in which a 6-in. frozen water main was thawed under circumstances of great difficulty is described in the *Scientific American*. The main in question supplies a hospital at North Brother Island, New York, and is laid along the bed of the river, and during the winter ice formed on an exposed portion near the shore and extended for a distance of about 160 ft. The problem was complicated by the fact that the temperature of the salt water flowing in the river was below freezing point, as salt water will not freeze till a temperature of 27 deg. Fahr. is reached. On a previous occasion it was found necessary to raise the pipe-line, thaw it, and then relay it.

The method commonly adopted to free ice-clogged pipes by means of electricity is to force a heavy current through the pipe, such that heat is generated by its resistance. Where the pipes are situated on land the radiation of heat from the pipes is comparatively slight, but where, as in the present case, the main is situated in flowing salt water, at a temperature below freezing point, the radiation is very great; furthermore, the radiating surface on the outside of the pipe is considerably greater than that of the inside surface. Thus with the main constantly cooled with cold salt water it was found necessary to use thirty-six times as much current as would have been required with a pipe buried in the earth. The fact that the pipes had caulked-lead joints limited the extent to which they could be heated, however. Lead offering twice the resistance of iron, and melting at a much lower temperature, suggested at once the possibility of injury to the joints if too great a current were used. An experiment was therefore made which will be of value to those who may have to face a similar problem. Two 6-in. pipes were connected together with a caulked lead joint, the pipe was filled with ice, and the ends closed with iron caps. This testing pipe was then lowered into the river, where it was allowed to remain till the conditions were exactly similar to those in the water main. Then a current of 1,500 amperes was passed through it, and it was found that it took twelve hours to melt the ice in it. The lead joint showed no signs of giving way, and then it was decided to raise the current through the main to 1,800 amperes. This was done, and after thirty-six hours of application the pipe was thawed. It should be noted that before this final effort was made 800 amperes were used at a pressure of 200 volts. This was then increased to 1,000 amperes, while a pressure of 80 lb. was maintained on the main by pumping. Then the current was increased to 1,300 amperes, and then to 1,500 amperes at 400 volts; this failing, the experiment described above was tried. It is pointed out that the current finally used was sufficient to have lighted nearly 13,000 16-candle power lamps of the carbon type, or nearly 29,000 of the common 25-watt tungsten lamps.

* * *

**The Cost of Labour.**

Although it is a comparatively easy matter to estimate with considerable accuracy the cost of the materials to be used in the erection of a new building, the same cannot be said of the cost of the labour. This is due not only—or even principally—to local variations in the rates of wages, but rather to the personal equations of the men employed. A very interesting paper on the "Cost of Labour in Connection with the Erection and Maintenance of Buildings" was read at a meeting of the Surveyors' Institution on Monday last. In this the author, Mr. R. M. Kearns, pointed out that in no way is the cost of labour affected so much as by the efficiency or inefficiency of the workmen. While there are plenty of efficient men to meet all ordinary requirements, it seems to be the fact that the percentage of inefficient men in the labour market is steadily increasing. This is no doubt largely due to the gradual collapse of the old-fashioned system of apprenticeship, and to the ease with which men can get enrolled as craftsmen in some of the trade unions. On the whole workmen do not take the interest in their work that they used to do. This is especially noticeable in large centres where trade union rates of wages are paid, and where the workmen receive no sympathetic recognition from a master builder, but are in the hands of a foreman, and liable to be dismissed at very short notice. And although the efficient and industrious hands should certainly be paid more than their inferiors, the bare minimum rate is, with too few exceptions, meted out to the good, bad, or indifferent. It is not always borne in mind that trade union rates of wages are only "minimum" rates; no objections are made to the payment of higher rates. When workmen display skill in craftsmanship and give proof of possessing trustworthy qualities—and England can still boast of many such men—it is important that they should be paid something more than the wages which are paid to men of a lower standard, if only to arouse a spirit of emulation.

Mr. Kearns' paper contained, in the form of an appendix, a very useful table showing the rates of wages which are current in many of the chief towns of the United Kingdom. The tendency of late years has certainly been upward—the London carpenter, for example, having increased from 9d. to 10½d. per hour since 1881. The table of wages reveals, too, an astonishingly low rate obtaining at the present time in some of the country towns and in Ireland, the wages in some cases being from 5s. to 10s. per week less than those which can be earned in the large centres. Mr. Kearns' paper provides a very valuable review of the present state of the labour market.

* * *

**Narberth's Unworthy Example.**

At a time when the minimum wage has received the supreme authority of legislative sanction it seems incongruous, to say the least, that we should once more be forced to call attention to a glaring instance of the underpaying of a professional man by a municipal council. The unwelcome example upon this occasion occurs at Nar-

berth, in Pembrokeshire, where Mr. W. G. Mathias, described as "a qualified man"—he had, at all events, quite recently passed the examination of the Royal Sanitary Institute, and, as he himself told the council, he had also had experience "at the biggest centre in South Wales, and had seen all that was carried on in Swansea"—was appointed sanitary inspector at a salary of £15 per annum, and surveyor at a salary of £5 per annum. No sort of remorse or shame had any manifest influence upon the council in offering such contemptible terms as these to the candidate for the joint office—not even the knowledge that half of the sum paid for the inspectorship would be reimbursed by the county council—and Mr. Mathias was unable by his personal appeal to move their hearts. All he could induce them to do was to promise that there would be a reconsideration of the remuneration at the end of twelve months. This is clearly a case where, as regards the sanitary inspectorship at all events, departmental action is called for. The members of an urban council may be so completely indifferent to the claims of sanitation as to appraise its administration at the miserable figure of £15 a year, but happily the Local Government Board insist upon a standard of inspectorial vigilance and efficiency, and at the same time may withhold their contribution towards the official salary unless this be fixed at a figure commensurate with the duties to be performed. As to the miserable salary attached to the office of surveyor—the duties of which Mr. Mathias asserted are considerable—it is, of course, deplorable that such things should be, but there is undeniably a ray of hope in the fact that their existence makes all the more certainly for that professional unity that will eventually, and at no very distant date, abolish such scandals once and for ever.

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**Direct Labour for Athlone Roads.**

The question of direct *versus* contract labour on the roads does not trouble us to a serious extent in this country, but in Ireland it continues to excite keen controversy. Opinion is gradually materialising there in favour of direct labour, and the reasons for this were given emphatic expression to at a recent meeting of the Athlone No. 2 Rural District Council. A proposal in favour of the substitution of the contract system by direct labour was moved by Mr. Percy, who denounced the former system as being responsible for the "wretchedly unsatisfactory state of the roads about Athlone"; and added, in somewhat glowing terms, that he had seen direct labour schemes working in England, "and they supplied splendid roads, the same being the case recently in Westmeath, Roscommon and Queen's County." The proposition in favour of direct labour was eventually agreed to with unanimity. One of the chief advocates of the change was the county surveyor, who was able to speak feelingly from experience of the weakness and extravagance of a system which is completely breaking down under the severe test of modern traffic conditions. Moreover the county official is virtually powerless to mend matters, for he is not authorised under the Local Government Act to take measures of compulsion, while any proceedings that he is enabled to adopt are rendered futile by the slackness of the powers given to him. It seems pretty certain that a system that has so little to commend it, and is in many respects so undesirable, will have to be swept away if Irish roads are to be maintained at a needful standard of efficiency.

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**Reinforced Concrete Practice.**

A most valuable paper was read by Mr. Maurice Behar at the last meeting of the Concrete Institute. In this the author pointed out that the progress of reinforced concrete was likely to be hindered rather than helped by the promulgation of official regulations, unless they were kept free from certain principles and formulæ which are still the subject of controversy among engineers. The object of the paper was to draw the attention of all those concerned with reinforced concrete to the disadvantages which would result from the general application of such theories and formulæ. Special attention was devoted to consideration of the various degrees of fixity of the beams, and examples were set forth in order to establish a comparison from an economical point of view, and also from the point of view of safety between the various cases mentioned. Calculations concerning the verification of the strength and stability of beams, slabs and pillars were given by the author, and special attention was given also to the question of ascertaining the position of the neutral axis in various cases. The paper was mostly of a mathematical character, and had for its principal object the eliciting of views of all those concerned in the design of reinforced concrete in a discussion upon all the subjects dealt with in the paper.

We quite agree in Mr. Behar's general conclusion that regulations which are intended for general application should be concerned with principles rather than with the imposition of specific formulæ. It will frequently be found that the particular formula which is usually adopted cannot be applied in certain special circumstances. In such cases the design must be left to the discretion of the engineer, and to compel him to follow stereotyped lines only would seem to imply a certain degree of lack of confidence.

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**Sewage Disposal at Tonbridge.**

The successful completion of the new sewage disposal works at Tonbridge, which have been constructed to the designs of Mr. W. Laurence Bradley, the engineer and surveyor to the council, marks the conclusion of an enterprise which was rendered necessary owing to the rapid growth which has taken place in the population of the town during recent years. Mr. Bradley's original scheme included the provision of a dust destructor. This would have served the double purpose of abolishing the nuisance caused by the system of burning the refuse in the open and of providing the necessary power for driving the new pumps. For some reason or other, however, the Local Government Board, after inquiry, refused to sanction a loan for this part of the scheme, and ultimately it was decided to use electric power for pumping purposes. The new works comprise the reconstruction of the pumping station, the provision of electrical pumping plant, mains, rising main, new high-level tanks and percolating filters. The total cost of the works, including all incidental expenses, has only amounted to £9,450, and the engineer and all concerned are to be congratulated on the results of their enterprise and labour.

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**The Exmouth Meeting.**

The meeting of the Institution of Municipal and County Engineers which was to have been held at Exmouth on April 6th, but which was postponed on account of the recent coal strike, will take place, we may remind members, in a fortnight's time. "A Decade of Progress in a Residential Town" is the title of a short but exceedingly interesting paper which will be submitted during the business proceedings by Mr. Samuel Hutton, the surveyor and water engineer to the urban district council. Judging by the contents of this contribution—a copy of which is before us—the round of visits which has doubtless been arranged for in connection with the gathering will be by no means an unattractive one, and it is to be hoped, therefore, that the attendance will be such as to ensure the success of the meeting and large enough at the same time to induce members in other parts of the South-Western District to entertain the Institution in the near future.

# Sewage Disposal at Tonbridge.

## OPENING OF NEW WORKS.

New works for the disposal of the sewage of the urban district of Tonbridge, Kent, were formally opened on Saturday afternoon last by Mr. T. Ives, chairman of the local authority.

The old works, which were constructed in 1873, comprised underground storage tanks of a capacity of about 100,000 gallons, with a Tangye steam pump capable of raising about 16,000 gallons of sewage per hour, which was treated by broad irrigation on 38 acres of land, the overflow from the tanks passing untreated directly into the stream, a tributary of the Medway. This system not proving satisfactory, Messrs. Chatterton & Bazalgette, civil engineers, of Westminster, were called in by the late local board in 1890 and advised the construction of about 400 ft. of 5-ft. diameter brick tank sewer to increase the storage to about 150,000 gallons, the erection of two concrete precipitation tanks over the old storage tanks, with a capacity of 110,000 gallons, two Crossley gas engines, sludge-pressing plant, two sets of Waller's plunger pumps, and delivery mains, &c., at a cost of £4,250. These works, however, did not prove satisfactory either, as it was only possible to gravitate the sewage after precipitation over low-lying land, which very soon became sewage logged, and the resultant effluent was very offensive. The sludge-pressing plant was also unsatisfactory and expensive to work, being abandoned soon after the present engineer took up his appointment in 1895.

Owing to the rapid growth of the town, and the increase of the population from 9,000 to nearly 15,000 during the preceding ten years, the urban council in 1905 were compelled to consider the advisability of remodelling and increasing the disposal works, and instructed their engineer to prepare a scheme.

For many years the house refuse from the town has been carted to the sewage farm, deposited in ridges, and burnt in the open air, the nuisance from which at times was most acute, and Mr. Bradley's scheme included the provision of a dust destructor, with a view to doing away with a serious nuisance, and to take advantage, as far as possible, of the heat generated to produce steam for actuating the new pumps. The Local Government Board held two public inquiries, and in their wisdom, or otherwise, refused to sanction the loan as regards the destructor.

The council then abandoned the destructor scheme, and took into consideration the relative merits and advantages of town's gas, suction gas, steam and electricity for pumping purposes, and, after many discussions and much delay, the last-mentioned power was decided upon, and a further application was made to the Local Government Board for sanction to a loan of £9,450, with the result that an inquiry was held by Mr. Malet, M.INST.C.E., in November, 1909, and sanction was received early in last year, when the new works were immediately put in hand.

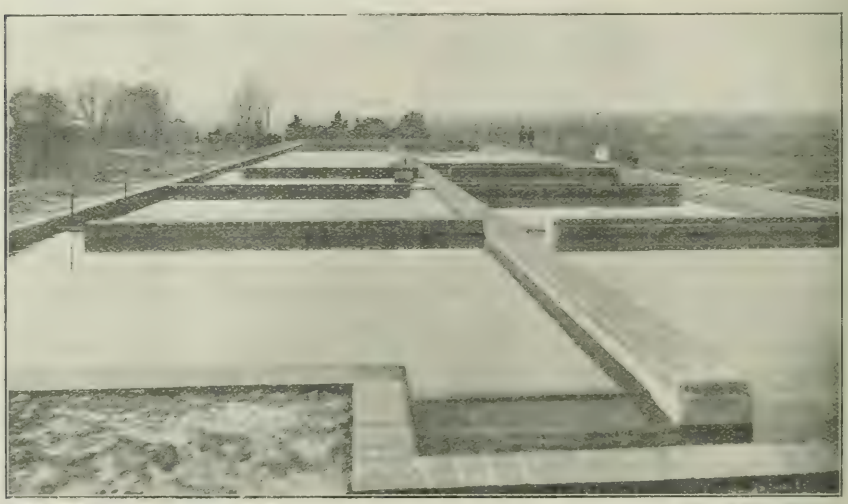
The new works comprise reconstruction of the pumping station, electrical pumping plant and mains, rising main, new high-level tanks and percolating filters, described as follows:—

### PUMPING STATION.

This has been practically reconstructed, the materials being High Brooms bricks with slated roof, supported on steel principals; the internal walls are lined with white glazed bricks to a height of 4 ft. 6 in., with a teapot-brown glazed moulded capping, the walls above being distempered; the floor is of terrazzo, the pipe and cable trenches having York stone curb and chequer plate covers.

### PUMPING PLANT.

This consists of three high-lift double inlet Gwynne's "Invincible" pumps, with 6-in. suction and delivery branches, each pump fitted with cast-iron casing, gun-metal disc and manganese bronze spindle, direct coupled to 20 h.p. electric motors,



*From Photo by* *Allwork Bros., Tonbridge.*

Sedimentation Tanks, Tonbridge Sewage Works.

by Messrs. Crompton & Co., suitable for 1,070 r.p.m. on 420 to 440 volts, shunt-wound type. Each pump is capable of delivering 33,000 gallons of sewage per hour against a head of 70 ft., on a consumption of 15·5 units.

There are also three low-lift double inlet Gwynne's "Invincible" pumps, with 10-in. suction and delivery branches, similarly fitted to above, and coupled to 9¼ h.p. Crompton motors at 680 r.p.m. shunt-wound type.

Each pump is capable of delivering 60,000 gallons of storm water per hour against a head of 17 ft., on a consumption of 7·95 units.

There is one Reavell duplex air compressor, with a displacement capacity of 34 cub. ft. per minute, coupled to a 4 h.p. Crompton motor, and one 5 h.p. Crompton motor for belt driving the existing air compressor. In addition, there are eight starting pillars by the Adams Manufacturing Company, and the necessary pressure and vacuum gauges, switch gear, cable connections, &c.

### ELECTRIC MAINS.

The electric mains, about 1,600 yds. long, are laid from the council's electricity works, near the Castle; they are in duplicate, and consist of two lead-sheathed cables, one 1 sq. in. concentric, and one

1-in. by 1-in. by ·05 triple concentric laid solid, in Doulton troughing.

Enamelled slate switch panels are provided at the generating station and pumping station ends, with all necessary instruments.

SEWAGE RISING AND SUPPLY MAINS.

The rising main from the pumping station to the tanks is about 1,400 ft. in length. The pipes are of cast iron, and 12 in. in diameter, with spigot and socket joints caulked with lead wool, each length of pipe weighing 8 cwt. 1 qr., and 12 ft. long. A reflux valve is provided directly after leaving the pumping station with a 6-in. sluice valve, for emptying the main, if required. Two 9-in. sluice valves are also provided in the line of main, to enable sludge to be pumped directly into trenches on the land without passing it through the high-level tanks.

SEDIMENTATION TANKS.

The sedimentation tanks are situated at the highest point of the farm, and have a capacity of 300,000 gallons. They are in duplicate, each set having five compartments, with dividing weir walls, built in wire-cut bricks, rendered in cement, and with blue Staffordshire copings.

Sludge and emptying pipes are provided with the necessary sluice valves. The sludge is run off into open lagoons, and when dry is carted on to the land or sold.

PERCOLATING FILTERS.

The filters are six in number, octagonal in shape, and 75 ft. in diameter, built in High Brooms bricks, in cement, and coped with Empire stone coping. The floors are of concrete, rendered and laid to falls delivering the effluent on two opposite sides, over white glazed brick lips into collecting carriers, the contents of which can be directed to any part of the farm.

The filtering medium is Keep's screened and washed clinker, laid on Stiff's floor tiles and graduated from 3-in. gauge at the bottom to ¾-in. at the top, with a total depth of 5 ft. The total area of the beds is 2,946 yds. super., and the cube of filtering medium is 4,908 yds.

The tank effluent is conveyed to the beds in 14-in. and 12-in. cast-iron mains, and is distributed on the beds by means of revolving sprinklers, four sets being of the Candy-Whittaker buoyant type, and two sets of the Ames-Crosta simplex type, with the respective firms' special dosing apparatus. The sprinklers are working at a head of about 24 in.

STORM WATER.

The precipitation tanks, constructed in 1890, have been retained for passing through the storm water in excess of three times the dry-weather flow. It is afterwards treated on small roughing filters, and on 2 acres of land filled to a depth of 4 ft. with burnt rubbish and underdrained.

The works have been carried out by the following contractors in a most satisfactory manner:

*From Photo by* *Allwork Bros., Tonbridge.*

PERCOLATING FILTERS, TONBRIDGE SEWAGE WORKS.

Pumping station, tanks, filters, carriers, &c., £6,293, Messrs. E. Punnett & Sons, Tonbridge.

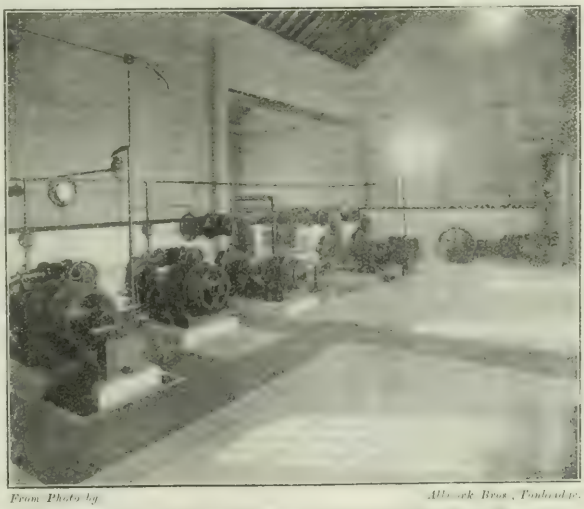
Pipes for rising and supply mains, &c., £376, Messrs. Cochrane & Co. (Woodside), Dudley.

Laying ditto, £108, Mr. W. Pratt, Tonbridge.

Pumping plant, £1,045, Messrs. Gwynnes, Limited. London.

Electric mains, &c., £1,032, Western Electric Company, North Woolwich.

Excavation for ditto, £90, Messrs. Ford & Son, Tonbridge.



*From Photo by* *Allwork Bros., Tonbridge.*

INTERIOR OF PUMPING STATION, TONBRIDGE SEWAGE WORKS.

Earthwork, carriers and reinstating, £252 (departmentally).

Clerk of works, printing, loan expenses and contingencies, £254. Total, £9,450.

The works have been carried out from the design

and under the supervision of the council's engineer, Mr. W. Laurence Bradley, M.INST.M. AND CO.E., who has had the able assistance of the council's electrical engineer, Mr. M. P. Plunkett, A.M.I.E.E., who has had charge of the electric plant, while Mr. J. L. Webb and E. M. Hendry, of the surveyor's department, have acted as clerk of works and draughtsman respectively.

The inauguration of the works above described was followed by an inspection of the tanks and filters under the guidance of Mr. Laurence Bradley, the surveyor. Luncheon was afterwards served at the Angel Hotel, where the successful outcome of the labours of both contractors and engineers was the subject of a number of congratulatory speeches.

## MUNICIPAL WORK IN CANADA.

*(From a* SURVEYOR *Canadian Correspondent.)*

An attempt is being made by Mr. W. A. McLean, engineer of highways for the province of Ontario, to eliminate the dust nuisance. He is experimenting with a solution of tannic acid, which has a great tendency to harden clay roads and provide a surface which he believes will largely prevent dust and do away with much of the unevenness and ruts of country highways.

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Advices from across the Border report the results of experiments made with motor-trucks in spreading oil and binder for roads. The macadam was thoroughly swept with a rotary street broom hitched to a motor-truck, after which one side of the road, including the dirt, was oiled and immediately spread with fine grit or dust screenings. After an interval of three days the other side was oiled. In some instances the length of the haul was 15 miles, the oil being delivered in tanks on side tracks at the railway station, from which it was pumped into the motor-truck tank. The dust was all hauled by motor also. Oil was applied to over 150 miles of road during the past year, the surface treated having an aggregate area of nearly 6,500,000 sq. yds. The actual cost, not including the first cost of the motor-trucks, was about seven-tenths of a cent (½d.) per square yard. This cost includes oil, labour, surfacing dust, freight, drivers, repairs to trucks, storage and gasolene. These experiments are interesting to municipal engineers as showing the possibilities of motor-trucks in civic work.

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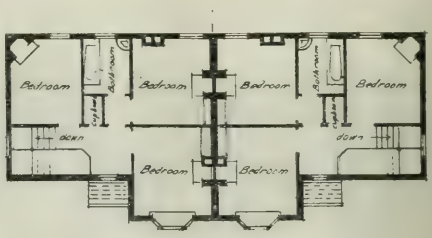
It is impossible for the ordinary British municipal official to grasp the difficulties under which Canadian work has to be carried out. In this country the conditions are of a widely varying nature, climatic characteristics are many, and there are also great problems to be worked out. Many of the difficulties are no doubt due to the rapidity with which towns and cities arise, and these gradually disappear as the districts become more settled. The problems of, say, Montreal, with its extreme cold weather for several months, are not those of Vancouver, where the climate is more nearly that of England. These two cities have certain difficulties in common, but Vancouver is not burdened with an immense expenditure consequent upon heavy snowstorms. Montreal spends thousands of pounds every year in clearing the streets of snow and ice, the latter in the spring being several inches thick. It is impossible to remove the snow as it falls—one day this year there was a fall of 15 in.—and in consequence on many of the streets a thick crust of ice forms. This is partly washed away by the spring rains, but most of it has to be broken up by the pick and carted away. The action of the frost on the roads is naturally of a detrimental character, and the surveyor of the city has by no means an easy position. Montreal has the reputation of being one of the dirtiest cities in the Dominion, but it must not be overlooked that the city is confronted with difficulties which probably do not exist in any other city in Canada.

**Paris Improvements.**—The President of the Municipal Council of Paris, reviewing the work of that body during the past four years, stated that, among other things, a loan of £36,000,000 is being devoted to the embellishment of the city, the improvement of roads, and the building of new schools and hospitals. Besides this, some £8,000,000 are to be spent in new and improved dwellings for the poor.

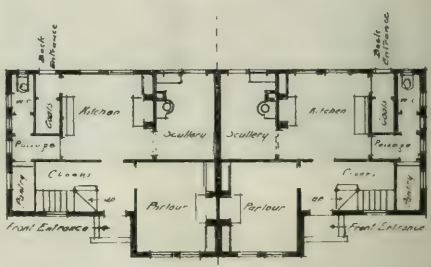
## ASYLUM ATTENDANTS' COTTAGES.

We reproduce herewith the plans of twelve additional cottages in course of erection at the Middlesex County Asylum, Napsbury, St. Albans, for the County Council of Middlesex, from plans prepared by Mr. H. T. Wakelam, M.INST.C.E., M.S.A., the county architect.

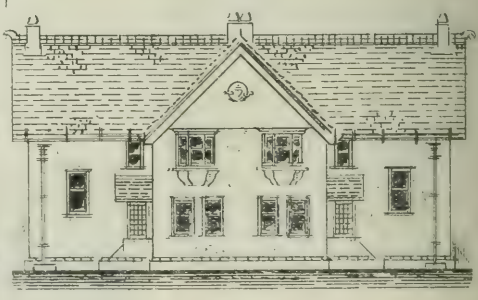
The plans have been designed to give suitable



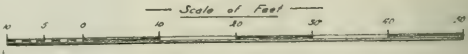

First Floor Plan.




Ground Plan.



Elevation.




ATTENDANTS' COTTAGES, NAPSBURY ASYLUM.
*(Mr. H. T. Wakelam, M.Inst.C.E., M.S.A., Architect.)*

accommodation for the attendants of the asylum and their families, at a cost commensurate with requirements. The cottages work out very reasonably in the latter connection, the outlay per cottage being at the rate of £240.

Mr. Pitkin, of St. Albans, whose tender was accepted by the county council, is the contractor for the work.

**Rural Housing.**—Somerset County Council last week adopted a resolution suggesting that the facilities given to Irish local authorities for providing cottages in rural districts should be extended to English local authorities.

**Surveyors' Institution: Country Meeting.**—The council of the Surveyors' Institution have accepted an invitation from the Nottingham and Lincoln Committee of the institution to hold the next country meeting at Nottingham on May 30th and 31st. Particulars will be issued later on.

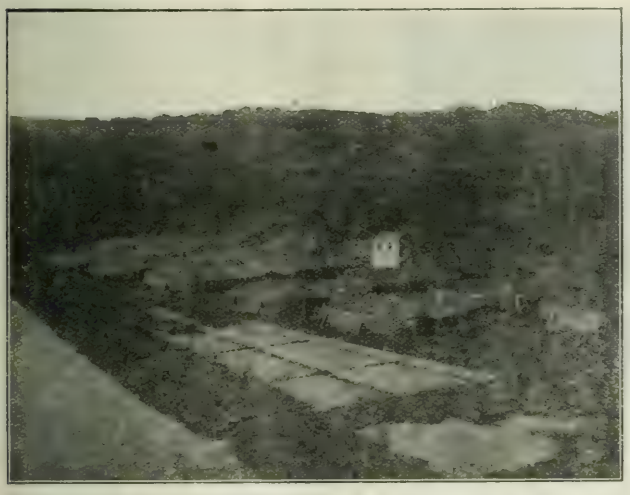
# Institution of Municipal Engineers.

## NORTH-WESTERN DISTRICT MEETING AT HEYWOOD.

At the visit of the Institution of Municipal Engineers to Heywood sewage works on Saturday last the following were among those present: Messrs. A. R. Bleazard (Clitheroe), W. Briggs (Stockport), C. E. Crowder, G. F. Daniel and H. H. Parker (Salford), B. J. Garrett (Preston), L. M. Hindle (Chadderton), A. Darlington (Billinge), J. Howard and J. H. Marsh (Worsley), A. Dempsey (Eccles), C. H. Blakeway (Heaton Norris), R. J. McKenn and J. W. Gleave (Heywood).

After tea a short meeting was held, and in addition to those mentioned above his Worship the Mayor (Councillor A. Barrett, J.P.), the deputy-mayor (Councillor C. Coupe, J.P.), and Alderman R. Grundy attended.

Councillor Coupe presided, and extended a hearty welcome to the members on behalf of the Mayor and Health Committee. He explained that other duties had been the cause of the Mayor's absence at that stage. With reference to the sewage works, he was sure that those present had had a very instructive visit. He assured them that Heywood possessed practically all the departments which were at the service of larger corporations. The sewage works had required much consideration in the past, the health of the borough being no little matter, and large sums of money had been expended for that purpose.



Heywood Sewage Works, showing 60 ft. Diameter Percolating Beds, Humus Tanks and Final Outfall.

The following paper by Mr. McKenn was then presented, and taken as read:—

### HEYWOOD SEWAGE PURIFICATION AND REFUSE DESTRUCTOR WORKS.

By R. J. McKenn,
Manager.

The refuse destructor works were opened on June 15, 1903, and have since been regularly working. The plant consists of two front-feed units of the Meldrum patent "Simplex" regenerative type, hand fed, and having an effective grate area of 50 sq. ft., and works in conjunction with a Lancashire boiler, 20 ft. long by 7 ft. diameter, with a total heating surface of 570 sq. ft., working at a pressure of 150 lb. per square inch. The "Simplex" grate consists in having the furnace chamber common to the number of grates. This arrangement of continuous grate ensures the maintenance of an evenly high temperature, and allows of one section being cleaned and charged while the other is in an incandescent state, and as the gases commingle in the furnace, and again in the combustion chamber, complete immunity from dust or smell from gases leaving the chimney is ensured. The temperature in the combustion chamber varies from 1,700 deg. Fahr. to 2,000 deg. Fahr. The gases of combustion pass from the furnace into the combustion chamber, through the boiler and its settings in the usual manner, thence through the regenerator to the chimney flue. The regenerator, or air heater, consists of a number of cast-iron tubes, through which the gases of combustion pass to the main flue. The air for combustion drawn by the steam jet blowers, which produces the forced draught, circulates round these tubes, and becomes heated in its passage to a temperature of from 250 deg. Fahr. to 350 deg. Fahr., this temperature varying with the quantity and quality of the refuse, as also the size of the boiler. The refuse for consumption in the destructors is obtained from dry ashpits and a good number of privy middens. That from the latter often contains 65 per cent of moisture, and is of low calorific value. The average amount of water evaporated per lb. of refuse is 0·62 lb. The engine-room contains a non-condensing engine, 8 in. diameter cylinder by 14 in. stroke, running at 160 revolutions per minute. This engine drives a 7 ft. diameter mortar mill, and a compound air compressor 8 in. and 6 in. diameter cylinders by 12 in. stroke, with a working pressure of 100 lb. per square inch, also a small inverted direct-coupled engine and dynamo, which gives 20 amperes at 200 volts. The current generated is used for lighting the works.

#### SEWAGE PURIFICATION WORKS.

It is now approaching eighteen years since the construction of the Heywood sewage works was commenced under the present engineer, Mr. Jas. Diggle, Assoc.M.Inst.C.E., F.G.S., of the firm of Messrs. Jas. Diggle & Son, of Westminster and Heywood. The actual [illegible] of the scheme was made on August 13, 1894, but after the work of construction had proceeded some time a most unfortunate discovery was made. It was found that a worked-out coal mine existed practically over the whole site. This caused the committee and engineer considerable anxiety; and instead of the works being built with the usual foundations, it became necessary to excavate to a great depth and fill in with concrete. The foundations vary in depth from a few feet to 56 ft. This, together with pumping the water out of the old mine, added enormously to the cost of the works.

Heywood has a population of 27,000, and the rateable value is £121,700. The sewage treated at the works consists of, besides domestic sewage, manufacturing waste. It may be stated that the council adopt the policy of allowing manufacturers to turn their waste into the sewers after treatment. The manufacturing waste consists of liquids from tanneries, flannel scouring, dye works, breweries, and paper stainers. The dry-weather flow of sewage is 850,000 gallons, and the major portion gravitates to the works, and enters by an egg-shaped culvert 4 ft. 6 in. on the major by 3 ft. on the minor axis. Passing through the primary screen, the screening bars of which are 2-in. mesh, the sewage is conveyed to the works by means of a cast-iron pipe, 36 in. diameter, 300 yds. long, and discharges from an inverted bell-mouth pipe. Part of the sewage is diverted on to a high breast water wheel 14 ft. diameter by 3 ft. wide. The energy generated by the water wheel is utilised for driving the secondary screens, which are of ⅜-in. mesh. A further portion of the sewage is diverted into an Adams lift, where energy is generated free of cost (with the exception of attention for cleaning), for lifting a maximum of

108,000 gallons of sewage per twenty-four hours from Hooley Bridge, which is a low-lying district. This low-level sewage enters the forcing cylinders through retentive valves, which prevent its return when the air pressure is applied. When a forcing cylinder has filled, the supply of high-level sewage used for energy is automatically turned on through the syphonic feed into the flush tanks placed overhead in the air chamber. Each flush tank when full automatically discharges its contents through the deep trap syphon and fall pipe into the air cylinder immediately below, to which it is connected. The air contained in each of these air cylinders is thus expelled as required, and by means of the air pipes is brought to exert its pressure on the low-level sewage contained in the forcing cylinder to which it is connected. The low-level sewage is thus forced automatically to the required level. The air cylinder is now full of high-level sewage, but is at once emptied by the simple syphon attached, and so, after being utilised for work, passes by gravitation to the disposal works. Thus the low-level sewage is raised automatically entirely without cost for energy, and with a minimum of oversight.

After the sewage has performed these functions it is again united and passes alongside the overflow weir, which is set up to pass the sewage, in excess of three times and up to six times the dry-weather flow, on to the storm filters, which have an area of 6,200 sq. yds. The sewage from one to three

Sludge Pressing Room, Heywood Sewage Works.
(Crude Sewage Inlet Main as shown carried above Presses.)

times the dry-weather flow is then charged with alumino-ferric, and passes through the baffle channels and on to the precipitation tanks. There are six of these, with a total capacity of 710,000 gallons, and they are worked on the continuous system.

When the works were originally constructed, contact filters were laid down. There were twelve in number, with a total area of 1,325 sq. yds. These gave excellent results, but they were not sufficient to deal with the whole volume of sewage; consequently it was necessary to construct additional beds. There are twelve beds, constructed on the percolating system, each 60 ft. diameter by 8 ft. deep, having a total area of 3,720 sq. yds. The sewage is distributed on to the beds by means of the Simplex distributing apparatus. This apparatus can be set to feed the beds in rotation for any desired period of time. When No. 1 bed has had a ten minutes' supply the distributor automatically diverts the flow to No. 2 bed for ten minutes, and so on throughout the series. Should the flow of sewage increase through rain or any other cause, one bed is not sufficient to deal with the flow, and the distributor automatically brings additional beds into action in ratio to the flow, and as the flow decreases the beds go out of action in ratio to the flow. The cycle of changing is going on continuously. Provision is also made which enables any bed in the series to be put out of action by simply placing a disc on the distributor, for no matter how well a sewage works may be managed there are times when the beds become sick and require a rest.

The bacteria beds are constructed on a concrete base, cone-shaped—that is, the centre of the beds is higher than the outer circumference. This allows the effluent to run to the effluent channels, which are constructed round the outside of the beds. The filtering media is laid on floors constructed with Ames-Crosta's floor tiles, which give a free access of air under the beds and allows a free passage for the humus matter to escape. The outside walls are constructed of pigeon-holed brickwork, 14 in. thick for 4 ft. high and 9 in. thick for the remaining 4 ft., and eight buttresses are constructed to each bed. As the effluent discharges from the beds it is collected by two main carriers, which convey it to the humus tanks. These tanks, two in number, are each 130 ft. long by 24 ft. wide, and vary in depth from 18 in. at the inlet to 2 ft. 6 in. at the outlet sills. These tanks are cleaned out every week. A Shone's ejector of 50-gallons capacity is fixed for raising the humus sludge from the humus tanks up to the precipitating tanks. This ejector is worked by compressed air, and works against a head of 24·62 ft., exclusive of pipe friction.

The sludge from the precipitation tanks gravitates to the sludge well, which is situate under the engine-room. A cast-iron box is fixed in this well, into which the sludge falls, and when a charge is required compressed air is turned on and the contents of the box ejected up and into the sludge mixer. There are three sludge presses, each fitted with twenty-eight plates. The press liquor runs from the presses into a steel boiler-shaped receiver, and when the rams have discharged the sludge into the presses, the exhaust air is conveyed to the steel receiver, the whole of the press liquor being thus raised to the precipitation tanks. The energy required for driving the agitating gear in the mixer, also the hauling gear for bringing the pressed cake to the top road, is obtained from a 6-in. diameter cylinder engine by 12-in. stroke, which is driven by compressed air.

Automatic samplers are fixed on the crude sewage inlet to the Adams lift tanks, the effluent from the precipitation tanks and the final effluent. This is an advantage, and obviates the necessity of workmen taking samples every hour. The appliances are simple and work continuously, thus ensuring an average sample being obtained extending over the twenty-four hours.

## DISCUSSION OF MR. McKENN'S PAPER.

Mr. B. J. Garrett inquired whether the unfortunate circumstance with regard to the coal mine could not have been foreseen. As they had had to go only 56 ft. down, was it not possible there might still be some settlement in the future from lower workings?

Among other questions were the following: From Mr. C. H. Blakeway, asking whether the mechanism in the valve-house worked in a rotary direction or reciprocated; from Mr. G. F. Daniel, inquiring if it was possible to get rid of the worms in the humus tanks; and from Mr. L. M Hindle with regard to the quantity of alumino-ferric used at Heywood.

Mr. R. J. McKenn, in reply, stated that the faults referred to were discovered the year after commencing the works, and consisted of galleries which ran from a disused pit some considerable distance away. The great depth was necessary in the press-house to support the column in the engine-room which they had seen. Sludge being heavier than water, it was necessary to have a good foundation for that building. As an instance of the poor supporting qualities of the ground, he mentioned that recently when laying a cast-iron pipe 6 in. below the surface it had been necessary to drive piles 15 ft. deep. This was caused through quicksands, due to underground springs. The mechanism for distributing the sewage to the new beds, situated in the valve-house, was rotary in action. As regarded the worms, they were a product of the system of treatment, and to sterilise the beds to remove the worms would destroy germs even more necessary to the purification. As the flow of sewage decreased it was necessary to put more precipitant into it. The quantity used during the past year had averaged 1·8 grain per gallon.

Mr. A. R. Bleazard (Clitheroe), in moving a vote of thanks, said how pleased they were to have the deputy-mayor as chairman, and congratulated the Heywood Corporation in having such a capable sewage works manager. They had had a very instructive afternoon, and the works had been explained most

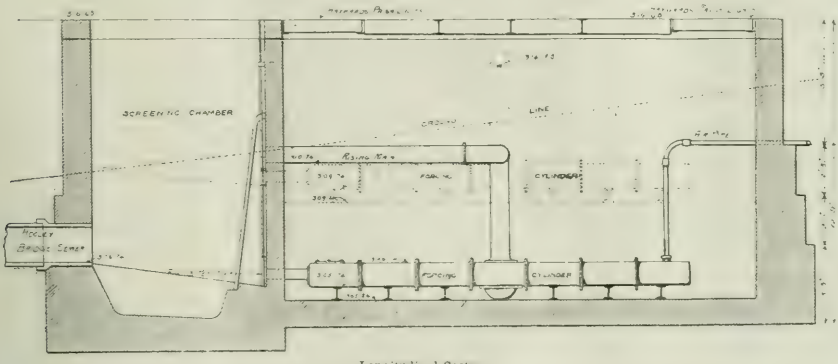
thoroughly. He inquired whether the effluent penetrated the percolating beds in a perpendicular or lateral direction. He had the greatest pleasure in thanking the chairman for presiding and Mr. McKenn for his paper.

Mr. A. Darlington (Billinge) seconded, and endorsed all Mr. Bleazard had said. Mr. G. H. Daniel

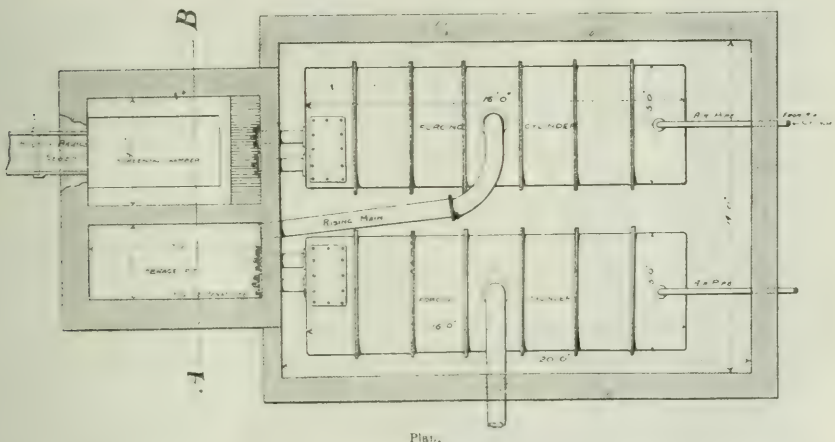
COUNTY GRANTS AND ROAD MAINTENANCE.

At the meeting held in Manchester in June last Mr. Jas. W. Gleave presented a paper on this subject, and it was then resolved that the discussion be continued at a future meeting. On Saturday the discussion was resumed.

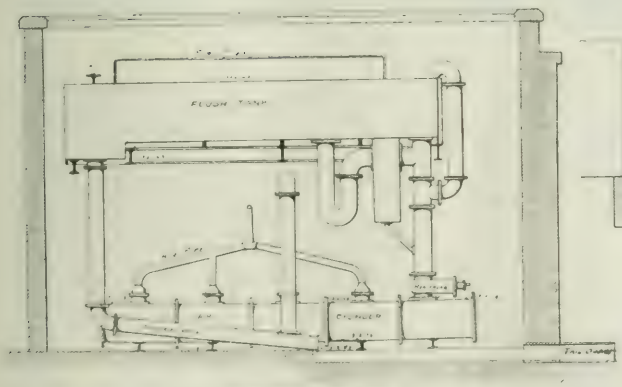
Mr. J. W. Gleave (Heywood) described the position



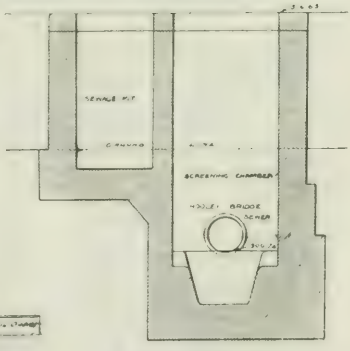

Longitudinal Section.




Plan.




Elevation of Flush Tank.




Section on Line A.B.

Heywood Sewage Disposal Works: Details of Forcing Cylinders in Adams Sewage Lift

supported the resolution, which was carried unanimously.

In responding, Mr. McKenn stated that he was quite happy and amply rewarded in the benefits the members had received. Answering Mr. Bleazard, he said that the sewage did travel laterally to a limited extent owing to the interstices in the bed.

at Heywood. Specimens of granite recently used for paving were handed round, and a 5-in. by 3-in. sett taken from the tramway track was exhibited. Reference was made to the fact that in some places the tramway track carried most of the traffic, and that the whole cost of maintenance had to be borne by the local ratepayers, as the county sheltered themselves

behind the Tramways and Light Railways Acts, and so denied legal responsibility. The time was coming, he thought, when this would have to be altered, and at the same time it would probably be necessary to apportion their share to county boroughs who at present paid the county council nothing towards the upkeep of the roads which so much of their traffic used. He said it would be better for the roads if heavy merchandise was compelled to be carried on iron roads—*i.e.*, the railways.

The Chairman thought the present type of traffic on the roads would increase, and therefore it was necessary to make the roads suitable for the traffic, and not *vice versâ*. As an instance, he mentioned some "tar-macadam" which had been tried on Manchester-road.

Mr. H. H. Parker (Salford) asked why the traffic should make for the track so much.

Alderman Grundy inquired whether there were any special powers necessary to restrict heavy boilers passing through the district. He understood that they had to pay before travelling through Bury.

Mr. B. J. Garrett (Preston) asked what was the amount allowed by the county for watering macadam roads.

Mr. Gleave, in reply, said that it would be more satisfactory to carry out the reconstruction of main roads such as theirs under a loan sanctioned by the Local Government Board, as the county council would pay nine-tenths of the interest and sinking fund charges. With regard to the "tar-macadam" referred to, crude tar had been supplied by their gas department for experimental purposes. Added to the unsuitability of the material was the fact that the work was attempted under the worst possible climatic conditions. Unfortunately this example had prejudiced carters and others locally against the real article. The traffic made for the track because it was in the centre of the road, and the smooth tram rail made haulage much easier for the horses. Answering Alderman Grundy, he said it only needed a resolution from the council to require a deposit before a boiler weighing over 14 tons could be hauled through the district. The amount of any damage could then be deducted. The county had allowed them £175 for scavenging (*i.e.*, £30 per mile), and this included £13 15s. for watering. All expenditure over this amount was considered to be solely of local benefit.

Mr. Garrett proposed, and Mr. Parker seconded, and the Chairman supported, a vote of thanks to Mr. Gleave for his address, to which he responded.

The Mayor expressed his thanks to Councillor Coupe for taking his place, and said he was sorry his other duties had prevented him giving them a welcome himself. From what he had heard he was sure they had benefited from their visit to Heywood.

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**Crystal Palace Engineering School.**—The "Wilson Premium," for the best paper read before the Crystal Palace Engineering Society (affiliated to the Society of Engineers, Incorporated) during the present session, has been awarded by the council to E. C. Coke, for his paper on "The Electrification of the L.B. & S.C. Railway." Other papers read during the session were: "Railway Signalling," by S A. Hall; "Macadam and other Roads," by J. D. Deane; "Town Water Supply," by A. H. Talhook; and "Internal Combustion Engines," by E. G. Whelon. The premium was presented to Mr. Coke on the occasion of the 118th distribution of certificates of the above school on Wednesday.

**Ultra-violet Light Water Sterilisation on a Large Scale.**—Ultra-violet light has been employed to sterilise water on a large scale in France, in a plant required to deliver 261·5 cub. yds. of water per twenty-four hours. The apparatus utilises the copious emission of these short waves from a mercury-vapour lamp having a quartz tube. More than three-quarters of the rays coming from the special lamp are utilised, and sterilisation to the point of leaving one germ to the cubic centimetre is accomplished by causing the water to traverse a zigzag path close to the lamp, thereby exposing it to the repeated action of the waves. The test showed that the process was highly efficient for municipal purposes. It is low in cost and simple in operation, occupies little space, uses a very small amount of electric current, and imparts no taste to the water, which remains fresh, since it retains its dissolved air and has not been heated in any way. For municipal water service the apparatus may be applied to the outside of the ordinary main, the radiations being transmitted through quartz windows in the main. *Scientific American.*

## EXMINSTER SEWAGE WORKS.*

By Herbert G. Hoskings, A.C.G.I.

The works about to be described were designed by and carried out under the supervision of Mr. S. R. Lowcock, M.Inst.C.E., the writer acting as his resident engineer. The works had to deal with the sewage from the Devon County Asylum, which contains about 1,300 patients and 200 attendants; and also that from the village of Exminster, the population of which is 427.

The sewage from the village gravitates to the bottom of Milbury-lane through an earthenware pipe sewer. The sewage from the asylum passes through an inverted syphon by gravity to an Adams patent "Autaram" sewage lift at the bottom of Milbury-lane, which raises the low-level sewage from the village, and both pass through another inverted syphon by gravity to the works.

The works themselves are situated on very low-lying marsh land, and this necessitated the whole being built above ground. This land at one time was the bed of the river Exe, but some thirty years or so ago, when the canal to Exeter was extended, this land was reclaimed. The first top 6 ft. to 8 ft. of the land is stiff clay, below which there is a good bed of beach gravel. This land, of course, is absolutely useless for irrigation purposes, save for lateral surface irrigation, as a final treatment to the effluent before passing into the Black Gulf, which finds its way into the river Exe at Turf, some 3 miles further down.

The old works did not prove satisfactory, being in a very bad position, just at the back of many cottages. They were the means of polluting two wells belonging to the cottages, and also the cause of two or three cases of typhoid, this being the main reason for the construction of the new works. The failure of the old works was, the writer thinks, to some extent due to the asylum sewage, which is very varied in character and temperature. At times quantities of disinfectants would come down, then laundry waste, &c.

The site of the new works being fixed, the next thing to decide was what system of sewage treatment should be adopted. The engineer considered that the aërobic principle of treatment would give the most satisfactory result, using no chemical, there being no trade waste turned into the sewers; so the following system was adopted.

The works were designed to deal with 50,000 gallons dry-weather flow of sewage per day. The area of land acquired for site of works was 6·269 acres, of which the works and roads, &c., occupy about 1·769 acres. The sludge disposal area equals ·900 acres, leaving area available for surface irrigation 3·600 acres. The capacities of the tank are as follows:—

| | In terms of mean dry-weather flow. |
|---|---|
| Detritus tanks ... ... ... | 10·5 per cent |
| Slate beds ... ... ... ... | 54·0 ,, |
| Humus tanks ... ... ... | 10·5 ,, |
| Storm-water tanks ... ... ... | 25·0 ,, |
| Total ... ... ... | 100·0 per cent |

There are two rectangular filters, each 150 ft. by 30 ft. by 4 ft. deep, giving a total area of 1,000 yds. super., giving the rate of filtration in mean dry-weather flow as 50 gallons per yard super. per twenty-four hours, or 12½ gallons per yard super. per foot in depth, and in storm time at the rate of 300 gallons per yard super. per twenty-four hours.

At the works the sewage, flowing up to the rate of three gallons of dry-weather flow, passes through detritus tanks (in duplicate), each being 6 ft. 6 in. by 6 ft. 6 in. by 10 ft. deep, and similar in principle to the Dortmund tank. The sewage is then passed into Dibdin slate beds, six in number, each 20 ft. by 15 ft. by 3 ft. deep, and filled with layers of slate placed on slate cubes, and spaced between 2 in. and 3 in. apart vertically. These beds are worked in rotation, being filled, allowed to stand full, emptied, allowed to stand empty, so as to aërate, and then again filled. The liquid from the slate beds is then passed through settling or humus tanks in duplicate, and exactly similar to the detritus tanks, from which the liquid passes into a central channel between the filters, and from these the automatic distributors are fed by syphonic action.

When the sewage reaches the works at a greater

* Paper read at a Students' meeting of the Institution of Civil Engineers on Friday last.

rate than three times the mean dry-weather flow, the first three volumes passes through the whole works, and is treated as raw sewage: the balance is diverted to the storm-water tanks (in duplicate), whence, after the tanks are full, anything between three and six volumes dry-weather flow will be partially treated by overflowing into the central channel feeding the humus tanks and filters. Any excess over six volumes dry-weather flow, after passing through the storm-water tank, passes straight into a dyke without any further treatment. When the flow of storm water ceases, the supernatant liquid from the storm-water tanks is drawn off by floating arms, and passes into the channel feeding the humus tanks and filters.

The object of the treatment is as follows: Detritus tanks, to collect any heavy solid matter, such as road refuse and washings, cloths, rags, &c.; slate beds, to break up the sewage, to bring into suspension any matter that was in solution (at the same time the slate bed also changes the nature of the sludge deposited on the slates into an earthy product or humus, portions of the sludge also being digested by bacteria); humus tanks, to settle out humus or any fine suspended matter brought over from the slate beds; filters, to aërate and oxidise the effluent still further.

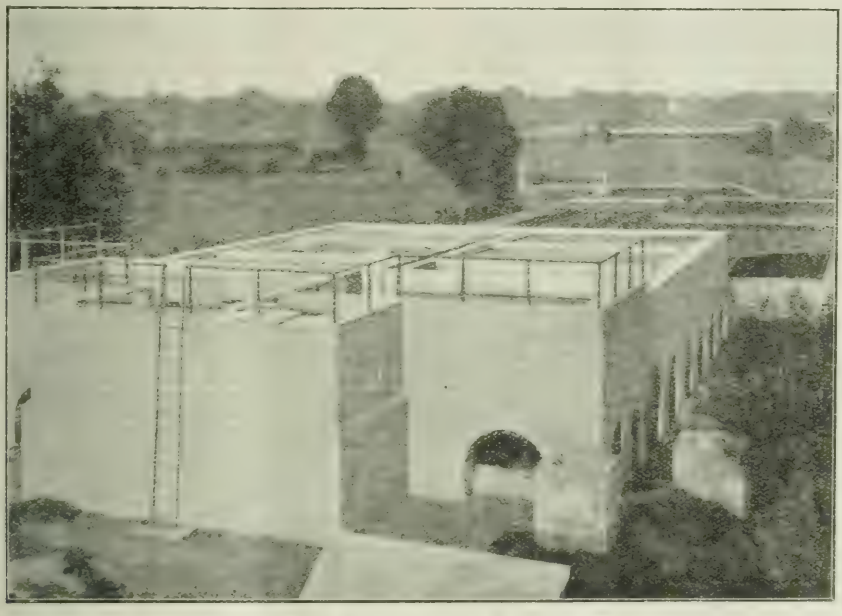
The filters are constructed above ground with brick walls and concrete floors, in which channels are sunk, the same being covered with plain tiles with open butt joints. The floors are laid to falls and slopes. The filling material is hard clinker washed and graded. The tank effluent is distributed over the surface of the clinker by means of two Ham-Baker automatic travelling distributors of the water-wheel type, the whole flow up to six volumes being dealt with on the filters. The effluent from the filters is conveyed by open carriers to the land and dealt with by lateral filtration through the surface of the land, before reaching the stream into which it is discharged.

For the proper working of the slate beds, it is very desirable to have automatic control, as, if not, during the night time septic action is liable to be set up in the beds, and this interferes with the action. Control also must be so arranged as to operate at a given time, and not wait until the bed is full, as when the flow is small it takes a considerable time to fill the slate bed, and septic action takes place before the bed is full. The objection to this method of working beds is that they do not receive equal treatment, and are never used to their full capacity except in times of storm.

The sludge from all the tanks is discharged at frequent intervals into trenches in the surface of the land and dug in.

DESCRIPTION OF SEWAGE LIFT.

The lift tower is unique in that it is so designed that the pipes through which the supply is carried to and discharged from the apparatus serve also to support the structure. The result is both artistic and economical. The sewage which operates the lift flows to the flush tank on its summit through a hydraulic main. It is discharged from the flush tank automatically to a closed cylinder below, called the air cylinder. The air is driven out from this air cylinder through an air pipe to the "sewage cylinder," into which the low-level sewage flows by gravity, and into which it is ejected to a receiving tank placed at such a height above the sewage works that the sewage raised may flow by gravity through this hydraulic main to the tanks. After the discharge from the flush tank to the air cylinder the sewage is withdrawn from the latter by means of a deep trapped syphon. The discharge from the flush tank is governed by means of a simple control apparatus, which brings the automatic tank into action when the sewage cylinder below is full. This apparatus ejects 300 gallons per discharge, and is capable of raising 70,000 gallons per day. It is wholly automatic, the sewage itself being used to raise the sewage. While performing every operation of engines and pumps, the only moving parts in the "Autaram" lift are the reflux valves, through which the sewage to be raised enters the forcing cylinder.



Tanks and Filters, Exminster Sewage Works.

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**London Engineering Students' Dinner.**—The thirty-seventh annual Dinner of the London Students of the Institution of Civil Engineers will take place at the Trocadero Restaurant on Wednesday next.

**Housing at Bideford.**—At the meeting of the Bideford Rural District Council on Wednesday a letter was read from the Local Government Board stating that they had had under consideration the question of the housing conditions obtaining in the rural district of Bideford and neighbouring district, and that they had instructed their inspector, Dr. Carnwarth, to make an inquiry into the matter. They asked the council and their officers to render Dr. Carnwarth all necessary assistance in the prosecution of his inquiry. The letter was referred to the medical officer of health.

## ROADS IMPROVEMENT ASSOCIATION.

### ANNUAL REPORT.

The report of the Roads Improvement Association for the past year, which has just been issued, records considerable extensions in the activities of that body. Included with the report are the first annual reports of the various centres of the association. Most of the centres are not yet fully organised, but it is pointed out that they have already accomplished good work, and it is believed that there is a very big field of usefulness before them. It is desired to extend this scheme of organisation so as to cover Great Britain entirely, and arrangements are being made to this end as circumstances permit.

The establishment by the Government of a Road Board to administer an Imperial Road Improvement Fund has, the report states, rendered it necessary for the association, as the representative body in highway matters of all classes of road users, to take action to ensure that the views of road users are efficiently formulated and placed before the proper authorities in conection with the administration of this fund. The ever-growing traffic upon the highways has, the association consider, rendered it very essential, especially in big commercial districts, for the passage of all vehicles to be so regulated that the capacity of the roads may be utilised to the fullest extent; this question has received special attention during the past year, and action has been taken to reduce to a minimum congestion caused by tramway carriages and vehicles not conforming strictly to the rule of the road. The income of the association for the year shows a considerable increase—approximately 36 per cent—over that of 1910; the extended activities of the association, however, has necessitated much additional expenditure, and the council earnestly appeals for further financial aid, especially from individual road users, in order that the association's existing work may not be hindered, and that its programme may be still further developed.

#### THE ASSOCIATION CENTRES.

The objects of the centres referred to are to enable local road users to take a greater interest in the condition and improvement of their roads and in the facilities for traffic thereon, and to take such action as may be necessary to promote before the proper authorities the interests of all forms of traffic. The committees of the centres are composed of delegates of the various local bodies, representing the different forms of road traffic, together with representatives of any other road-user interests in the locality. "The efforts and influences of all classes of road users are thus united in the common cause of obtaining improved roads. The centres first consider the general condition of the roads in the districts under their control, and the improvements necessary are ascertained. The relative importance of various road improvement schemes are then considered, and road users' views thereon placed before the responsible authorities. The centres consider questions connected with the mitigation of the dust nuisance, the more up-to-date construction and maintenance of the roads, the more efficient regulation of traffic, and the initiating and carrying out of all types of small improvements, &c."

The following is a list of the centres established to date:—

Bristol Centre, embracing Gloucestershire, Somersetshire and Wiltshire.—Headquarters, Bristol.

Derbyshire Centre.—Headquarters, Derby.

Lancashire and Cheshire Centre. — Headquarters, Manchester.

East Surrey Centre.—Headquarters, Croydon.

Leicestershire and Rutland Centre.—Headquarters, Leicester.

Midland Centre, embracing Staffordshire, Warwickshire and Worcestershire.—Headquarters, Birmingham.

Middlesex Centre.—Headquarters, London.

Sussex Centre.—Headquarters, Brighton.

South Wales Centre, embracing Breconshire, Cardiganshire, Carmarthenshire, Glamorganshire, Monmouthshire, Pembrokeshire, and Radnorshire.—Headquarters, Cardiff.

Yorkshire (West Riding) Centre.—Headquarters, Leeds.

#### THE GRITTING OF STREET SURFACES.

Strong complaints have been received by the association from certain of its constituent bodies and individual subscribers respecting the serious and expensive damage sustained by the rubber tyres of their vehicles from the unsatisfactory material used for gritting street surfaces, and the council resolved to take special action thereon. In this connection the report states: "A thorough investigation of the question revealed it to be one of exceptional difficulty; not only is the question closely allied to the cleansing and scavenging problem, but the requirements of rubber-tyred traffic are greatly different from those of horse-drawn traffic. If road surfaces are kept properly clean it is unnecessary to grit at all for rubber-tyred traffic; the presence of horse traffic, however, renders gritting necessary in certain weathers." Having collected data, the association arranged two conferences between itself, as representing the road users, and the Institution of Municipal and County Engineers, as representing the road engineers. The preliminary details concerning the conference and the names of delegates appointed were referred to in the annual report for 1910. Both conferences were attended officially by representatives of the Road Board, and the result was a joint recommendation on the following lines:—

(*a*) That every possible means should be taken to ensure a thorough cleansing of all highways so as to reduce the necessity of gritting to a minimum; and

(*b*) That the material used for gritting purposes should be as small as possible compatible with efficiency.

Upon the latter point it is considered that a small material would give horses an equally good foothold, while greatly reducing the damage to rubber tyres, as it would often happen that there was sufficient elasticity in a rubber tyre to enable it to pass over a small piece of grit without the skin of the tyre being lacerated.

The resolutions were duly circulated to the Metropolitan borough authorities, and the R.I.A. supplemented them by a special recommendation that, as a standard or basis, the material used upon clean, soft wood paving, should not exceed a gauge of $\frac{3}{16}$-in. All complaints of unsatisfactory gritting material have been investigated, and the association is continuing its campaign for the use of a smaller material distributed as sparingly as possible.

The association views this gritting question as one of great importance, and it does not propose to relinquish attention to the matter until improved methods have been adopted throughout the Metropolis and all town and urban areas.

During the frosty weather in February, 1912, one of the association's experts and an assistant made a special inspection of London street surfaces on several consecutive mornings. The report of the inspection states that, although some authorities have adopted improved gritting, a large number has not done so. Where improved gritting was employed its advantages were clearly demonstrated, as there was a nearer approach to a non-slippery surface than where the larger material was employed. Where material exceeding $\frac{1}{4}$ in. in gauge was used, practically no foothold was afforded until the material had been crushed by traffic, and until this was done the flint pebbles were either picked up by rubber tyres, to their detriment, or kicked to the gutter by horses. The association has, therefore, again addressed representations to the Institution of Municipal and County Engineers upon the subject, and negotiations between the association and the authorities will be continued.

#### THE DUST NUISANCE.

The campaign for the special treatment of roads with an efficient binding material, to reduce the dust nuisance to a minimum, has been continued, and advice and information upon various questions connected with this matter have been supplied to a number of applicants during the past year.

In regard to the alleged injurious effects on fish life by the washings from tarred roads, the report says:—

"The complaints that certain of the constituents of tar, when used upon road surfaces, have found their way into streams and injured fish have greatly diminished during the year. It is now a recognised fact that if the most elementary precautions are taken there is no risk at all on this score. The one or two authenticated complaints that have been received during the year, and have been investigated by the authorities, have all proved to be due to unskilful workmanship or to the tarring work being carried out under unsatisfactory conditions or with unsuitable tar.

"Complaints have, however, been made during the year in connection with tarred roads in another direction—viz., that a tarred road surface is unduly slippery for horse traffic. This question is now engaging the attention of the association and its experts. From information at present available it would appear that the complaints are not very extensive, and the causes of the alleged slipperiness are many; each case therefore requires to be dealt with separately. Some of the chief causes, all of which admit of remedy, appear to be: (*a*) the application of tar or similar material to the road in wet weather, or under conditions when the road metal is not in a fit condition to receive it, as a consequence of which the tar never becomes properly incorporated with the road metal and the surface is never satisfactory; (*b*) the application of tar to a road where, owing to trees, walls, &c., the passage of air and sunlight is limited and the road surface never becomes properly dry; (*c*) to an excessive amount of tar being applied when completing the work—this gives an unduly smooth surface which becomes slippery in certain weathers, and specially applies to certain types of tar-macadam work; (*d*) the injudicious use of caulkins upon horses' shoes—these chisel-like devices have the effect of piercing the waterproof coating of tarred surfaces and allow the water to get underneath the tar, which is then lifted and forms a greasy substance; (*e*) various local circumstances, such as unsatisfactory foundations, which cause the surface to become broken up by the traffic, excessive camber, &c. The association arranged to inspect, whenever possible, any special cases of slippery tar-treated roads, with a view to ascertaining the cause.

"It is probably useful at this point to make it quite clear that the Roads Improvement Association is an organisation representative of all classes of road users, and it fully recognises that horse traffic still exists, and will continue to do so in certain districts for many years to come; also that while every possible effort should be made to minimise the dust nuisance, such effort should be carried out with due regard to horse traffic, and the association feels quite sure that the local authorities in this country are equally alive upon this matter.

"It is pleasing to record that there is a general move on the part of the more up-to-date authorities to discard the commoner forms of tar and to use higher-grade binding materials, such as bitumen and asphalt. These, of course, have the effect of providing a much more efficient road surface."

### CAUTION SYMBOLS.

The report next proceeds to deal with the steps taken to remedy the present unsatisfactory state of affairs in regard to the erection of warning signs on roads. A draft scheme has been prepared, and this will, in due course, be circulated to the constituent bodies of the association and other organisations interested in the matter for their suggestions and approval. When the scheme has been approved by all organisations, it is proposed to approach the Government upon the matter, and strenuously to urge immediate action to be taken. In connection with this matter practical tests have been conducted with posts painted in various ways, and with triangles fitted with reflex lights, in order to obtain data as to their comparative visibility both by day and by night.

### LOOSE METAL ON ROAD SURFACES.

Allusion is made in the report to the efforts of the association to impress upon local authorities the great danger to road users and their vehicles caused by leaving loose metal upon road surfaces overnight and at week-ends. It is remarked: "Now that steam rolling is practically universal, this evil should, of course, have disappeared, but it is still prevalent." The association has circularised all the surveyors in Great Britain with a carefully worded communication pointing out the danger to road travellers caused by loose metal, and suggesting that where it was not possible to roll in all new stones on the same day as that on which they have been laid down, a lamp should be placed at night to warn travellers of their presence. The response was very satisfactory, and the association much appreciated the courtesy extended to it by several surveyors. Investigation is now being made of the suitability of certain types of lamps for indicating loose metal by night, and the association hopes shortly to be able to recommend a particular pattern for general adoption.

### LOCAL IMPROVEMENTS.

An important part of the Road Improvement Association's work is concerned with local improvements, such as hedge trimming, the removal of dangerous corners, the lessening of excessive camber, the adjustment of advertisement boards that hide the roadway from the traveller's view, the rolling in of loose metal, the avoidance of excessive watering or greasing of tramlines, &c. A number of cases have been successfully dealt with during the year. Details of some of the more important features of this work appear in the reports of the centres included in the report; a number has, however, been carried out by direct negotiations between headquarters and the authorities concerned.

### REGULATION OF TRAFFIC.

In prosecution of its campaign for the more efficient regulation of all forms of traffic, the association has taken special action to secure the more efficient regulation of tramway services. A test case is being made of London, as it is thought that if the matter can be successfully handled in the Metropolis it will have considerable influence upon provincial towns and cities. A memorial from the association has been presented to the Board of Trade, accompanied by corroborative data, protesting against the needless congestion caused to general commercial traffic, with the consequent waste of time and money to the general trading community by the unsatisfactory regulation of the tramway service in London. An informal interview has already taken place between a deputation from the Roads Improvement Association and the Board of Trade upon the matter, and the board have officially informed the association that they have invited the London County Council to forward their observations upon the memorial, and that when these are received a copy will be forwarded to the association. The board will then receive a formal deputation from the Roads Improvement Association.

Already considerable improvements, the report states, have taken place in the regulation of the London County Council tramway service.

### LIGHTING AND TRAMWAY STANDARDS.

The campaign for the removal of the lighting and tramway standards from the centre to the side of the carriageway is making good progress. Nearly all the large towns and cities, according to the report, are gradually taking down their centre tramway poles and re-erecting them at the side of the road. Among the more important places where this has been done are Glasgow, Manchester, Derby, Reading, Birmingham, Coventry, Nottingham and Sheffield.

### GENERAL.

A number of other important questions has received the attention of the association, including: (*a*) the necessity for the more efficient exhibition of street names; (*b*) the need for additional legal powers for urban district councils to enable the councils themselves to take in hand the reinstatement of road surfaces after they have been opened up by lighting and water companies, instead of having the work done by such companies with unskilled labour; (*c*) the sloping of the edges of roadside grass verges, so that, in narrow roads, when two vehicles pass, it will be possible for one to mount the verge with a minimum risk of accident—a number of roadside verges are at present cut vertically, and vehicles desiring to travel on to the verge have to mount a kerb varying in height from 3 in. to 12 in.

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**Rochdale Fire Brigade Equipment.**—The Rochdale Corporation has had a motor fire engine in service for nearly four years, and in view of the extension of the area to be served by the brigade a second engine has just been ordered. The engine decided upon is the same type as already in use; this machine has given most satisfactory results since it was placed in commission in 1908. It is of the Merryweather "Hatfield" design, with reciprocating pump of a capacity of 450 gallons per minute and is driven by a 55 h.p. four cylinder petrol engine. The new machine is to be of the same size, but the chassis will be arranged to carry a 50 ft. telescopic fire escape. The first engine has accomplished many excellent performances, and its satisfactory working largely influenced the Watch Committee when settling the order for the new motor. During 1911 over fifty fires were attended with this machine alone, and in one case the pump was working continuously for seven hours. Mr. Barry, the chief constable and head of the fire department, states that it is in excellent order and that there has never been a single hitch with it.

# Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

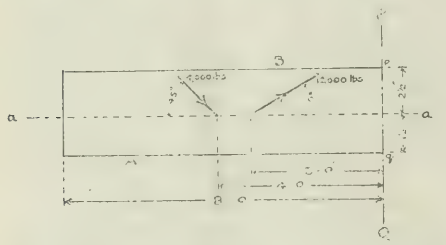
*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

## QUESTIONS.

This week answers are invited to the following questions:—

**238. Small Sewage Disposal Installation.**—Sketch and describe an installation consisting of a septic tank and filters for dealing with the soil sewage of about 750 persons, showing all the calculations for size of filters, &c. The filters are to be arranged so as to be capable of being enlarged if required. It is possible to have land treatment afterwards on about ⅛ acre to ⅜ acre of land. The effluent is to discharge into a ditch, and must be kept to a high standard. The scheme is not meant to be permanent, and is only required for a period of about six years, until sufficient assessable value is created to apply for a sewer loan to connect to a now existing sewerage system. ("Somerset.")

**239. Stresses in a Beam.**—A B is part of a beam, of which $pq$ is a cross-section, cut by the plane P Q; $aa$ is the axis of the beam. Forces of 4,000 lb. and



12,000 lb. act at the inclinations and distances shown. The moment of inertia of the section is 12-in. units, and its area is 4½ sq. in. Find the total compressive and tensile stresses in the section $pq$. (E. A. B., *Leicester.*)

**240. Pipe Joints.**—Sketch and describe some forms of joint suitable for stoneware pipes to be laid in waterlogged ground. (T. R.)

**241. Strength of Materials.**—Show how to find the moment of inertia of a tee section. What use is made of the moment of inertia in finding the strength?

**242. Joinery.**—Show by sketches what is meant by the following terms: (*a*) Lying panel, (*b*) raised panel, (*c*) frieze panels, (*d*) diminished style, (*e*) bolection moulding, (*f*) dove-tailed backings to jamb linings.

## REPLIES TO QUESTIONS.

**236. Reinforced Concrete Roof.**—Is the form of construction shown in the annexed figure suitable for a roof for a one-storey building, 9-in. walls? The roof may be used for storage purposes, and would as such have to carry in addition to its own weight 2½ cwts. per foot super. The spans vary from 6 ft. 6 in. to 9 ft., and all the bays are 17 ft. long. Fall in roof 6 in. In order to reduce the thickness of concrete to, say, 6 in., would R.S. joists 3 in. in depth be sufficient? If any reader can suggest a better form of construction (cost being a consideration), I should be much obliged. ("Hotel de Ville.")

The type of construction shown is now rarely used. The ⅜-in. rods placed over and under the joists hold the concrete in place, at the same time acting as braces, and do not add materially to the strength of the construction. The rolled steel joists should not be placed in the centre of the depth of concrete, but as much as possible in the lower half —*i.e.*, in the portion of concrete in tension.

Strength of proposed floor (neglecting braces)—4-in. by 2-in. joists, 7 lb. per foot at 4-ft. centres, concrete 7 in. deep. External load=2½ cwt. per foot super.

Total load=external load+concrete+joist.
=280+70+2.
=352 lb. per foot super.
(concrete 120 lb. per cub. ft., mixed 1:4).

At 4-ft. centres and 9-ft. span, total load on each joist $= \frac{352 \times 4 \times 9}{2,240} = 5$ tons 13 cwt.

The maximum safe load on a 4-in.×2-in. joist at 9-ft. span=1·3 tons.

By Wilkinson's rule for concrete steel floor—

$$W = 32\,\frac{I}{L^2} \text{ in which } \begin{cases} W = \text{safe distributed load in tons,} \\ I = \text{mom. of inertia in inch tons,} \\ L = \text{span in feet,} \end{cases}$$

$$= \frac{32 \times 4{\cdot}77}{9^2}$$

$$= 1{\cdot}88 \text{ tons} = 1 \text{ ton } 17 \text{ cwt.}$$

This shows the proposed roof to be much too weak to bear the loads likely to be placed upon the 9-ft. spans.

Assume joists at 15-in. centres, then, as before, total load on each joist

$$= \frac{352 \times 1{\cdot}25 \times 9}{2,240} = 1 \text{ ton } 35 \text{ cwt.}$$

This gives a margin of about 2 cwt. for each joist, the reinforcement being 1½ per cent.

On testing with the well-known formula:—

$$W = \frac{12t^2}{S^2}$$

applicable when $\frac{1}{100}$ of the sectional area is steel in the lower half of concrete, which at 15-in. centres is just obtained, and taking depth of concrete at 6 in., in which—

W=safe load in cwt. per ft. super.
S=span in feet, $t$=thickness in inches.

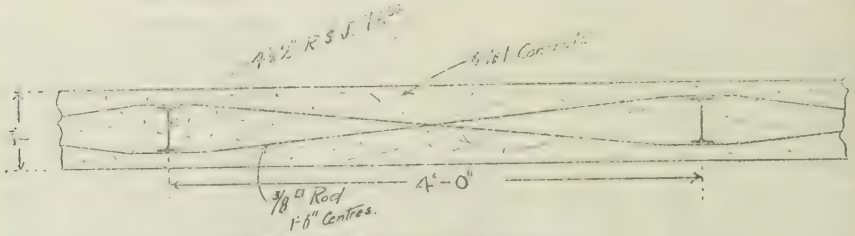
Concrete, first-class quality, mixed 1:4.

$$W = \frac{12 \times 6^2}{9^2}$$

$$= 5\tfrac{1}{3} \text{ cwt. per super. foot safe load}$$

The formula gives about 50 per cent strength more than that required, so that 18-in. centres for joists for 9-ft. spans will be ample, with a depth of concrete of 6 in. This will allow for the concrete not being mixed and laid by specialists in the work.

The querist should work out the correct spacing of joists in spans from 6 ft. 6 in. to 9 ft., in a similar manner, adopting 6 in. as depth of concrete. If 4-ft. centres for joists are decided upon, larger joists




Reinforced Concrete Roof Construction.

could be used, but should not be used if avoidable. No additional reinforcement is necessary. The 6-in. fall in roof should be arranged without reducing the calculated thickness of floor.

As regards a better form of construction, at the same time considering cost, much depends upon local conditions and the magnitude of the work. For a small building the method shown would be best, being simple, and could be carried out by average workmen.

In a large building, a reinforced concrete roof of a more monolithic nature is worth consideration, particularly if the bays are continuous. Experiments have shown that concrete floors stiffened with ¾-in. iron roads, where the load and span are suitable, are more economical than the use of small steel joists.

As the roof may be used for storage purposes, the structure appears to be a building of the warehouse class, and as such would be considered in some towns as being controlled by building by-laws relating to that class of building. In that event the walls would have to be 14 in. thick. In any case, a 9-in. wall should be built in cement in a first-class manner.

The two drawings show a good type of reinforced concrete construction, mentioned above.

The R.I.B.A. working stresses have been taken—i.e., 1,600 lb. per square inch on steel, 600 lb. on concrete, and concrete in shear, 60 lb. per square inch.

Floor slabs—end panels $BM = \frac{WL}{10}$, centre panels $BM = \frac{WL}{12}$

For beams $BM = \frac{WL}{8}$ (assuming beams *not* continuous).

R = hydraulic mean depth
$= \frac{\text{area of cross section, square feet}}{\text{wetted perimeter in lineal feet}}$

S = sine of inclination
$= \frac{\text{fall in water surface}}{\text{length of channel}}$

$n$ = coefficient of roughness dependent on the material of which the channel is composed,

$a$ = area in square feet.

At first sight the formula appears somewhat complex, but the work of calculation can be rendered extremely simple by the use of the Labour-saving Tables printed in either Wollheim's "Sewerage Engineers' Note Book" (published by the St. Bride's Press, price 3s. 6d.) or Moore and Silcock's "Sanitary Engineering" (published by Batsford, price 2 guineas).

The hydraulic mean depth, or hydraulic radius as it is also termed, is the

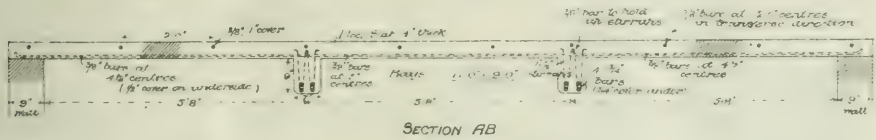
$$\frac{\text{cross-sectional area of stream in square feet}}{\text{wetted perimeter in feet}}$$

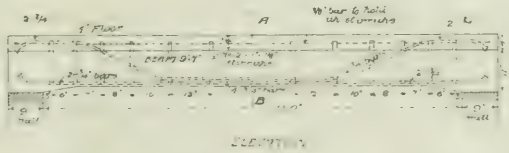
The following handy table (extracted from the previously mentioned Note Book) gives the various particulars required for the standard form of egg-shape conduit where the radius of the invert is one-half the radius of the crown.

Let $r$ = radius of crown, then—

| Depth of flow. | Area. | Perimeter. | H.M. depth. |
|---|---|---|---|
| Full | $4{\cdot}594\,r^2$ | $7{\cdot}930\,r$ | $\cdot579\,r$ |
| ⅞ | $3{\cdot}518\,r^2$ | $5{\cdot}291\,r$ | $\cdot665\,r$ |
| ¾ | $3{\cdot}023\,r^2$ | $4{\cdot}788\,r$ | $\cdot631\,r$ |
| ⅝ | $2{\cdot}037\,r^2$ | $3{\cdot}783\,r$ | $\cdot538\,r$ |
| ½ | $1{\cdot}136\,r^2$ | $2{\cdot}750\,r$ | $\cdot413\,r$ |
| ⅜ | $\cdot745\,r^2$ | $2{\cdot}211\,r$ | $\cdot337\,r$ |

The value of $n$ for ordinary brickwork in good condition may be taken as ·013, and when in fair condition (as, for instance, a sewer that has been in use for some time) as ·015. (H. F. W., *Tottenham.*)



Reinforced Concrete Roof Construction.

Carefully-prepared quantities should be compared for each design, and cost ascertained. No difficulty should be experienced, with careful workmanship and supervision, in carrying out the second design. ("G. S.-L.")

**237. Egg-shaped Sewer.**—State a formula for obtaining the discharge of an egg-shaped sewer, also show how to obtain the hydraulic mean depth of same. (F. B., *Hereford.*)

Undoubtedly the best and most reliable formula for this purpose is that based on the investigations of the two eminent Swiss engineers Ganguillet and Kutter. They found that the fundamental equation of Chezy—*i.e.*, $v = c\sqrt{RS}$, could be adopted, provided the coefficient $c$ was raised to suit the conditions of each individual case; especially they took into consideration the roughness of the surface impinged upon by the water.

The formula reads—

$$c = \left[\frac{41{\cdot}66 + \frac{\cdot00281}{S} + \frac{1{\cdot}811}{n}}{1 + \left(41{\cdot}66 + \frac{\cdot00281}{S}\right)\frac{n}{\sqrt{R}}}\right]\sqrt{RS}$$

and $q = av$.

Where $v$ = mean velocity in feet per second,

$q$ = discharge in cubic feet per second,

**Wood Paving in New Zealand.**—Wood-block pavements in Wellington, New Zealand, are reported as particularly good, and those which have been in use for eight years are stated to have remained in good condition without further treatment than an occasional surfacing of tar and sand. The only renewals made have been at places where the subgrade was so soft as to allow the base to settle. The city engineer has described the construction as follows: The roadway is excavated to a depth of 11½ in. below the finished-surface level of pavement. Six inches of concrete (composed of 6 parts of ballast to 1 part of Portland cement) are laid over the whole width of the roadway and floated to a smooth surface. Jarrah blocks, 5 in. deep, cut from planks measuring 6 in. by 3 in., 7 in. by 3 in., or 8 in. by 3 in., are dipped in hot tar and then laid in courses 3 in. wide across the street, the blocks in each course and the several courses being placed as close together as possible. Expansion joints 1 in. wide of well-worked clay are laid alongside each kerb. The whole surface is coated with boiled tar, well brushed in, and then sprinkled with coarse sand. This tarring and sanding are repeated as found necessary. The sand used is taken from the seabeach, the particles being about the size of rice.—The *Contract Record*, Toronto.

# The Main Levelling of Copenhagen, 1907-8.

By C. F. V. BOOCK, Surveyor-in-Chief and Municipal Engineer in Charge of Division B, Copenhagen.

*(Continued.)*

As a rule work was commenced just before sunrise, provided the weather permitted. Before the proper levelling work was started a set of regulations for the Copenhagen main levelling (1907) was prepared, and a copy given to each operator, who was cautioned to follow the regulations strictly. The regulations were as follows:—

The levelling of marks shall be performed in duplicate, so that the difference in height of two points "*n*" and "*m*" is determined, firstly by sighting from *n* to *m*, and afterwards from *m* to *n*. The difference of height of the two points will then be the mean of the two observations.

The instrument is to be placed so exactly midway between the two points that the distances from the instrument to the points do not differ by more than 1 m.

The position of the instrument is to be first determined by pacing, and finally by means of the telemeter on the telescope. The maximum length of sight is 50 m., and this is only allowed under favourable circumstances, such as experienced operators, assistants and staffmen, hard ground, little traffic, no wind, clear weather, and sharp focus in the telescope. Where these conditions are not fulfilled, shorter sights must be employed. As far as practicable the same length of sights should be used. Suppose, for instance, the distance between the marks to be 210 m., three instrument placings of 35 m. each are used, but not two placings with long and one with short sight. Naturally, a few meters do not count, and the placing of the instrument must be made without wasting too much time. Each observation is to be recorded twice, thus: (1) with the reversible spirit-level below the telescope, and readings of red figures on the staff; (2) spirit-level above the telescope and readings of the black figures on the staff.

The order of procedure for every observation is as follows:—

Chaining to the back staff (after the telescope has been focussed).

Adjustment of the vertical axis of the instrument.

Chaining to the front staff (and examination of the vertical position of the instrument).

Back sight: The telescope is sighted to the back staff and clamped. Signal is made to the staffman, and the spirit-level is brought into play by means of the vertical tangent screw. The staff is read off on the red side. The operator reads off the staff in a loud and distinct voice, so that the assistant can note the reading down without difficulty. He repeats the reading. Meanwhile he has noted down the reading of the spirit-level, provided it has not altered during the operations. While the assistant is noting down the readings the operator reads off the complement of the numbers. These are marked by the assistant with a cross. If the spirit-level has altered more than one-tenth of a division, the observation is cancelled. The operator then turns the telescope so that the spirit-level is on top, and the staffman turns the staff. Then the observation is repeated. The fore sight is taken in the same manner as the back sight.

Small corrections for the spirit-level should be preferred, and the greatest difference between the spirit-level readings for fore sight and back sight for the same set of observations should not exceed one division on the bubble.

The staffman must not move, and the staff must not be removed, before all the observations to be taken at one instrument station have been finished and checked.

The instrument must always be in a well verified condition. The same must be the case with the spirit-levels of the staves, which must be tested frequently.

The following rules are of particular importance:—

(1) The resting point of the staff must be absolutely immovable; as a consequence of this, where possible, the iron pegs are used in preference to the plates.

(2) During the sighting the staffman must keep the staff in a true vertical position, and accurately on the mark: he must therefore be notified in good time when a reading is to be taken. In order that the man's attention may not be unduly strained, he must also be notified by sign or whistling when the exact position is no longer required.

(3) The spirit-level must be at rest when the reading is taken.

(4) Before the observation begins, the instrumentmen must get into their positions, and during the observation they must remain perfectly immovable.

(5) The instrument, both while in use as well as when it is being moved from one place to another, must be protected from the sun.

(6) To eliminate possible differences between the divisions of the two staves, the same staff must be used for the first and last sights, at the same range of observations.

(7) The staffman must never place the staff upright on the ground, but lay it down or rest it on his boot.

RANGE OF ERRORS TOLERATED.

(1) The sum of the direct and complementary readings must not exceed ½ mm.

(2) The difference between the height measured on the red and that on the black side of the staff must not exceed 1½ mm.

LEVELLING—CIRCUIT II.

A.

Face of staff: Red figures, spirit-level below.

| Stations. | Telemeter reading. | Number of paces. | Sight to. | Staff reading. Half-meter. | | Rise, Half-meter. | Spirit-level. Reading. | | Correction. ½ L.D. | Correction. ½ mm. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | From B M 94 Randersgade 8. | | | | | | |
| 1 | 40 | 60 | *b* | 1·379 | × 8·621 | × 7·9190 | 11·3 | 28·7 | + 0·3 | 0·3 |
| | 40 | 60 | *f* | × 6·540 | 3·460 | | 11·1 | 28·6 | | |
| 2 | 33 | 50 | *b* | 2·459 | × 7·541 | × 9·4430 | 11·1 | 28·5 | − 0·4 | × 9·6 |
| | 33 | 50 | *f* | × 6·984 | 3·016 | | 11·2 | 28·8 | | |
| 3 | 30 | 44 | *b* | 2·671 | × 7·329 | 0·7770 | 11·2 | 28·7 | 0 | 0 |
| | 30 | 44 | *f* | × 8·106 | 1·894 | | 11·2 | 28·7 | | |
| | 206 4 | 308 | | × 8·139 | 1·861 | × 8·1390 × 8·1391 | | | | × 9·9 0·1 |
| | 210 | | | | | | | | | |

B.

Face of staff: Black figures, spirit-level above.

| Staff reading. Half-meter. | | Rise, Half-meter. | Spirit-level. Reading. | | Correction. ½ L.D. | Correction. ½ mm. | Remarks. |
|---|---|---|---|---|---|---|---|
| To B M 85 Logstorgade 9. | | | | | | | |
| 1·492 | × 8·508 | × 7·9175 | 11·4 | 28·8 | + 0·5 | 0·6 | Date: 10/8/1907, 1 a.m.— 12.15 p.m. |
| × 6·425 | 3.574 | | 11·1 | 28·6 | | | |
| 2·672 | × 7·427 | × 9·4435 | 11·3 | 28·8 | + 0·2 | 0·2 | Weather: cloudy. Force of wind: 0. |
| × 6·871 | 3·129 | | 11·2 | 28 7 | | | |
| 2·785 | × 7·215 | 0·7770 | 11·2 | 28·6 | − 0·5 | × 9·6 | Temperature at 11.15 a.m., 17·2 deg. C. |
| × 7·992 | 2·008 | | 11 4 | 28 9 | | | |
| × 8·137 | 1·861 | × 8·1380 × 8·1376 × 8·1383 × 8·1378 | | | | 0·4 × 9·6 | Staff-meter: 1000·28. Correction in staff-meter + 0·52. |

The Surveyor
And Municipal and County Engineer.

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(3) Similarly the difference between red reading and black reading for one range of observations of $n$ instrument stations must not exceed

$$\frac{3\sqrt{n}}{2} \text{ mm.}$$

(4) The difference between the levelling of a line of $l$ km. and its check-levelling must, measured by the sum of its sight-readings, not exceed

$$\frac{12}{2}\sqrt{l} \text{ mm.}$$

Here it is assumed that the first and second levelling of a line would give a mean error of 1 mm. per km., and that an error of more than three times the mean error should not be allowed.

The two parties level the main circuits in opposite directions.

To further illustrate the methods employed, a copy of Field-Book No. 16A, Party No. 2, page 4, is appended. Operator, Mr. Landt; recorder, Mr. Skafte; instrument, Hildebrand's pattern; staves, No. 3 and No. 4 (German make).

The field-books were delivered up to me each day, so that I could compute the corrections, compare the results of the two parties, and arrive at the final error in the circuits, from which it follows that I could always point out the lines which had to be relevelled.

The sum of the vertical readings in a circuit should, of course, be zero, theoretically speaking; but there is nearly always a final error, the magnitude of which is a check upon the accuracy of the work.

It will be observed that in the field-books the decadical complements of the negative numbers have been employed, marked with a cross (×) in front, instead of the negative numbers themselves. For example $\times 9{\cdot}4220 = 9{\cdot}4220 - 10$, or $= -0{\cdot}5780$.

In column 2, 4 m. have been added to the sum of telemeter readings. This arises from the additive constant, which for every sight is 0·6 m. (1½ times the telescopic length). The additions of columns 5, 6 and 7 provide checks on the observations as well as the computations. The spirit-level corrections are computed with opposite sign, because the graduation on the spirit-level commences at the eye end. In 3rd column, B, the sums of the rises (or falls) are first found to be $\times 8{\cdot}1376$; next the figure corrected by the level correction $\times 8{\cdot}1376$; next the mean of the corrected figures in both cases $\times 8{\cdot}1383$, and last the figure $\times 8{\cdot}1378$, which is obtained by adding the staff correction to the before-mentioned mean $+0{\cdot}5$. The last named figure gives the exact value of the fall from B.M. 94 to B.M. 85 (bench marks).

The employment of the decadical complement is the natural consequence of the manner in which the staves are marked, and it is a great convenience, inasmuch as the numbers in the column can be added immediately without regard to their signs. It is to be observed that the cross really means −10, and that the principle is the same as that applied to negative logarithms.

The final errors 0·0001 and 0·0005 show for the small circuit a particularly fine result.

The final error in the outer main circuit, which compasses all the secondary circuits, amounted by party No. 1 only to 0·8 mm. on a chainage of 51·966 or over 32 miles, but naturally this must not be taken as being a standard value.

The mean error for any circuit is computed from the formula—

$$M = \pm\sqrt{\frac{S^2}{o}}$$

where S is the final error in mm. and $o$ the length of the circuit in *km.*

For the sake of comparison between the results obtained by the levelling parties, the mean error for the first party, for the second party, and for both parties was computed from the formula—

$$M = \pm\sqrt{\frac{1}{n}\sum\frac{S^2}{o}}$$

where $n$ means the number of circuits.

The results were as follows:—

| | First party. | Second party. | Mean. |
|---|---|---|---|
| Mean error of the main circuits | ±1·378 | ±1·252 | ±1·014 |
| Mean error of the total 183 circuits | ±1·420 | ±1·365 | ±1·098 |

From this it can be seen that the results of the second party were the best, and that the levelling of the main-circuits quite naturally was better than that of all the lines taken as a whole.

*(To be concluded.)*

## ROAD FOUNDATIONS IN HEREFORDSHIRE.

### "ECONOMY OR FOLLY?"

The surveyor of highways, Mr. F. Gwillim, stated at a recent meeting of the Weobley (Hereford) Rural District Council that when he submitted his estimates he told the county surveyor he was sorry to have to present the figures, but they were his estimate for the work, and he could not alter it as these estimates had to carry them on to 1913. Their payment by the county council was subject to the roads being efficiently maintained. If when the time of inspection came the roads were in a bad state then the grant by the county council to that council would be refused. He quite expected to be "called over the coals" for it, but he would rather face the music then than later on. He was suffering now for what in the past was either economy or folly, he did not know which to call it. They had only skimmed the roads with metal, and when they got a bad frost away the roads went. Fifty per cent of the roads had only 3 in. of metal upon them in that district—that meant that they were practically upon the earth. He was not asking any more for labour expenses; in fact their labour expenses were below the average for the county.

Sir John Cotterell: How many miles of main roads have we?

Mr. Gwillim: Forty-five.

Sir John Cotterell: That is over £100 per mile. In justice to Mr. Gwillim he was bound to say that ten years ago their roads cost considerably less than the average—*viz.*, about £40 per mile. He could only suppose that they then looked "pretty" and just stood the traffic, but now they had got to suffer for it. It was a terrible increase from £40 to £100, and the worst of it was there seemed to be no chance of diminution, because the roads of Herefordshire had no foundation, being merely a layer of metal on clay. For that reason the committee were going to interview the Road Board in order to get the enormous sum of £10,000 to make foundations in places where the roads were very bad.

The vice-chairman said that in the past they had cut Mr. Gwillim's estimates.

**Southend's Tramway Profits.**—Southend Corporation tramways show a profit of £5,000 for the relief of rates.

## CORRESPONDENCE.

*"Men are never so likely to settle a question rightly as when they discuss it freely."*—Macaulay's *"Critical and Historical Essays."*

### SOUTH-EASTERN DISTRICT: INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*To the Editor of* The Surveyor.

Sir,—I enclose you a copy of Mr. Maybury's letter in reply to my communication of the 1st inst. already published in your columns. I shall be much obliged if you will have Mr. Maybury's reply published.

I have also been in communication with the president with respect to this matter, and have received his reply, but as yet I have not his permission to give it publicity. However, this much I can say: Mr. Maybury was asked by the president to call a meeting in the South-Eastern District, and was supplied with envelopes addressed to every member and associate member in the district. These envelopes, however, were evidently used for conveying to the members and associate members the result of the deliberations of the Kent Association of Surveyors at their meeting held at Maidstone.

In common with many other members, I am still waiting for some explanation of these extraordinary proceedings.—Yours, &c.,

A. Ernest Prescott,
Borough Surveyor.

The Town Hall,
Eastbourne.
April 15, 1912.

[copy of letter referred to.]

County Surveyor's Office,
St. Peter's-street,
Maidstone.
April 2, 1912.

A. E. Prescott, Esq.,
The Town Hall,
Eastbourne.

Dear Sir,—I am in receipt of your long letter of yesterday, wherein you criticise the action I have taken in my capacity as chairman of the Kent Association of Surveyors, in connection with the election of a district representative to the Institution of Municipal and County Engineers.

At the proper time, and to my colleagues of the South-Eastern District, I shall be glad to give whatever explanation may be necessary.

Yours faithfully,
(Signed) H. P. Maybury.

### EASTERN DISTRICT: INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*To the Editor of* The Surveyor.

Sir,—Through the good offices of Mr. Collins, city engineer of Norwich, a meeting was convened at Norwich on the 23rd ult. to discuss the question of district representation on the council of the Institution of Municipal and County Engineers.

I believe several candidates' names were placed before the meeting, and a vote taken upon each one, it being subsequently unanimously decided to recommend:—

Mr. W. H. Prescott } as representatives on the
Mr. H. T. Wakelam } council.
Mr. A. Fidler as district chairman.
Mr. E. J. Elford as district secretary.

Many members (including myself) were unable to be present at Norwich to join in the meeting, but I think the choice of those present is a very wise one, and I sincerely trust that the gentlemen named may be returned by the unanimous vote of the district members.—Yours, &c.,

Charles Vawser.

Hadley-road,
New Barnet,
April 15, 1912.

### NORTH-EASTERN DISTRICT: INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*To the Editor of* The Surveyor.

Sir, As a member of the above institution, will you allow me to protest against the method that is being adopted in this district with regard to appointment of district chairman, &c.?

On April 3rd I received a circular letter asking me to support certain gentlemen, and stating that "after consultation with several colleagues the following gentlemen have been nominated for office."

What I object to is that I and a great many more of my brother surveyors were not consulted; and, further, the names given are unsatisfactory and certainly unrepresentative.

Another point is that the author of the circular is the district chairman of the Institution of Municipal Engineers, and if he is desirous of taking a leading part in the fortunes of either institution, then let him unreservedly support either one or the other.

I recognise the desirability of unity, but in consequence of the method pursued I have refrained from voting in any way, and also because I believe that an urban district council should be in evidence in this district.—Yours, &c.,

"Auld Lang Syne."

April 13, 1912.

### METROPOLITAN DISTRICT CHAIRMANSHIP: INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*To the Editor of* The Surveyor.

Sir,—I should esteem it a favour if you would kindly make it known through the medium of your paper that I have not given my consent to be nominated for the district chairmanship of the Metropolitan District of the Institution of Municipal and County Engineers.

I should not for one moment think of allowing my name to go forward against that of Mr. J. Patten Barber, who has devoted so much time and has done such estimable work for the institution; and I regret that the person who nominated me did not obtain my consent in accordance with the suggestion of the committee.—Yours, &c.,

Frank Sumner,
City Engineer.

Guildhall, E.C.
April 18, 1912.

## RENOVATION OF WOOD-PAVING BLOCKS.

The Corporation of Burton-on-Trent have ordered one of Phillips' wood-paving block renovating machines, and another is in course of erection at the Battersea Borough Council's depot for the trimming and sawing of about 100,000 old wood blocks which are lying there.

The machine referred to, full information with regard to which can be obtained from the makers, the Wood Paving Block Renovator Company, 166 Walworth-road, London, S.E., and an illustration of which appears in our advertisement columns this week, has been designed to facilitate the re-use of old Jarrah wood and other paving blocks which during a course of years have become worn and uneven on the surface. It is claimed, and is said to have been demonstrated beyond doubt, that it has solved a problem which for a long time past has been exercising the minds of borough engineers and others interested in road construction—*viz.*, the successful treatment on a practical and economic basis of old hard-wood road blocks, with a view to extending their life and utility, and thereby considerably reducing the heavy cost of road maintenance. By Phillips' process the slow and costly hand methods hitherto employed for cleaning and trimming the old blocks are practically dispensed with, and this machine will effectively treat them at the rate of eighteen per minute, removing burred edges and all adhesive matter, and sawing them to a uniform thickness ready for relaying.

Under the old system of handling a large percentage of the used blocks are either destroyed or discarded as useless. There is practically no waste by using this machine; the old blocks, after serving their first term of years, can be taken up, cleaned and trimmed, sawn to the required thickness, and relaid, fit for a further ten years' service.

A depot has been established at 166 Walworth-road, to which old wood-paving blocks may be sent to be trimmed, cleaned and sawn by one of these machines.

One of the machines has been in use for some time past in one of the largest of the Metropolitan boroughs, to the complete satisfaction of the borough engineer and other officials, who are prepared to testify that it does all that is claimed for it, both in regard to efficiency and economy. Streets are now being paved in this borough with renovated blocks, taken up from the main roads, and which, before the introduction of this machine, would have been thrown aside as useless or sold for firewood. The machine is not complicated in construction, its details and working are readily mastered, and it is easily kept in order. A point of some importance is that it can be adapted for sawing timber, including hard-wood planks.

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Alnwick R.D.C.** (April 16th. Mr. H. R. Hoopers).—£650 for works of water supply for the township of Alnmouth, to include the laying of a main from Trobe's Dene, in the parish of Shilbottle, to the reservoir at Bilton.—Mr. Marmaduke Temple Wilson, sanitary inspector for the council, stated that it was proposed to collect the water from a borehole and two springs, giving a minimum yield of 10 gallons per minute, and to lay new 4-in. cast-iron coated pipes to the existing covered service reservoir at Bilton.

**Barnstaple R.D.C.** (March 29th. Mr. W. O. E. Meade-King).—£200 for the extension of the sewer at Georgeham.—Mr. R. E. C. Balsdon, clerk, gave a statement of the case from 1906, leading up to the application, while the surveyor, Mr. E. G. Kingwell, explained the scheme in detail.

**Barrow-in-Furness T.C.** (April 10th. Mr. W. O. E. Meade-King).—£1,050 for works of sewerage, and £1,370 for the purchase of the properties in Paxton-street, for purposes of street improvement.—The town clerk, Mr. L. Hewlett, explained that the £1,050 was required for the purposes of proposed relief sewers in Newbarns district, and the reconstruction of a short length of the original sewer in Ainslie-street. The borough engineer and surveyor, Mr. Arthur Race, gave the details of the scheme and submitted plans.

**Bournemouth T.C.** (March 29th. Mr. M. K. North).—£700 for the purchase of certain land on the Mayfield Estate, Moordown, for the purpose of a gravel pit and children's playground.—The borough surveyor, Mr. F. W. Lacey, stated that at the present they had to obtain their gravel through contractors, and experienced difficulty even then in obtaining it. Nearly all the corporation roads were made up of gravel. Asked by the inspector when it was likely that the ground would be converted into a children's playing ground, he said he estimated that it would be in about five years' time, as the gravel would last about three or four years. There was no opposition.

**Bristol T.C.** (April 13th. Mr. F. H. Tulloch).—£7,037 for works of paving, and £2,470 for works of sewerage, at Bedminster and St. George.—Mr. W. H. Wise, assistant town clerk, stated with regard to the first amount that nine streets were included in the application, all of which were at present paved with setts, which were laid probably not less than forty years ago; the surfaces are much worn and difficult for traffic, and the council desired to repave them in a manner suitable to the traffic they have to bear. The inspector: Will these works be carried out by contract? The city engineer, Mr. L. S. Mackenzie: No; by administration. Mr. Wise proceeded to state in regard to the other application that the sewerage at Bedminster would cost £770. In St. George it was proposed to spend £1,700. In reply to a question as to the period of the loan, the inspector said that they allowed twenty years for paving and thirty years for sewerage works.

**Donaghadee U.D.C.** (April 12th. Mr. P. C. Cowan).—£14,000 for the purpose of providing a water supply and sewerage system for the district.—Mr. H. J. Weaver, M.Inst.C.E., the engineer in charge of the schemes, submitted plans for both undertakings. He pointed out that the sewerage scheme had been so designed as to allow for the draining of practically the whole of the area needing drainage, but owing to the limited borrowing powers of the council it was impossible to lay the whole of the sewers at present. The sewers were designed to take sewerage from a population of 10,000, and the outfall would be constructed at Robby Point. The total cost of the scheme complete was estimated at £12,410, but it was proposed to carry out work to the value of £7,000 only. The supply of water was to be obtained from a well and galleries which had already been constructed at Priest Moss, the yield from which was 100,000 gallons per twenty-four hours. Under the scheme the whole of the district requiring water would be supplied, and the total cost was estimated at £6,607.

**Evesham R.D.C.** (April 9th. Mr. E. Leonard).—£10,000 for the erection of cottages under the Housing of the Working Classes Act, 1890, at Broadway.—Mr. E. H. Wadhams, clerk to the council, said the Local Government Board had previously sanctioned a loan of £625 for the land. The scheme was for building sixty cottages, twenty-four at 3s. 6d. a week rent, twenty-four at 4s. a week, and twelve at 4s. 6d. He gave figures showing an estimated deficiency of £38 upon the scheme. The inspector said he did not think they would keep the cottages in repair for 10s. a house, which was the sum provided. Mr. H. E. Dicks, the architect, described the cottages. The twenty-four to be let at 3s. 6d. a week would, he said, each have a living-room 13 ft. by 13 ft., scullery 8 ft., larder, ventilated coal-place, bath, copper, and three bedrooms. They would be in blocks of six. The twenty-four at 4s. a week would be similar, but slightly larger rooms, and in blocks of six. The twelve to be let at 4s. 6d. a week would be in pairs, and the accommodation would be slightly larger. His total estimate, including the roads and all the charges, was £9,670.

**Fleetwood U.D.C.** (April 11th. Mr. W. O. E. Meade-King).—£3,520 for works of private street improvement.—The surveyor, Mr. E. Frobisher, stated that the streets would not, so far as he could say, be broken up, as they were sewered and lighted, and where there was no light provision was made in the present estimate.

**Richmond T.C.** (April 10th. Mr. Edgar Dudley).—£25,000 for the wood paving of Kew-road, Petersham-road and Hill-street.—The town clerk, Mr. H. Sagar, stated that Kew-road was not a main road, and no contribution was therefore received from the county in respect of its maintenance and repair. The Treasury, however, made an annual payment of £800 in respect of the road. There was at present in the road an antiquated horse-tramway, but the London United Tramway Company had agreed to pay £6,000 in consideration of being relieved of their existing obligations with regard to the line and of being allowed to abandon it entirely. On this undertaking the corporation had agreed to withdraw their opposition to the company's Bill now in Parliament. The inspector asked what would be done with the £6,000. The town clerk replied that it would be utilised in paving Kew-road with wood. The position was an unusual one, and he had been told by the council's Parliamentary agents that they had never heard of such a case. The council asked for a loan for twenty years for the concrete foundation and of ten years for the wood paving. The borough surveyor, Mr. J. H. Brierley, and others also gave evidence.

**Shildon (Durham) U.D.C.** (March 30th. Mr. F. H. Tulloch).—£3,000 for the provisionof a recreation ground and works of street improvement in St. John's-road in connection therewith.—The clerk, Mr. J. T. Proud, reminded the inspector that application was made some time ago for sanction to borrow money for a recreation ground, but the Local Government Board did not comply. This was a fresh site entirely, and the inspector would see from the plan how much more central the new site was than the old. The two Shildons at present were not well connected, and it was hoped to connect them by means of the road which would be made round the ground. The surveyor, Mr. Middleton Turnbull, also gave evidence.

**Torquay T.C.** (April 12th Mr. H. S. Bidwell and Dr. E. St. George Mivart).—This was an inquiry regarding the application of the corporation for power to improve the baths which were acquired as part of the harbour undertaking, and to provide medicinal and other baths, also for sanction to borrow a sum of £15,000.—The borough surveyor, Mr. H. A. Garrett, estimated the annual expenditure of the swimming baths at £766. He indicated many sources of revenue, which, at a low estimate, would amount to £787, including £328 from general bathers.

**West Hartlepool T.C.** (March 30th. Mr. F. H. Tulloch).—£908 for the provision of bowling greens in the Park and Burn Valley Gardens.—Councillors Coates and Hussey spoke to there being a growing desire on the part of the working men of the town for bowling greens, and pointed out that the green which it was proposed to lay down in Burn Valley Gardens would be in the very heart of a big and largely working-class population.

**Whitley and Monkseaton U.D.C.** (April 4th. Mr. R. H. Bicknell).—£1,250 for paving works.—It was explained that the work proposed to be done was the paving of Whitley-road, from South-parade to Station-road, with wood blocks, which would involve the improvement of the gradient of the road and the relaying of the tramway lines.

**West Bromwich T.C.** (April 12th. Mr. T. C. Ekin).—£7,700 for extension of the electricity works, and

£2,000 for the purchase as a site for a public elementary school of certain land adjoining the Cronehills, Sandwell-road, together with the mines under such land, and the Cronehills, and for the levelling of the pit mound on the land.—Mr. A. Wickham explained that the original application was for £2,000 in connection with the Cronehills land, but this would probably have to be increased by £600 or £700. They asked for sixty years for the repayment of the loan on the land, and for as long a period as the board would grant for the repayment of the money spent on levelling. They had already started clearing the mound to find work for the unemployed. The inspector said it often happened that unemployed labour was more expensive than skilled labour. Mr. A. D. Greatorex, borough surveyor, said it was not so in this case, as the unemployed who were working on the mound were ironworkers and others thrown out of work by the coal strike, and they were earning what they received. He estimated the total cost of levelling at £1,928, and he thought they would receive for the slack £428, making the nett cost £1,500. Now that the coal strike was over they would lose much of their labour, and they would not have the carts available. It was proposed only to clear about a third of the land, leaving the other to be cleared when it was necessary to find work for the unemployed. The town clerk said they wished to amend the application to include an extra £1,300 for the cost of removing the mound, as only £200 had been allocated for this purpose.

### APPLICATIONS FOR LOANS.

**Arundel T.C.**—£1,400 for the improvement of the Brighton to Portsmouth road.

**Ashington U.D.C.**—£4,000 for the improvement of the main road.

**Beaconsfield U.D.C.**—£13,000 for the completion of the sewage scheme for the northern part of the district.

**Beckenham U.D.C.**—£8,800 for the purchase of Kelsey Park.

**Chapel-en-le-Frith R.D.C.**—£865 for the construction of waterworks.

**Dartmouth T.C.**—£150 for street improvement purposes.

**Featherstone U.D.C.**—£33,000 for a housing scheme.

**Frinton-on-Sea U.D.C.**—£400 for the extension of the main sewer outfall.

**Cosport U.D.C.**—£2,177 for works of asphalting.

**Harwich T.C.**—£400 for repairs to schools.

**Lowestoft T.C.**—£2,000 for sea defence works.

**Malvern U.D.C.**—£2,000 for extensions of electricity mains.

**Penge U.D.C.**—£3,537 for street works.

**Preston R.D.C.**—£5,300 for the Penwortham sewerage scheme.

**Selby U.D.C.**—£3,200 for the provision of workmen's dwellings.

**Sheffield T.C.**—£9,060 for a housing scheme at High Wincobank.

**Ulverston R.D.C.**—£440 for a water supply scheme for Scales.

**Weymouth T.C.**—£5,000 for ornamental gardens and bungalows.

**Widnes U.D.C.**—£2,600 for the construction of Ditton-road.

**Windsor T.C.**—£350 for laying a sewer.

**Withnell (Lancs) U.D.C.**—£830 for the extension of the pumping station at the waterworks.

**Yeardsley-cum-Whaley U.D.C.** £3,000 for works of sewerage.

### LOANS SANCTIONED.

**Banff C.C.**—£2,068 for an additional water supply for Watt's Bog, Blairmaud.

**Battle (Sussex) U.D.C.**—£1,250 for a new pumping plant at the waterworks.

**Runcorn U.D.C.**—£4,000 for improvements in drainage.

**Scarborough T.C.**—£5,050 for the purchase of the land immediately to the south of the Spa from the Cliff Bridge (Spa) Company; £6,520 for the purchase of adjoining land from Mr. G. Lord Beeforth and Miss Beeforth; £3,750 for the purchase of pleasure grounds in the North Bay; and £1,800 for the purchase and laying out of land at Peasholm, at the northern confines of the borough.

**Spennymoor U.D.C.**—£2,600 for the extension of Tudhoe Cemetery.

**Wantage R.D.C.**—£200 for the Challow drainage scheme.

### FORTHCOMING INQUIRIES.

| APRIL. | £ |
|---|---|
| 22.—**Kingston-upon-Thames.** For works of paving (Mr. R. H. Bicknell) ... ... | 15,150 |
| 23.—**Bishop Stortford.** For water supply purposes (Mr. M. K. North) ... ... ... | 1,650 |
| 23.—**Campden.** For works of water supply (Mr. R. G. Hetherington) ... ... ... ... | 200 |
| 23.—**Clacton.** For works of paving (Major J. Stewart) ... ... ... ... ... ... | 2,210 |
| 23.—**Harrogate.** For cemetery and public bath purposes (Mr. F. H. Tulloch) ... ... | 8,335 |
| 23.—**Hythe.** For road extension purposes (Mr. Edgar Dudley) ... ... ... ... ... | 390 |
| 23.—**Macclesfield.** For water supply purposes (Mr. P. M. Crosthwaite) ... ... ... | 1,700 |
| 23.—**Margate.** For the provision of a refuse destructor (Mr. H. Shelford Bidwell) ... | 13,218 |
| 23.—**Tunbridge Wells.** For electricity and water supply purposes (Mr. T. C. Ekin) ... | 21,090 |
| 24.—**Bridge.** For works of sewerage (Mr. H. Shelford Bidwell) ... ... ... ... | 1,000 |
| 24.—**Croydon.** For street purposes and the provision of a fire station (Mr. Edgar Dudley) ... ... ... ... ... ... | 2,850 |
| 24.—**Dartford.** For electricity purposes (Mr. T. C. Ekin) ... ... ... ... ... | 10,000 |
| 24.—**Saffron Walden.** For sewerage purposes (Mr. M. K. North) ... ... ... ... | 2,500 |
| 24.—**Todmorden.** For private street works (Mr. F. H. Tulloch) ... ... ... ... ... | 5,604 |
| 24.—**Warrington.** For the provision of a pumping plant and a recreation ground (Mr. W. O. E. Meade-King) ... ... ... | 7,772 |
| 24.—**Warwick.** For works of sewerage (Mr. R. G. Hetherington) ... ... ... ... | 324 |
| 24.—**Wimbledon.** For street and baths purposes (Mr. R. H. Bicknell) ... ... ... | 3,750 |
| 25.—**Darfield.** For the provision of a cemetery (Mr. F. H. Tulloch) ... ... ... | 1,780 |
| 25.—**Erith.** For electricity purposes (Mr. T. C. Ekin) ... ... ... ... ... ... | 11,971 |
| 25.—**Helmsley.** For works of water supply (Mr. A. G. Drury) ... ... ... ... ... | 1,794 |
| 25.—**Stretford.** For private street improvement purposes (Mr. W. O. E. Meade-King) ... ... ... ... ... ... | — |
| 25.—**Stroud.** For the provision of a refuse destructor and sewage disposal purposes (Mr. R. G. Hetherington) ... ... ... | 10,000 |
| 26.—**East Barnet Valley.** For private street works (Mr. M. K. North) ... ... ... | 3,380 |
| 26.—**Leek.** For the purposes of the gasworks (Mr. W. O. E. Meade-King) ... ... | 1,550 |
| 26.—**Sutton-in-Ashfield.** For private street works (Mr. F. H. Tulloch) ... ... ... | 2,001 |
| 26.—**Walthamstow.** For electricity purposes (Mr. T. C. Ekin)... ... ... ... ... | 25,624 |

**Akonia for French Roads.**—The Automobile Club de France (which corresponds in France to the Royal Automobile Club of Great Britain) have decided to have the course for the next great automobile race on the Dieppe circuit, which is to take place on June 24th next, treated throughout with Akonia. The circuit, which forms practically an equilateral triangle extending from Dieppe to Eu, Eu to Londinières, and Londinières to Dieppe, covers a distance of over 50 miles. Akonia, Limited, have not only to supply the Akonia required, but also to carry out the treatment itself. The work has to be done in two days, and will necessitate the assistance of over 100 roadmen. Akonia has been adopted in preference to tar on this occasion owing mainly to the fact that it is not injurious to the drivers' eyes, and does not make the road slippery.

# Municipal Work in Progress and Projected.

*The Editor invites the co-operation of* Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Barnsley £6,300, Cannock £6,000, Finchley £1,630, Norfolk £6,300, Swansea £5,000; housing and town planning—Featherstone £33,000; refuse collection and disposal—Bexhill, Hanwell; roads and materials —Essex £12,410, Leith; sewerage and sewage disposal —Dunfermline £100,000, Liversedge £17,150, Preston £5,300, Repton £6,000, Swansea £15,000, York £21,000.— Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

## ADMINISTRATION.

**Greenwich B.C.**—It has been agreed that no man between the ages of twenty-five and fifty-five years employed in the highways department, whether temporarily or permanently, should be paid a less rate of wages than 4s. 3d. per day.

## BUILDINGS.

**Barnsley T.C.**—It has been decided to proceed with the extension of the baths scheme, at an estimated cost of £6,300, exclusive of the cost of the land (£2,725).

**Cannock U.D.C.**—It has been decided to provide, at a cost of £6,000, an isolation hospital to contain twenty beds.

**Derry C.C.**—A new courthouse is to be provided at Limavady, at a cost of £2,000.

**Finchley U.D.C.**—The estimate of the surveyor, Mr. C. J. Jenkin, at £1,630, has been approved for a public convenience at Tally Ho! Corner.

**Gosport U.D.C.**—The tender of Messrs. Lear & Son, of Gosport, at £5,944, has been accepted for a new school in Stone-lane.

**Hanwell U.D.C.**—The surveyor, Mr. S. W. J. Barnes, has been instructed to prepare plans showing the whole scheme of the proposed open-air swimming bath, including keeper's lodge and convenience for both sexes, apart from those provided in connection with the bath itself.

**Keith T.C.**—The tender of Mr. W. Cruickshank, at £755, has been accepted for widening and strengthening the bridge over the Isla between Keith and Fife-Keith.

**Louth T.C.**—A scheme for public baths is to be submitted by the General Purposes Committee.

**Motherwell T.C.**—It has been referred to the Sanitary Committee to inquire and report on the question of providing a public swimming pond and baths.

**Norfolk C.C.**—Plans have been completed for the New Magdalen Bridge, which it is proposed to erect at an estimated cost of £5,600, and a bridge is to be built at Saxthorpe Ford, at an estimated cost of £700.

**Paisley T.C.**—Plans for the extension of the municipal buildings have been prepared by Mr. James Lee, burgh master of works. The plans show that the addition is to take place on the north side of the buildings. The frontage will be a continuance of the existing style of architecture, and the estimated cost is £2,300.

**Portsmouth T.C.**—Two new shelters are to be erected on the Esplanade at Southsea, at a cost of £200.

**Swansea R.D.C.**—It is proposed to erect a bridge at Penllergaer, at an estimated cost of £5,000.

**Weybridge U.D.C.**—The council have approved the plan of the proposed additions to the bathing-place, and instructed the surveyor, Mr. J. S. Crawshaw, to obtain estimates for carrying out the work.

## HOUSING AND TOWN PLANNING.

**East Elloe R.D.C.**—Land has been purchased at Gedney Drove End, at the price of £80 an acre, and it has been decided to erect eight cottages thereon in pairs.

**Farnham (Surrey) U.D.C.**—Mr. Kempson, at the last council meeting, took exception to a recommendation by the Sanitary Committee that the designs for the proposed additional twenty workmen's dwellings should be entrusted to the surveyor, Mr. R. W. Cass. He said the preparation of plans for such buildings offered a good opportunity for skill and design, and he did not think the opportunity should be limited to one man, however competent he might be. He moved an amendment that the local architects be also allowed to submit designs, and this was adopted.

**Featherstone U.D.C.**—The council have passed the plans for a proposed housing scheme, and will ask the Local Government Board to hold an inquiry at an early date. It is proposed to build 159 houses, in blocks of not more than eight, at Purston. The estimated cost is £33,000.

**Hendon U.D.C.**—The Local Government Board have declined to sanction the council's scheme for the erection of fifty artisans' dwellings at Child's Hill. The plans provided for cottages of five rooms to be let at 8s. 6d. per week. The board state that, in their opinion, cottages of a more commodious type could be erected and let from 7s. to 7s. 6d. a week. The council have adopted the suggestions of the board and amended the plans accordingly.

## PARKS AND OPEN SPACES.

**Chesterfield T.C.**—Alderman G. A. Eastwood has made a gift to the council, on behalf of the public, of Hasland House and the adjoining 15 acres of land for a public park.

## REFUSE COLLECTION AND DISPOSAL.

**Bexhill T.C.**—A sub-committee has been appointed to consider and report upon the advisability of the adoption by the council of some method of collection of house refuse other than that at present in operation.

**Burnham (Somerset) U.D.C.**—The surveyor, Mr. W. H. Chowns, in his annual report, points out that the question of the destruction of the town refuse will shortly have to be faced by the council.

**Hanwell U.D.C.**—The surveyor, Mr. S. W. J. Barnes, estimates the cost of a two-cell refuse destructor at £3,500. The quantity of refuse collected last year was 2,600 tons, and the cost of barging it away was £357. The approximate annual cost of the destructor would be £457 for repayment of loan and labour, repairs, insurance, &c. The gross cost of destroying 2,600 tons of refuse would be 3s. 6d. per ton, and the nett cost after allowing for the value of clinker worked out at £364, as against £357 for barging away the same quantity. Should the cost of the erection of the destructor not exceed £3,000, the nett cost would be £326 instead of £364. The Works Committee point out that an increased quantity of refuse destroyed would not increase the capital charges, as two cells would be capable of doing more than 2,600 tons per year, and that until the limit of the power of the cells was reached, the price per ton destroyed would gradually be reduced. The council have adopted the surveyor's estimate and the report of the Works Committee.

## ROADS AND MATERIALS.

**Argyllshire C.C.**—It is stated that the following grants have been made by the Road Board: Lorn, grant of £2,500, with loan of £800; Mid Argyll, grant of £1,000, with loan of £600; Kintyre, grant of £1,000, with loan of £600; Cowal, grant of £500.

**Bexhill T.C.**—The borough surveyor, Mr. G. Ball, has been instructed to submit estimates of cost of making up Station-road from Buckhurst-place to Belle-hill, with a view to application being made for sanction to a loan to carry out the work.

**Cardiganshire C.C.**—A report of Colonel Crompton and Mr. H. P. Maybury upon the main roads was laid before the Southern Main Roads Committee at the meeting last week, and arising therefrom a discussion took place upon the desirability of purchasing a petrol lorry to haul stones, and it was resolved to recommend to the county council that a lorry be purchased. The other most important matter in the report was that relating to the improvement of the Aberayron and New Quay roads. A committee was appointed to consider the whole report jointly with a committee appointed by the Northern Division.

**Cheadle and Catley U.D.C.**—The tender of the Taroads Syndicate has been accepted for tar-spraying to March 31, 1913.

**Chesterfield T.C.**—Alderman Markham has presented the council with 4¼ acres of land, between Spital-lane and the Great Central Railway, for the purpose of laying out a first thoroughfare from Hasland main road to Spital.

**Cockermouth R.D.C.**—The Barrowdale Parish Council has urged this council and the county council to press on with the widening of the second section of the famous coaching road from Keswick to Honister Pass. The scheme is estimated to cost £10,000.

**Dartford U.D.C.**—The tender of Messrs. A. C. W. Hobman & Co., of South Bermondsey, at £287, has been accepted for tar-paving works at Hesketh Park.

**Essex C.C.**—The resurfacing of the main road from Epping to Wantz-corner is to be carried out at a cost of £12,410, the Road Board's contribution being £5,527.

**Exmouth U.D.C.**—It has been agreed to carry out a diversion of the Cliff-path up to Foxholes-road, and improve a section of Foxholes-road, at a cost of £135.

**Farnham (Surrey) U.D.C.**—Some discussion took place at the last meeting upon a recommendation by the Public Works Committee that a tender by the surveyor, Mr. R. W. Cass, of £370 for the making up of Searle-road, a private street, should be accepted. Six tenders had been received. That of the surveyor was the lowest, and the two next lowest were £375 and £375 14s. 6d. Mr. Kempson asked if the surveyor's tender included any sum for his services. Mr. Mitchell: Yes, 15 per cent. Mr. Kempson: That is about £60. The surveyor: It is 10 per cent. Mr. Mardon: Against that there is the wear and tear of our plant. The surveyor stated that if labour were available there would be no difficulty in his doing the work, but Mr. Mardon pointed out that Mr. Cass had just now plenty to do without making up roads, and moved that the next lowest tender be accepted. Mr. Figg seconded, and asked what was the good of contractors tendering if the surveyor was to be allowed to compete against them. Mr. Aldridge was of opinion that the surveyor ought not to be allowed to tender. Mr. Barnard, chairman of the committee, said it was not the first time that the council had accepted tenders from the surveyor. Mr. Roumieu remarked that by accepting the surveyor's tender they would place Mr. Cass in the anomalous position of having to pass his own work. The council decided to accept the tender of the Farnham Road Preservation Company of £375 for the work.

**Galashiels T.C.**—Concreting of footpaths is to be carried out at a cost of £376.

**Hinckley U.D.C.**—The council are again treating their roads with Akonia this season.

**King's Lynn T.C.**—The Streets Committee recommend that the improvement on the Highgate side of the East Gates Bridge should be carried out at a cost of £395, and that the tender of Mr. William A. Bardell for the work should be accepted.

**Leamington T.C.**—The surveyor, Mr. W. De Normanville, has reported at length on various improved systems of road making. "Ordinary water-bound macadam," he said, "will undoubtedly in a few years be a method of the past, as the greater durability of the new system, and the absence of watering and scavenging will effect a saving on maintenance which will more than balance the extra prime cost of construction or repair." He recommended for the repair of the Kenilworth-road a coating of Leicestershire granite grouted with a patent binding, largely used by the Northamptonshire County Council.

**Leith T.C.**—In a report by the burgh surveyor it is proposed that the Seafield-road should be paved with granite setts on a good under-bed of concrete, the cost being estimated at about £5,300. Regarding the proposed tramway extension on that road, he reports that, in addition to the cost of paving, a further sum of £4,800 would be required to remodel and re-down rails and to lay the route for a double track. Should only a single track and suitable passing places the additional cost would be £2,975. The matter remains in the hands of a committee.

**Lowestoft T.C.**—A sum of nearly £900 is to be spent upon paving work in three roads.

**Newport (Salop) U.D.C.**—Plans prepared by the surveyor, Mr. P. Darroch, for the widening of Station-road, Wellington-road, Salter's-lane, and Lower-bar have been approved.

**Nuneaton U.D.C.**—Akonia is again being used by the council for dust prevention.

**Paddington B.C.**—The Works Committee have been instructed to consider the renewal of the paving of Bishop's-road.—Referring to what was termed the nuisance caused by motors in Bishop's-road, Councillor Waycott suggested that tracks of asphalt should be laid in roads where there was heavy motor traffic. They could easily try the experiment in Bishop's-road at once.—The estimate of £3,400 for reconstruction of the Ranelagh-road footbridge has been approved for inclusion in the next annual estimates.

**Perth C.C.**—The annual report of the surveyor on the roads was submitted at a meeting last week along with an estimate of the expenditure for this year, which amounted to £8,071, as compared with £8,038 last year.

**Tralee R.D.C.**—A road to Castlemaine is to be constructed at a cost of £156.

**Troon T.C.**—A scheme has been prepared for the continuation of the South Esplanade round to the Ballast Bank, at an estimated cost of £2,000. Works for the prevention of floods are also under consideration. The Duke of Portland has offered to pay half the cost of both schemes.

**Wimborne and Cranborne (Dorset) R.D.C.**—The surveyor, Mr. R. T. Seymour, reports that the past winter was the most destructive to roads of any he has known during the thirty-four years he has been the council's surveyor. Although, he says, the owners of heavy traction engines were written to begging them not to send their engines on the roads for a few days when the frosts were giving out very little notice was taken of the request. One firm sent a traction engine and trucks from Poole to Colehill and thence to outlying parts of the rural district, ploughing up the roads as it went. The driver, apparently losing his way, had to go over the same ground again, which unnecessarily added greatly to the damage. Altogether on the main and district roads quite £100 in damage was done to the surface crust of the roads by the engine in the two days it was going and returning in one journey, and the surveyor said he was afraid the council could not recover any of this except the small cost of repairing a stone gutter and drain at Handley.

## SEWERAGE AND SEWAGE DISPOSAL.

**Barnsley T.C.**—Councillor England, at the council meeting on Tuesday last, referred to the completion of the new sewage works, which, he said, reflected great credit on the borough engineer (Mr. J. H. Taylor), who had introduced features into the scheme which were not included in other schemes in the North. The works now covered nearly 130 acres, and had cost in all £83,000.

**Dunfermline T.C.**—The tender of Mr. Andrew Blair, of Dunfermline, at £20,812, has been accepted for No. 1 contract in connection with the laying of the main travelling sewer from the city to the Firth of Forth. The total amount of the contracts is £100,000.

**Liversedge U.D.C.**—The proposed extensions to the sewage works at The Bottoms, Heckmondwike, the estimated cost being £17,150, have been sanctioned by the Local Government Board, no amendment whatsoever having been suggested by the board. All the plans have been prepared by the engineer and surveyor, Mr. A. Rothera, M.Inst.M.C.E.

**Lynton (Devon) U.D.C.**—The surveyor, Mr. Walter Yeo, has been instructed to take observations during the coming season in the subject of the complaints of the pollution of the foreshore, and to make a full report at the end of the summer.

**Pontardawe R.D.C.**—Sewerage works to cost £5,985 are under the consideration of the council.

**Preston R.D.C.**—A modified scheme of sewerage for Penwortham has been submitted by Messrs. Myers, Veeves & Myers, engineers, and this has been approved. The estimated cost of the works is £5,300.

**Repton R.D.C.**—The plans and estimates of Messrs. Lofty Stone, Son & Lindley, of Derby, for the sewage scheme have been adopted, and forwarded to the Local Government Board. The estimated cost is £6,000.

**St. Mellons R.D.C.**—The tender of Messrs. R. Pomeroy & Co., of Cardiff, at £4,100, has been accepted for sewerage works at Rumney.

**Swansea R.D.C.**—Among large works under consideration by the council are the drainage of Fforestfach, to cost from £15,000 to £20,000, and an outfall sewer at Gowerton.

**Uckfield (Sussex) R.D.C.**—Referring to the council's request that the Local Government Board should receive a deputation with regard to the Waldron drainage scheme, a letter has been received from the board stating that apparently the council's object was to obtain an expression of opinion as to the merits of various schemes. It was a matter for the council first to decide which of the schemes they would adopt, and the board could not undertake to advise them in the matter. Under the circumstances they were not prepared to receive a deputation. If the present scheme was to be abandoned the council should adopt an alternative scheme and submit it for the sanction of the board in the ordinary way, and an inquiry would be held in due course.

**Uppingham (Rutland) R.D.C.**—The sanitary surveyor, Mr. G. Dolphin, has prepared two plans for dealing with the sewage at houses on the north-end of the Ayston-road. The population was eighty-seven, which, with twenty-four employed at a laundry, made a total of 111 persons. He computed that about 5,000 gallons of sewage went into the river daily, without any filtration whatever. The scheme of conveying the sewage to the sewage works would probably cost from £900 to £1,000. An alternative scheme would probably involve an outlay of £250 to £300. They would not want above an acre of ground at the present time to work the smaller scheme. The matter has been referred to the Uppingham Committee for consideration.

**Wenlock U.D.C.**—The tender of Messrs. M. S. Boswell & Co., of Wolverhampton, at £4,932, has been accepted for a sewerage scheme.

**York T.C.**—The Sewerage Committee have accepted the tender of Mr. Bell, of Manchester, at £21,000, for the construction of new septic tanks at Naburn sewage farm, and that of Messrs. Ward & Tetley, Nottingham, at £10,000, for the extension of the pumping station at Fulford.

## WATER, GAS, AND ELECTRICITY.

**Bideford T.C.**—The report and estimates of Mr. Baldwin Latham in reference to the proposed augmentation of the water supply by the Biberry scheme have been adopted. The estimates show that the sum of £19,300 will be required for the work. Of this sum £1,750 will be borrowed for repayment in forty years at 3¾ per cent; £500 for machinery, borrowed for fifteen years at 3½ per cent; and £17,050 borrowed for thirty years at 3½ per cent.

**Chelmsford R.D.C.**—The tender of Messrs. G. Porter & Co., of Hackney, at £149, has been accepted for the extension of water mains at Ingatestone.

**Kirkcaldy T.C.**—The tender of Messrs. Willans & Robinson, at £8,396, has been accepted for the provision of turbine plant for the electricity station.

**Okehampton R.D.C.**—It is proposed to cover the North Towton reservoir, at an estimated cost of £690.

**Shepshed (Leicester) U.D.C.**—A new tank and holder have been installed at the gasworks, at a cost of nearly £700.

**Wallasey T.C.**—The council have under consideration a scheme for utilising the tides of the river Mersey in order to generate electrical energy for the purpose of working the hydraulic lift at the Seacombe Ferry luggage stage, and illuminating the promenade. The project involves the erection of a high water wheel in the space between the luggage stage and the shore to operate the generating plant.

**Wombwell U.D.C.**—A gasholder is to be constructed at an estimated cost of £4,000.

## MISCELLANEOUS.

**Hanwell U.D.C.** The Works Committee have been authorised to prepare a scheme for a steam disinfecting apparatus, to be worked in connection with the proposed new refuse destructor.

**Manchester T.C.**—The revenue of the tramways undertaking for last year amounted to above £800,000. A meeting of the Tramways Committee was held on Tuesday last, when it was decided to place £85,000 to the relief of the city rates. A similar sum went to the relief of the rates last year.

**Rochdale T.C.**—The nett surplus on the year's working of the tramways is £6,486, against £1,944, and after deducting £582, the amount spent last year beyond the borrowing powers, there remains a balance of £5,904, which the committee propose to place to the depreciation fund. This year's report is by far the most satisfactory the committee have ever issued.

## PERSONAL.

Mr. T. de Courcy Meade, city surveyor of Manchester, has been elected a member of the Concrete Institute.

Mr. George Sheppard, late borough surveyor of Newark, has been voted a sum of 100 guineas, and appointed consulting surveyor.

Mr. C. H. Waithman, surveyor to the Newmarket Urban District Council, has been appointed surveyor to the Cleethorpes Urban District Council.

Mr. A. A. Pattison, borough surveyor of Newcastle-under-Lyme, has had his salary increased by £25 per annum, and Mr. W. A. Clowes, assistant surveyor, has had his salary increased by £10 per annum.

Mr. H. Ditcham is resigning the position of borough surveyor of Harwich after thirty-nine years' service, and the corporation have appointed him consulting surveyor, at a salary of £52 per annum, as from June 5th next.

Mr. R. O. Wynne-Roberts, whose appointment as consulting engineer for the important water scheme for Regina we recently announced, has also been retained as consulting engineer to report on the water supply of Watrous, Saskatchewan.

Mr. H. C. Fread, surveyor to the Esher and the Dittons Urban District Council, has been appointed, together with the vice-chairman (Mr. C. Martineau) and two members of the council, to represent that body at the forthcoming National Housing and Town Planning Conference in London.

Mr. Harry Jackson, civil engineer, of Birmingham, has been awarded the first premium for his scheme for the Carbridge drainage scheme. The scheme provides for the sewerage of the district, and for sewage disposal works. Mr. Jackson has been requested to meet the committee.

Mr. Hector F. Gullan, superintendent of works, Belfast, has been transferred from the class of associate member to that of member of the Institution of Civil Engineers. For eleven years Mr. Gullan has been chief of the Belfast Public Works Department, during which period he has been responsible for the execution of numerous large municipal undertakings directly carried out by the corporation, and involving an expenditure of upwards of £1,300,000. He contributed to the Brussels International Road Congress in 1910 a paper on "Choice of Surfacing Materials in the Construction and Maintenance of Streets in Large Towns," and last year read before the Irish Road Congress a paper on "The Use of Mechanical Tests to Determine the Relative Value of Various Stone for Road Construction and Maintenance." He has patented a process for the utilisation of waste heat and power from a refuse destructor in the manufacture of tar-macadam. After serving his articles with Mr. T. Harnett Harrisson, M.Inst.C.E., consulting engineer, Liverpool, Mr. Gullan was for eight years assistant to Mr. Harry Footner, chief maintenance engineer of the London and North-Western Railway, but relinquished that post on his appointment as constructional railway engineer to the Chinese Government. He returned home during the Boxer outbreak in 1900.

Mr. Charles Boulnois, whose death at St. Leonards-on-Sea on Friday was reported in *The Times*, was a brother of Mr. H. Percy Boulnois, M.Inst.C.E., who has thus within the last few years suffered the loss of three brothers. The late Mr. Charles Boulnois, who was interred at St. Leonards on Tuesday, was in his eighty-first year, was a barrister-at-law of the Middle Temple, and was formerly Judge of the Punjab Chief Court. He retired in 1877, and in 1878 was published his work of minute research, "Notes on the Customary Law of the Punjab," in the writing of which he collaborated with the late Sir William Rattigan. It prepared the way for Sir William's invaluable standard "Digest" of the same subject, which has gone through many editions. Mr. Boulnois was afterwards appointed Reporter of Indian Appeals to the Privy Council for the Indian Law Reports, and continued the work until about eleven years ago. He married, in 1864, Emmeline, eldest daughter of the late Mr. Joseph Goodeve, Master in Equity in the Bengal Supreme Court. In *The Times'* obituary notice it is stated that he had a family of two daughters, but this is an error, as he had, in addition, two sons, distinguished respectively in the Navy and Army. The deep sympathy of an unusually wide circle of friends will be felt for Mr. H. Percy Boulnois on his latest bereavement.

## FOR OTHER ADVERTISEMENTS

See End of Paper.

### BUSHEY URBAN DISTRICT COUNCIL.

ASSISTANT SURVEYOR.

The above Council invite applications for a properly qualified Assistant in the Surveyor's Department, at a commencing salary of £80, rising by annual increments of £20 to £120 per annum.

Applicants must be neat and expeditious Draughtsmen and accurate Surveyors and Levellers.

Preference will be given to candidates who have been trained in the general routine work of an Urban District or Borough Surveyor's Office.

Applications, in the handwriting of the candidates, accompanied by copies of not more than three testimonials, and endorsed "Assistant Surveyor," must reach me by 30th April, 1912.

Canvassing, directly or indirectly, will be a disqualification.

The Assistant appointed will be required to devote the whole of his time to the duties and to reside in the district.

(By order)
JOHN WILSON,
Clerk.

Council Offices, Bushey.
April 17, 1912.

### EAST AND WEST MOLESEY URBAN DISTRICT COUNCIL.

SURVEYOR'S CLERK AND ASSISTANT.

The above Council invite applications for the appointment of Clerk and Assistant in their Surveyor's Office. Age not exceeding 28 years.

Applicants must be neat, expeditious, and accurate draughtsmen, typist, well versed in, and had previous experience in the routine work of a Municipal Surveyor's Office.

Salary £70, rising by annual increments of £5 to £100 per annum.

Engagement terminable by a month's notice.

Applications, stating age, previous experience, accompanied by three recent testimonials, and endorsed "Surveyor's Assistant," to be delivered on or before 1 o'clock p.m. on the 27th instant.

Canvassing will be a disqualification.

D. CANN,
Clerk of the Council.

Council Offices,
East Molesey.
April 17, 1912.

WANTED, a Temporary Assistant, at a salary of £2 10s. per week, rising by annual increments of 5s. to a maximum of £3 per week. Candidates must have had good experience of drain and sewer work, and be able to level and prepare sketches or plans and sections.

Applications, in the handwriting of the candidates, stating age, past and present employment, and accompanied by copies of not more than three recent testimonials, to be addressed to Box No. 1,150, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

WANTED at once, a Clerk of Works for a Bridge.

Must have had experience in Ferro-concrete Construction on the Hennebique system. Salary £3 per week. Apply by letter only to

A. AINSWORTH HUNT,
County Architect,
51 Abbeygate-street,
Bury St. Edmunds.

### THINGOE RURAL DISTRICT COUNCIL.

Tenders are invited for the Supply of Granite for the year ending 31st March, 1913.

Particulars and Forms of Tender may be obtained on application to the undersigned.

A. R. CAMERON.

Board Room,
Mill-road,
Bury St. Edmunds.
April 6, 1912.

WANTED urgently, for FRANCE, a Surveyor, with knowledge of architectural work, to take charge of the development of an estate. Must be fluent French linguist.—Apply, with references, stating age, and salary required, to Box 1,151, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

### EARBY URBAN DISTRICT COUNCIL.

The Council invite applications for the position of Assistant in the Surveyor's Office, at a salary of 25s. per week.

Applicants must be neat and expeditious Draughtsmen and accurate Surveyors and Levellers.

Preference will be given to candidates who have had experience in the preparation of plans and apportionments, and in the carrying out of works, in the making up of streets under the Private Street Works Act, 1892.

Applications, stating age and experience, accompanied by copies only of not more than three recent testimonials, and endorsed "Assistant," must be sent to me on or before May 3rd, 1912.

Canvassing members of the Council, either directly or indirectly, will be a disqualification.

JAS. E. ALDERSLEY,
Engineer and Surveyor.

Council Offices, Earby.
April 17, 1912.

### DUNMOW RURAL DISTRICT COUNCIL.

The above-named Council invite Tenders for the Supply of Broken Granite, to be delivered free during June, July and August, as under:—

Felstead Station (G.E.R.).
200 tons 2-in. gauge.
75 tons 1½-in. gauge.
25 tons ¾-in. chippings.
300

Dunmow Station (G.E.R.).
300 tons 2-in. gauge.
550 tons 1½-in. gauge.
25 tons ¾-in. chippings.
875

Tenders, with samples, should reach me not later than the 26th inst.

A. E. FLOYD,
Clerk.

Dunmow, Essex.
April 12, 1912.

### METROPOLITAN BOROUGH OF WANDSWORTH.

DISUSED ROLLING STOCK.

Tenders are invited for the Purchase of 12 Water Vans; capacity about 400 gallons each.

The vehicles can be seen at Clapham Depot, 374a Wandsworth-road, Clapham, S.W., any day between the hours of 9 a.m. and 4 p.m. (Saturdays 9 a.m. to 1 p.m.).

Form of Tender can be obtained on application here any time during office hours.

Tenders, on the prescribed form, to be sent to the undersigned not later than 12 noon on Monday, April 29th next.

The Council does not bind itself to accept the highest or any Tender.

P. DODD, M.Inst.C.E.,
Borough Engineer.

215 Balham High-road, London, S.W.
April 17, 1912.

### BOROUGH OF MALDON, ESSEX.

The Council are prepared to receive Tenders for the Supply of the under-mentioned:—

Granite.
Flints.
Hire of Steam Roller and Scarifier.

Specification and Form of Tender may be obtained on application at my office.

Tenders, sealed and endorsed "Tender for Supplies," must be delivered to me not later than Thursday, the 2nd May, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

THOS. R. SWALES, M.Inst.E.E.I.,
Borough Surveyor.

Municipal Offices,
Maldon, Essex.
April 17, 1912.

# The Ideal Home Exhibition.

## NOTES ON THE EXHIBITS.

The Ideal Home Exhibition was opened at Olympia, Kensington, W., on Friday last, by the Duke and Duchess of Teck. The exhibition is a comprehensive and essentially a full one, every available inch of floor space in main hall, gallery and annexes being covered. It is divided, so far as the main hall is concerned, into seven sections, devoted respectively to furniture, hygiene and cleaning, music and recreation, sanitation and ventilation, construction and decoration, heating and lighting, and food and cookery. The number of exhibits here is 182, and the sections radiate—somewhat, on plan, in the form of a Union Jack—from the "Ideal House," which stands centrally as the hub of the wheel. The metaphors are somewhat confusing, it must be allowed, but blame must be laid upon the official announcement for their use. With many of these sections, and with those in the gallery and annexes, our readers will have no concern. We cannot refrain, however, from just a comment upon the "Babyland" section, where a hundred or less babies of all colours, races and ages disport themselves in a kind of arena to the languid interest of the visitors. What on earth such a variegated display of infantine life has to do with the ideal home it is difficult to conceive; indeed, experience would teach one that the introduction of vari- and parti-coloured children into the home would have a tendency the reverse of ideal. Awkward questions would be asked, and the joint presentation of a black or a yellow and a white product would be a severe strain upon the amiability of the husband.

The "Ideal House" was, we understand, fashioned from a design selected from some 700 plans—our sympathy goes out to the 699 unlucky competitors—sent in for the *Daily Mail* Ideal Homes Competition, and was awarded premier place by the assessors, who were Mr. E. C. P. Monson and Mr. Edwin J. Sadgrove (both nominated by the president of the Society of Architects), and Mrs. F. S. Stoop, of Byfleet, Mrs. Foster, of Byfleet, and Mr. W. G. Tarrant, of Byfleet, all nominated by the directors of the *Daily Mail*. Our knowledge of Byfleet is limited, so perhaps we may be hasty in wondering why this unimportant place should have been selected by the directors as the hub of architectural genius in this country. We could have understood one assessor from Byfleet, and one from, say, Slapton Sands in Devonshire, and another from some other equally important artistic centre; but it *is* puzzling to reconcile the selection of three-fifths of the assessors from the one little town. Possibly the 699 unsuccessful competitors have already muttered a word or two in private on the selection. The design is the work of Mr. Reginald C. Fry, and the builders are prepared "to reproduce the house from the original designs on a reasonable site for the sum of £1,100 anywhere within twenty miles of Charing Cross." We should like a definition of "reasonable site" before passing an opinion on the price, and we note that the sum "provides for fittings and details such as stoves, ranges, heaters, &c., suitable to a house of its character, but does not cover the special fittings . . . which are in the nature of independent exhibits."

The general arrangement of the exhibition is good. The division into distinct sections—not in catalogue alone, but on plan—facilitates selection, and many a visitor will be enabled in half an hour to see all that he wants. Thus, if his interest lies in heating and lighting only, he can turn to the left on entering from Addison-road Station—the main entrance—and by devoting his attention to one triangular section see all that he wants without having to walk down avenues of exhibits which he does not want to see. It is the same with the other sections, and four of those in the main hall will about satisfy the visiting surveyor, architect, or engineer. For the womenfolk—and to a lesser degree for the children—all is of interest, and a pleasant day might have been spent had seating accommodation been provided. There are a few seats near the bandstand in the gallery, and many ladies—especially those who have been able to sport half-a-crown for one of the "higher-class" days—spread themselves unconcernedly upon the furniture which is provided by the exhibitors. There is, too, the "Palm Lounge," where easy chairs have been provided by Messrs. H. J. Searle & Co., Limited, but the accommodation here is quite limited. Even the refreshment bars are without a stool. There may be method in the omission, however, for to encourage visitors to remain all day would mean unpleasant crowding in the busy hours. Too, the tea and dining room contractors must be considered, and many will be driven to their tables simply for the purpose of having a rest. We think, however, that some concern should be had for the comfort of visitors, even though the "gate" might suffer.

Four of the sections we have enumerated will appeal to our readers, and we propose to follow the lines upon which we noticed the recent Building Exhibition at Manchester. Here we gave first a brief note, specifying the more important firms exhibiting in the various sections, concluding with special notices of exhibits which we considered would prove of the highest interest to our readers. The sections we select now are the hygiene and cleaning, sanitation and ventilation, construction and decoration, and heating and lighting.

### HYGIENE AND CLEANING.

Perhaps the most notable exhibits under this section are the vacuum cleaners, which are shown in large variety. The British Vacuum Cleaner Company, Limited, of Parson's Green-lane, S.W. (Stand 34), were, we believe, the originators of the system, and they exhibit both hand and electric models, the former of which range upwards from an extraordinarily low price. Other firms in this line are the Imperial Electric Company, of 26 Rosebery-avenue, E.C. (Stand 46), who show "the smallest and most powerful portable cleaner ever manufactured"; the Wizard Dust Extractor Company, Limited, of Frankfort-street, Birmingham (Stand 47), with specialities in portable hand and electric vacuum cleaners, including one to work from the ordinary electric lamp; Daisy Vacuum Cleaners, of Royal London House, Finsbury, E.C. (Stand 51); and the Harvey Pneumatic Cleaners Company, Limited, of 15 Newgate-street, E.C. (Stand 55), who, in addition to their modern implements, present an exhibit of cleaning machines made by them as far back as 1893.

Disinfectant preparations are represented by the Sanitas Company, Limited, of Locksley-street, Limehouse, E. (Stand 37), who exhibit a selection of their well-known fluids, oils, powders, soaps, distempers, polishes, fumigants, drain testers, spraying machines, and deodorants. The number of the wares of this firm is legion, and visitors will gather some idea of this fact from a glance round the stand. It would be superfluous to expatiate upon preparations which have been tested in a hundred thousand households and by local, hospital and other authorities all over the world. "Kerol" disinfectants are exhibited (stand 48) in a somewhat novel manner, actual "scenes"—garden, kitchen and stable—being laid out for the depiction of the uses to which the various products of the firm may be applied. "Kerol" disinfectant is a non-poisonous, non-irritant fluid (for which are claimed great stability and penetrating power), highly useful for the disinfection of drains. The "Kerol" sanitary powder forms a powerful deodoriser for sprinkling dustbins and garbage heaps generally. It might well be used on the many public "shoots" which disfigure the face of the country in so many parts. Among exhibits falling under the head of "cleaning" may be mentioned "Gospo," prepared by the firm of that name at 33 Waterloo-road, S.E. (Stand 35), an antiseptic cleansing powder for marble, tile and mosaic floors and other purposes; and "Zog" (Stand 40), the paint cleaner which is going far towards the coining of another active verb in the language. Two exhibits which seem singularly out of place in this section are that of Mr. George J. Hutchings, of 116 Blackfriars-road, S.E. (Stand 44), who shows his well-bottom steam cookers, and that of Messrs. James Stott & Co., of 158 Queen Victoria-street, E.C. (Stand 59), where are shown the "Stott" mercurial gas governor, 300,000 of which are said to be in use, with an annual saving in gas consumption of 500,000,000 cub. ft.

### SANITATION AND VENTILATION SECTION.

Many firms which will be known to our readers are showing in this section, and the various exhibits are distinctly good. Sanitary fittings are represented by, among other firms, Messrs. H. Pontifex & Sons, Limited, of Shoe-lane, E.C., whose splendid array of

model bath-rooms deserves the special notice which is given below, and is also accorded to the gas geyser exhibits of Messrs. Ewart & Son, Limited, of 346 Euston-road, N.W., and to the lavatory and bath-room accessories shown by Messrs. O'Brien, Thomas & Co. (in association with Messrs. Yates, Heywood & Co.), of Upper Thames-street, E.C. Stoves and ranges are well to the fore, and readers should not omit a visit to the stands of the firms of whose exhibits we now briefly treat.

Taking catalogue order, we come first to that of Messrs. Frank Staines & Co., Limited, of 88 Victoria-street, S.W. (Stands 107-110), where an "Ideal" kitchen, replete with every requirement, is fitted up, and where demonstrations of gas and electric cooking are given. Messrs. Cornes & Haighton, of 240 High Holborn, W.C. (Stand 112), exhibit their now well-known "Model Cottage Combination," a description of which would make tedious reading, as no exhibition of recent years has been complete without the fitting. It has been installed in municipal housing schemes and garden cities throughout the country, and its satisfactory emergence from these numberless tests speaks volumes for it. At Stand 114 is to be seen the "Lion" range of Messrs. McDowall, Steven & Co., Limited, of 4 Upper Thames-street, E.C., with its "improved" raising fire and new design of boiler flue, which cannot become choked with ashes. Their "white-flame" fire is a new type of fire on the under-fed principle, the gases from the coal being thoroughly consumed and a bright fire maintained at all times. Messrs. Wilmer & Sons, of 11-14 Bury-street, E.C., show, at Stands 118 and 166, selections of their patent "Bend" grates, interiors and mantel registers. They are introducing a new range, which is shown in action, and the main features of which are slow combustion and smoke prevention. Special interest attaches to one of the "Bond" fires, which is shown in action fitted with a tubular boiler at the back for heating radiators, utilising by this means what would otherwise be waste heat.

Reference will be made later to the system of warming by central heating of Messrs. J. F. Phillips & Son, Limited, of Queen Anne's Chambers, Westminster, at whose stands, Nos. 98 to 101, a pavilion has been erected from the design of Mr. Robert Atkinson, A.R.I.B.A. Stand 112A contains examples of the principal portable types of ozone generators, made by the Ozonair Company, Limited, of 96 Victoria-street, S.W., and used in the production of absolutely pure ozone. As our readers will know, the appliances of this company are used on the Central London Railway, and in numberless important public and other buildings.

Three other exhibits may be referred to before passing to the next section, although we must confess again that at least two of them would appear to have been wrongly placed. Water Softeners, Limited, of 91 Queen Victoria-street, E.C., show at Stand 102 their apparatus for softening water for domestic and other uses without the aid of lime, soda, or other chemicals, and without the use of mechanical gear or settling tanks. By means of filtration through "Permutit," the softened water is, it is claimed, obtained by "a simple and automatic process." Electric service and passenger lifts—the latter being available for conveying visitors from the main hall to the gallery—form the exhibit of Messrs. Hammond & Champness, of Alfreton-street, S.E. (Stand 103). The passenger lift is fitted with alternative methods of control—*viz.*, car switch and automatic push buttons. Among the other exhibits are one hand-power "Self-sustaining" invalid and service or dinner lifts, and a hand-power "Cabinet" lift, which requires no enclosures on the upper floor. Specimens of the "Modern Building Record," the handsome publication, now in its third year, published by Messrs. Charles Jones, Limited, of Cursitor-street, E.C., may be seen at Stand 105. The aim of the publication is to afford a reliable and thoroughly independent guide to British architecture of the day, by means of illustrated descriptions of representative examples of modern buildings of every description. Why the exhibit should fall under the head of "Sanitation and Ventilation" it is difficult to conceive, and it would surely have been better placed in that dealing with construction.

CONSTRUCTION AND DECORATION.

A number of well-known firms is showing in this section, and some of these will be treated quite briefly here with a view to a special notice later. "Hall's Distemper" water paint is represented by Messrs. Sissons Brothers & Co., Limited, of Hull (Stand 119), who exhibit two rooms decorated with this material. Messrs. Thos. Parsons & Sons, of Endell-street, W.C. (Stands 127 and 128), have on show various materials for use in the artistic and hygienic decoration of the house, including "Endelline" and "Endelflat" enamels, "Trans-ol" friezes and "Opak" lead-free, non-poisonous undercoating paint. The exhibit of the Silicate Paint Company, of Charlton, S.E. (Stand 124), consists of a Renaissance building, the exterior of which is painted with "Charlton White" non-poisonous zinc paint and Charlton enamel, and the interior (ceilings, cornices and walls) with water paint "Duresco." The inside woodwork is treated the same as the exterior of the building. Messrs. Randall Brothers, of Sherwood House, Piccadilly, W. (Stand 125), exhibit "Paripan" in its various forms with glossy or dull finish. A specimen of motor-car painting with the material also is shown, and the result is an exceptional finish and brilliance of colour. Anyone acquainted with the time and labour involved in coach work will appreciate the saving effected by the use of a material such as Paripan. Wall papers are represented in this section by one firm only—Messrs. Arthur Sanderson & Sons, Limited, of 52 Berners-street, W. (Stand 121)—and they show also specimens of "Gilmour" doors, which are guaranteed not to twist, warp or open at the joints. Worthy of special notice is the "Smooth both sides" door. Mention may be made here of the hinges of the Guildecor Hinge Company, Limited, of 29 Newman-street, W. (Stand 120), which, while regulating the action of the door, require neither floor plate nor overhead attachment. An exhibit of considerable interest is that of Messrs. Thos. Lawrence & Sons, of Bracknell, Berks (Stand 131), consisting of a selection of bricks and tiles. The trade marks of the firm, "T.L.B." and "W.K." are "household words" among architects and builders. Reference will be made later to this exhibit, as also to that of the Coatostone Decoration Company, of 77 Mortimer-street, W. (Stand 133), and to Stands 136 and 137, where are shown a number of beautiful models made by Mr. John B. Thorp, of 98 Gray's Inn-road, W.C.

HEATING AND LIGHTING.

The exhibits in this section—and it forms the most important at the exhibition from the standpoint of the engineer, surveyor and architect—may be divided roughly into three classes: Stoves and ranges, lighting plants, and heating apparatus. We have already noted one or two firms exhibiting in the first class, and it would have been better had these been placed in this section and not in that of "Sanitation and Ventilation." We quite fail to see how the ordinary stove or range comes under either of those designations.

Taking stoves and ranges, we have first the exhibit of Mr. Thos. Potterton, of Ravenswood-road, Balham, S.W. (Stand 139), comprising cooking and water-heating apparatus, using both gas and coal fuel. His "Queen" kitchener, for example, can be at once converted from a coal-burning fire to a gas-heated cooking appliance. The South Metropolitan Gas Company give, at Stands 142, 143 and 155, demonstrations of the efficiency of incandescent gas lighting and gas heating and cooking. The well-known "Devon" fireplaces of Devon Fireplaces, Candy & Co., Limited, of 87 Newman-street, W., are to be seen at Stand 144, in every variety of setting; at Stand 150 the Teale Fireplace Company, of 28 Berners-street, W., show examples of their fireplaces of the sunk and other types; and at Stand 160 Messrs. Bratt, Colbran & Co., of 10 Mortimer-street, W., exhibit both their "Heaped Fire" and their patent "Heaped" gas fire, the latter being interchangeable for either coal or gas. From among the exhibits of cooking ranges, the following are selected as specially worthy of inspection: The Coalbrookdale Co., Limited, of 1 Berners-street, W. (Stand 157), who show "K.B." and "Thrift" ranges, both excellent types; the Eagle Range and Gas Stove Company, Limited, of 127 Regent-street, W. (Stands 158 and 159); Messrs. Smith & Wellstood, Limited, of 11 Ludgate-circus, E.C. (Stand 162), with their "Wellstood" and "Sovereign" ranges, and "Esse" anthracite stoves; the Falkirk Iron Company, of Craven House, Kingsway, W.C. (Stand 163), who also show their system of heating small houses from the one fire; the Interoven Stove Company, Limited, of 78A Great Queen-street, W.C. (Stand 167), with their combined sitting-room stove and cooking range; and Messrs. R. & A. Main, Limited, of Angel-road, Edmonton, N. (Stand 168), with a selection of gas cooking and heating appliances.

Space does not allow of more than a "catalogue"

mention here of the firms exhibiting lighting plants, but it may be said that not one of these exhibits should be missed. They are: The British and Colonial Lighting Company, Limited, of 216 Tottenham Court-road, W.C. ("Simpitrol" petrol air-gas plants for lighting, cooking and heating); Messrs. Strode & Co., of 48 Osnaburgh-street, N.W. (electric and petrol air-gas lighting systems, and accessories for domestic engineering); the Allen-Liversidge Portable Acetylene Company, Limited, of 106 Victoria-street, S.W.; the Allen Company, of the same address (acetylene plants for country house lighting); Messrs. Duncan, Watson & Co., 62 Berners-street, W. (electric lighting plant for country houses, cottages and bungalows); Edmundson's Electricity Corporation, Limited, of Broad Sanctuary Chambers, Westminster (automatic electric lighting plants for country houses, churches, institutions, farms, and so on); Messrs. R. A. Lister & Co., Limited, of Dursley ("Lister-Bruston" automatic electric lighting and generating plants); the County Light, Limited, St. Stephen's House, Westminster (the "County" weight-driven petrol air-gas plant); and the Dowsing Radiant Heat Company, Limited, of 105 Great Portland-street, W. (electric appliances for home use, including heaters, cookers and motors).

In the heating class mention may be made of the exhibits of Messrs. Messenger & Co., Limited, of Loughborough (Stand 164), with their "Quorn" and "Loughborough" cast-iron boilers for heating dwelling-houses and glass-houses, and the "Meseta" independent boiler for domestic and bath services; and Messrs. John Wright & Co., of 19 Queen Victoria-street, E.C. (Stand 170), who show the "Calefactor" gas-heated hot-water apparatus for the economical supply of domestic and other requirements. The Foster Engineering Company, of Wimbledon, S.W., exhibit, at Stand 145, their "Foster" metal lamps and gas governors, the latter preventing waste of gas due to excessive pressure. They should be worth the attention of surveyors having street lighting systems to control.

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We come now to a few notes of a more extended nature on some of the most important of the exhibits in the sections dealt with.

### H. PONTIFEX & SONS, LIMITED,
Shoe-lane, London, E.C.
(Stands 89 to 93.)

This exhibit comprises six model bath-rooms—complete with lavatory basin and water-closet—which may be fitted at prices varying from £9 to £80. Among the specimens of fittings are porcelain enamelled baths, glass spray screens, spray and shower fittings, towel airers, mirrors, marble and earthenware lavatories, and valve, syphonic and low-down closet combinations. Specially noticeable is the white marble and silver plate lavatory in Adams design with mirror *en suite* over. Features of the exhibit are a really *silent* waste-preventing cistern, which is made in iron, porcelain, enamelled iron, porcelain ware, and fireclay, and a water-closet supported on corbels and specially designed for hospital use, no part of the apparatus touching the floor.

### O'BRIEN, THOMAS & CO.
(In Association with Yates, Haywood & Co.),
17-18 Upper Thames-street, E.C., and
15 Berners-street, W.
(Stand 111.)

At the stand of this well-known firm are to be seen examples of the latest models in porcelain-enamelled baths, together with lavatory and water-closet suites in marble, fireclay and earthenware. We would direct special attention to the very handsome porcelain-enamelled plunge, spray and shower bath with glass screen, nickel-plated fittings, and combined standing waste and overflow at side. The exhibit is, it may be added, fitted with a "Lasco" anthracite heating stove.

### J. F. PHILLIPS & SON, LIMITED,
Queen Anne's Chambers, Westminster, S.W.
(Stands 98 to 101.)

The central heating pavilion of this firm, already referred to above, contains interesting examples of warming by central heating, showing that such an adjunct to comfort and convenience can be economically and artistically adapted to any building irrespective of size. The installations are actually working, and although the fires are in operation there are no chimneys in the entire building, which has been designed also with a view to showing the unobtrusive possibilities of modern heating. "The main motive," says the official description, "is a large doorway in a recessed bay of Grecian character. The upper storey, treated as mezzanine, is much lower, and lit by a small window in each face of oblong proportions. Internally the four corners are occupied by apparatus which would, in an actual building, be located elsewhere. The building is warmed by hot-water radiators under the window-seats concealed by metal curtains, and alternately by a system of hot air. The main doors themselves are based upon the Late Georgian town-house doorway of London."

### EWART & SON, LIMITED,
346-350 Euston-road, London, N.W.
(Stand 117.)

Messrs. Ewart's exhibit is one of the most interesting with which we have to deal. The name of "Ewart" is a household one where gas geysers are concerned, and the visitor here has an excellent chance of inspecting and testing the capabilities of quite a representative range of these appliances. We must specially note the 46B "Califont," which delivers 10 gallons of hot water a minute, will give a bath in 4½ minutes, and is fitted with automatic control whereby the gas burns only when hot water is being run off; the "Radion" cylinder, with automatic valve to regulate the consumption of gas; the "Supreme" geyser, automatic also, and giving 2½ gallons of hot water a minute; the "Brilliant" geyser, yielding a gallon a minute, with real boiling water in twenty-five seconds; and the "Ever-ready" boiler for restaurant purposes.

### SISSONS BROS. & CO., LIMITED,
Hull, London and Liverpool.
(Stand 119.)

We have here "Hall's Distemper" exhibit, consisting of rooms decorated in "Hall's Distemper" water paint. The dining-room is decorated in the "Scottish Baronial" style, showing on the ceiling the characteristic ornament and design, while in the frieze depicting "Autumn" an artistic scheme is carried out in the colours and material of this distemper. The drawing-room has for its motif the "Peacock," and in the frieze a rich field of colouring is obtained, showing the great possibilities of the material in high-class decoration.

### MESSRS. ARTHUR SANDERSON & SONS, LIMITED,
52-55 Berners-street, London, W.
(Stand 121.)

This stand shows a room decorated in a simple manner as a background for pictures or rich materials. The samples displayed consist of the choicest silk flocks, chintz patterns, leathers and imitation silks. All the doors are of Gilmour construction, and can therefore, it is claimed, be guaranteed not to twist, warp, or open at the joints. Special attention is drawn to the "smooth both sides" door (which, in addition to its hygienic properties, gives a most artistic effect), and to the new Georgia yellow pine veneered doors, two of which are shown. There are few firms that can equal Messrs. Sanderson in artistic wall hangings, and their exhibit is always worth a careful inspection.

### SILICATE PAINT COMPANY,
Charlton, London, S.E.
(Stand 124.)

This exhibit consists of a simply-treated Renaissance building, the exterior of which is painted with "Charlton White" non-poisonous zinc paint and "Charlton" enamel. The interior is divided to show vestibule, hall, drawing-room, bedroom and bath-room, the ceilings, cornices and walls being decorated with the original water paint "Duresco" in various colours, and the woodwork throughout treated with "Charlton White" paint and "Charlton" enamel.

### RANDALL BROS.,
Sherwood House, Piccadilly-circus, W.
(Stand 125.)

This firm exhibit Paripan in its various forms with glossy or dull finish, and also a special preparation for the complete hygienic decoration of walls and ceilings in hospitals, schools and public institutions of all kinds. They claim that their new process of painting motor cars with Paripan secures a saving of time and labour and insures extraordinary elasticity and resistance to wear and an exceptional finish and

brilliance of colour. Certainly the specimen which we saw was equal to the highest class of coach work, although the labour involved in its execution must have been very small in comparison.

THOS. PARSONS & SONS,
8 Endell-street, Long Acre, W.C.
(Stands 127 and 128.)

H.M.S. "Endelline" is, apparently, out of commission at present, and we had no opportunity of inspecting its condition, although we have no doubt that its surfaces are as bright and glossy as ever and none the worse for wear during its trip to Manchester. The well-known manufactures of the firm are, however, exhibited here in other forms, and we noted their "Endelline" and "Endelflat" enamels, their "Transol" frieze, and their "Opak" lead-free, non-poisonous undercoating paint. There is little need to expatiate upon the wares of a firm that has acquired a reputation extending over a century.

THOMAS LAWRENCE & SONS.
Bracknell, Berks.
(Stand 131.)

Here we have a selection of facing bricks and house tiles in various colours exhibited upon a neatly-designed stand by Mr. Reginald C. Fry, one of the architects for the central feature of the exhibition, who has also employed this firm's bricks and tiles for the ideal house and for other work. Special attention is called to the variety of colour obtained in the patent sand-blasted roofing tiles, also the varied colourings of bricks which can be picked to almost any required shade or tint. Bricks and tiles made by this firm have been used during the last forty years, and their trade marks, "T.L.B." and "W.K.," have the highest repute.

FALKIRK IRON COMPANY,
Craven House, Kingsway, London, W.C.
(Stand 163.)

The examples of this firm's manufacture, specially applicable to domestic cooking and heating, include two examples of the "George" range; two Barker's generators, an excellent system of heating small houses, one fire thoroughly heating a villa at absolutely minimum cost; the "Era" anthracite stove in two sizes; the "Pelham" fire grate; and the very latest idea in a hot-air, controlled-combustion stove, ornate in design of Adams style. This stove will burn either ordinary coal, anthracite, or coke. There are also examples of the "Ajax" sanitary appliances.

MESSENGER & CO., LIMITED,
Loughborough, and 122 Victoria-street, S.W.
(Stand 164.)

This firm show cast-iron boilers of various types for heating dwelling-houses, glass-houses, &c., including the "Quorn" and the "Loughborough," an independent boiler (the "Meseta") for domestic hot-water supply and bath service, radiators, and all other materials necessary for complete hot-water heating installations.

COATOSTONE DECORATION COMPANY.
77 Mortimer-street, W.
(Stand 133.)

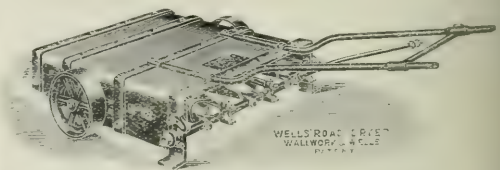
A most striking exhibit is that of the Coatostone Decoration Company, where are to be seen specimens of the "Coatostone" composition, which gives the effect of natural stone when applied to plaster, cement, wood and other surfaces. All tints may be obtained, and every kind of stone simulated. Walls can be lined out to resemble blocks of stone with mason's joints by the use of a bricklayer's jointer before they are dry. This will give an indented line, and the joints can be painted in flat colours to any tint required by means of a lining fitch; or the lines can be painted on the surface of "Coatostone." Old cement stucco or terra-cotta fronts can be successfully treated with "Coatostone" and made to resemble stone. When so treated they are difficult to detect from a stone building, thus enhancing not only the appearance but the value of the building. "Coatostone" is quick drying, possesses artistic, effective and lasting qualities, and when dry gives a surface as hard as natural stone. Samples of work executed in "Nealstone"—an ideal composition for interior work—and of "Aquastone"—a preparation for coating new and old cement work, and for renovating stone work or rough cast—are also to be seen at this very interesting stand. Visitors to the stand should ask for full particulars of the materials and a list of important works that have been carried out with their aid.

In conclusion, particular attention may be drawn to two distinctive items. The first is the exhibit of architectural models, prepared by Mr. John B. Thorp, of 98 Gray's Inn-road, whose name has on more than one occasion come prominently before our readers. The exhibit is numbered Stands 136 and 137, and is referred to in the catalogue (p. 49) as "Architects' Models." The models are executed on a scale of 4 ft. to 1 in., and are beautiful specimens of Mr. Thorp's artistic work. Not only are the various materials of construction faithfully represented, but gardens, paths, and other outside adjuncts are cunningly woven out of a variety of materials. The other exhibit, although having nothing of an engineering character about it, will be of interest to many of our readers. We refer to that of "Blick" Typewriters, of 9 and 10 Cheapside, E.C. (Stand 57), where are to be seen the handy little machines which, while costing from a quarter to less than one half the price of other machines—which are controlled, one would almost think, by some mysterious combine—are in every way as satisfactory for everyday requirements. They are fully equipped with characters, and are first-class manifolders, taking, we understand, from ten to twelve copies at the one impression.

## ROAD HEATING AND DRYING APPARATUS.

The machine illustrated below is arranged with two, three, or four of the well-known "Wells' Light" burners, using ordinary petroleum oil. These are carried upon a strong frame under a double-cased hood or shield, and mounted upon broad wheels, so that the apparatus can be easily moved about. The burners are arranged to swivel, and can be used horizontally or at an angle, so that the heat plays upon the ground. The whole is of the simplest construction, it is strong and well made, and is already giving great satisfaction where in use.

The machine is invaluable for drying road metal previous to the application of tar, bitumen, or asphalt preparations, as well as for drying the bed of a road



when cutting out and repairing patches, and for warming asphalted roads before applying a surface coating.

When patching asphalt with the use of the Wells' heater, it is not necessary to cut out all the old material. The method of operating is to place the heater over the space to be repaired, and in a short time the entire surface under the hood is softened. The top crust can then be removed with a hoe, only sufficient of the old being taken off to secure a clean, fresh surface. Fresh mixture is then applied, with the result that the old and the new become homogeneous, and the material is then raked, tamped and rolled to the required surface, being as perfect as the original work. The process is applicable alike to the repair of openings, cracks, depressions, and the resurfacing of an entire road.

The manufacturers of the apparatus are Messrs. A. C. Wells & Co., of 102-104 Midland-road, St. Pancras, London, and Carnarvon-street, Cheetham, Manchester.

**Public Health Law.**—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangement well suited for easy reference.—*The Law Times.*

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By Sydney G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President*—Mr. Albert D. Greatorex, M.Inst.C.E., Borough Engineer and Surveyor of West Bromwich.

### FORTHCOMING MEETINGS.

The following meetings have been arranged:—

April 27th.—Council meeting.
May 4th.—Exmouth.
May 11th.—Nuneaton.
May 24th—29th.—Paris.
June 1st.—Council meeting.
June 7th—8th.—Stirling.
June 15th.—East Ham.
June 22nd.—Lowestoft.
June 29th.—Bridlington.
July 6th.—Stourbridge.
July 11th—13th.—Annual meeting, London.

Provincial members who propose to take part in the visit to Paris will, in cases where the journey exceeds a distance of 30 miles, be able to obtain return tickets to London at a single fare and a quarter.

Thomas Cole,
11 Victoria-street, S.W. *Secretary.*

## ROYAL SANITARY INSTITUTE.

### MEETING AT BLACKPOOL.

On May 24th next, at Blackpool Town Hall, discussions will take place on "The Card Index System as applied to Public Health Work," to be opened by E. W. Rees-Jones, M.D., D.P.H., M.O.H., and on "A Description of the Joint Scheme of Sewerage for Thornton-le-Fylde, Bispham-with-Norbreck, and Carleton," by Arthur Hindle, Assoc.M.Inst.C.E. On Saturday, May 25th, visits will be arranged to the new promenades, the new main sewerage works for Thornton-le-Fylde, Bispham-with-Norbreck, and Carleton, and the new main drainage works of the Fleetwood Urban District Council.

## ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

### ACTON AND CHISWICK JOINT MEETING.

By permission of the Acton and Chiswick Urban District Councils the members will have the privilege of visiting the sewage disposal works of those authorities to-morrow (Saturday).

Description of Acton Works: Electrically-driven centrifugal pumps with automatic control raising the sewage into gauging chamber leading to London County Council's sewers; automatic recording instruments for recording the sewage flow; storm-water filter-beds, &c.

Mr. F. Sadler, surveyor to the Acton Council, has promised a short descriptive paper.

Description of Chiswick Works: Gas engine-driven centrifugal pumps; chemical treatment with lime and alumino-ferric, settling tanks, sludge presses and bacterial filters on the contact principle; Horsfall refuse destructor, clinker crusher and screen, artificial stone plant, clinker tar-macadam plant.

Programme.

2.30 p.m.—Assemble at Turnham Green Station, District Railway. Brakes will be in attendance to convey the party to the Acton sewage works and afterwards to the Chiswick works. After inspecting the works, &c., members are invited to return to the town hall, where tea is being provided.

Jas. Craig,
*Hon. Secretary, Metropolitan District.*

**Danger of Petrol in Sewers.**—Paddington Borough Council are calling special attention to the great danger occasioned to the lives of the men employed in sewers by petrol being thrown or escaping into drains. They strongly urge upon all inhabitants, whether using petrol for cleaning or motive purposes, the necessity of taking such steps as will prevent any quantity, however small, finding its way into the drains.

## CARDIFF'S WATER SUPPLY.

### ADDRESS BY MR. C. H. PRIESTLEY.

At a meeting of the Royal Sanitary Institute last Friday evening, at Cardiff, Mr. C. H. Priestley, M.Inst.C.E., the city water engineer, submitted a paper dealing with the development of the undertaking in his charge. Describing the Taff Fawr works, he said that when the third reservoir in that scheme was completed Cardiff would have a total storage in its reservoirs of over 2,200 million gallons, sufficient for a population of considerably over 300,000 persons, allowing for a full and unrestricted use. The wisdom of going so far afield as the Taff Fawr Valley for the Cardiff water supply had, he thought, been amply demonstrated, especially when he mentioned that there was a further site in the valley for another large reservoir, whenever that might become necessary, and a sufficient rainfall during the wet season to fill all the reservoirs.

Among those who took part in the discussion which followed Mr. Priestley's address were Mr. W. Harpur, the city engineer of Cardiff, and Mr. T. F. Harvey, joint engineer with Sir Alexander Binnie of the new waterworks for Merthyr.

## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned* (*No.* 1359 *Holborn*), *subject to later confirmation by letter.*

ROAD FOREMAN.—April 22nd.—Leyland Urban District Council.—Mr. J. J. Johnson, clerk.

CLERK OF WORKS.—April 23rd.—Chingford Urban District Council.—Mr. L. C. Bowen, clerk.

WASTE WATER INSPECTOR.—April 23rd.—Corporation of Workington. £80—£100 per annum.—Mr. John Warwick, town clerk.

CLERK OF WORKS.—April 24th.—Goole Urban District Council. 50s. per week.—Mr. R. Tyson, clerk.

CLERK OF WORKS.—April 25th.—Bandon Town Commissioners. £2 per week.—Mr. J. Coghlan, town clerk.

INSPECTOR OF NUISANCES.—April 26th.—Chesterfield Rural District Council. £120—£140.—Mr. R. F. Hartwright, clerk.

ROAD FOREMAN.—April 27th.—Inverness Town Council. 35s. per week.—Mr. T. H. Scott, burgh surveyor.

INSPECTOR OF NUISANCES.—April 29th.—Sedgefield Rural District Council.—£110 per annum.—Mr. J. W. Lodge, clerk.

SEWAGE FARM FOREMAN.—April 29th.—Corporation of Bolton. 30s. per week, with house, coal, and light.—Mr. S. Parker, town clerk.

CLERK OF WORKS.—April 30th.—Corporation of Nelson.—£2 10s. per week.—Mr. J. H. Baldwick, town clerk.

BOROUGH SURVEYOR'S JUNIOR ASSISTANT.—May 1st.—Corporation of Stoke-on-Trent. £65 per annum.—Mr. A. Burton, borough engineer.

CONSULTING SANITARY ENGINEER.—May 2nd.—Flaxton Rural District Council.—The Clerk.

SUB-FOREMAN OF WORKS.—May 4th.—Corporation of Swindon. £2 per week.—Mr. R. Hilton, town clerk.

TRAMWAY TRACK FOREMAN.—Corporation of Newport (Mon.). £3 per week.—Mr. H. Tremelling, borough engineer.

## MUNICIPAL COMPETITIONS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned* (*No.* 1359 *Holborn*), *subject to later confirmation by letter.*

WOMBWELL.—May 1st.—Designs for public swimming bath, for the urban district council.—Prizes of £40, £30 and £20 are offered.—Mr. W. Quest, surveyor.

HALE.—June 28th.—Designs for a town planning scheme for the urban district council. Premiums of £50 and £25 are offered.—The Clerk.

## MUNICIPAL CONTRACTS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No.* 1359 *Holborn), subject to later confirmation by letter.*

### Buildings.

BEXLEY.—April 20th.—For the erection of a branch library, for the urban district council.—The Clerk.

OXFORD.—April 20th.—For additions to a school, for the County Education Committee.—Mr. S. Stallard, county surveyor, County Hall, Oxford.

MONMOUTH.—April 20th.—For the erection of a school, for the Education Committee.—Mr. C. Dauncey, secretary, County Council Offices, Newport.

KENT.—April 22nd.—For the erection of a stamping station for weights and measures, for the county council.—Mr. W. B. Prosser, clerk, Maidstone.

BRISTOL.—April 22nd.—For the erection of a shelter, for the corporation.—Mr. G. S. McKenzie, city engineer and surveyor.

NORTHUMBERLAND.—April 22nd.—For the erection of a school at Hazelrigg, for the Education Committee.—Mr. C. Williams, secretary, Moothall, Newcastle-upon-Tyne.

LEEDS.—April 23rd.—For alterations to the town hall, for the corporation.—Mr. R. E. Fox, town clerk.

MERTHYR TYDFIL.—April 23rd.—For removing slate roofs and substituting flat asphalt roofs, for the town council.—Borough Engineer.

LEEDS.—April 23rd.—For the construction of public conveniences, for the corporation.—Mr. W. T. Lancashire, city engineer.

GLASGOW.—April 23rd.—For the extension of the Whitevale depot, for the corporation.—Mr. John Lindsay, town clerk.

WEST RIDING.—April 23rd.—For alterations to police station, for the county council.—County Architect, County Hall, Wakefield.

NORTH RIDING.—April 23rd.—For alterations at a council school, for the county council.—Mr. J. C. Wrigley, secretary, County Hall, Northallerton.

BOOTLE.—April 24th.—For the erection of electric light station, for the corporation. — Mr. J. Henry Farmer, town clerk.

BOOTLE.—April 24th.—For the erection of brick chimney shaft, for the corporation.—Mr. J. Henry Farmer, town clerk.

ROCHDALE.—April 24th.—For the construction of an engine-room, for the corporation.—Mr. W. Henry Hickson, town clerk.

BEDFORDSHIRE.—April 24th.—For the erection of a school, for the county council.—The Clerk.

HARWICH.—April 24th.—For alterations to schools, for the Education Committee.—The Secretary.

KENT.—April 24th.—For rebuilding a bridge, for the county council.—Mr. Frederick W. Ruck, county architect.

ASHTON-UNDER-LYNE.—April 24th.—For alterations to electricity works, for the corporation.—Mr. John Neal, borough comptroller.

TEIGNMOUTH. — April 25th. — For additions to depot buildings, for the urban district council.—Mr. F. W. Knight, surveyor and water engineer.

NUNEATON. — April 26th. — For the erection of chapel, entrance lodge, and boundary walls at the cemetery, for the town council.—Mr. F. C. Cook, borough surveyor.

SOUTHGATE.—April 26th.—For the erection of sixteen workmen's dwellings, for the urban district council.—Mr. W. M. Ellenor, clerk, Palmer's Green, N.

EGHAM.—April 26th.—For the erection of discharge block and additions to receiving wards at isolation hospital, for the urban district council.—Mr. A. G. Hutchins, clerk, 50 High-street, Egham.

WEST RIDING.—April 26th.—For the erection of a school, for the Education Committee. — The Clerk, County Hall, Wakefield.

PORTSMOUTH. — April 26th. — For constructing stalls and messrooms, for the corporation. Borough Engineer.

WEST SUFFOLK.—April 27th.—For repairs and painting at police stations, for the Joint Committee. —Mr. A. A. Hunt, county architect, 51 Abbeygate-street, Bury St. Edmunds.

COVENTRY.—April 27th.—For the erection of three branch libraries, for the corporation. — Mr. J. E. Swindlehurst, city engineer and surveyor.

PONTYPOOL.—April 27th.—For the erection of 100 dwellings, for the urban district council.—Mr. H. H. Haden, clerk.

WIDNES.—April 29th.—For alterations at Farnworth Grammar School, for the Education Committee. —Mr. G. H. Danby, director and secretary, Town Hall, Widnes.

BRADFORD.—April 29th.—For the reconstruction of conveniences, for the Education Committee.—Director of Education, Town Hall.

THETFORD.—April 30th.—For the erection of fifty workmen's dwellings, for the urban district council.—Mr. J. Houchen, clerk.

ISLE OF WIGHT.—April 30th.—For the erection of a house at the county asylum, for the Committee of Visitors.—Mr. J. H. Green, clerk, Whitecroft.

WALLSEND.—April 30th.—For the erection of public conveniences, for the town council.—Mr. W. V. Mulcaster, town clerk.

LONDON.—April 30th.—For the erection of hostels and kitchen block at Eltham, for the county council.—Superintending Architect, 19 Charing Cross-road, W.C.

### Iron and Steel.

HORNSEY.—April 22nd.—For the erection of a boiler and slab-making machinery, for the borough council.—Mr. F. D. Askey, town clerk.

STIRLING.—April 22nd.—For laying cast-iron water pipes and constructing foundation for steel tank, for the county council.—Mr. Thomas Lupton, district clerk, 22 King-street, Stirling.

MANCHESTER.—April 22nd.—For supplying and fixing wrought-iron railings and gates, for the Education Committee.—Mr. Thomas Hudson, town clerk.

MOSSLEY.—April 26th.—For the supply of socket pipes and steel tubes with rigid sockets, for the gas department.—Mr. J. Taylor, engineer and manager.

SCUNTHORPE.—April 30th.—For the supply of spigot and socket pipes and specials, for the Joint Sewerage Board.—Mr. G. E. Davy, clerk, High-street, Scunthorpe.

ABERGAVENNY.—May 1st.—For the construction of spring and stream intakes, collecting, balancing and dividing chambers, laying pipes, and formation of service reservoir, for the corporation.—Mr. W. H. H. Hopwood, town clerk.

RICHMOND (Surrey).—May 7th.—For the supply of spigot and socket pipes and irregular castings, for the corporation.—Town Clerk.

ECCLES.—May 8th.—For fixing heating apparatus in school, for the corporation.—Mr. Edwin Parkes, town clerk.

BATTLE.—For a new pumping plant at the waterworks, for the urban district council.—The Clerk.

### Roads.

STANDISH-WITH-LANGTREE.—April 20th. — For laying 6,465 yds. of flags, for the urban district council. —Mr. J. H. Richards, clerk.

KETTERING.—April 20th.—For the supply of 800 yds. super. of concrete paving slabs, with kerb and channel, for the urban district council.—Mr. R. Smith, surveyor.

HOUGHTON-LE-SPRING. — April 20th. — For the supply of road materials, for the rural district council. —Mr. D. Balfour, surveyor.

WIGAN.—April 20th.—For the supply of paving materials, pitch and creosote, for the corporation.—Mr. W. H. Tyrer, town clerk.

HALE.—April 22nd.—For making up Nursery-avenue, for the urban district council.—Mr. J. G. Whyatt, clerk.

MARYLEBONE.—April 22nd.—For the supply of Fletton bricks and wood blocks, for the borough council.—Mr. James Wilson, town clerk.

ILFORD.—April 22nd.—For making up a road, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

BURGESS HILL.—April 22nd.—For the supply of broken granite, fine granite and flints, for the urban district council.—Mr. A. F. Hardwick, clerk.

RUSHDEN.—April 22nd.—For the supply of granite and slag, for the urban district council.—Mr. W. B. Madin, engineer and surveyor.

WALSALL.—April 22nd.—For the supply of granite setts, for the corporation.—Mr. J. R. Cooper, town clerk.

TOTTENHAM.—April 23rd.—For the improvement of St. Ann's-road, for the urban district council.—Mr. W. H. Prescott, engineer.

GATESHEAD.—April 23rd.—For work of macadamising, for the corporation.—Mr. N. P. Pattinson, borough engineer.

CLUTTON.—April 23rd.—For the construction of a footpath, for the rural district council.—Mr. J. S. Dury, Temple Cloud, near Bristol.

GOSFORTH.—April 23rd.—For making up a back street, for the urban district council.—Mr. G. Nelson, engineer and surveyor.

ELY.—April 24th.—For the supply of coarse clunch and coarse-screened gravel, for the rural district council.—Mr. E. B. Claxton, clerk.

LYTHAM.—April 24th.—For the supply of 5-ton motor roller and tar boiler, for the urban district council.—Mr. Chas. A. Myers, clerk.

BRIGHTON.—April 24th.—For the supply of flints and broken granite, for the corporation.—Mr. H. Talbot, town clerk.

WOODHALL SPA.—April 24th.—For the supply of granite, for the urban district council.—Mr. J. E. Chatterton, clerk, 4 Church-lane, Horncastle.

CARDIFF.—April 25th.—For making up eight streets, for the corporation.—Town Clerk.

HETTON-LE-HOLE.—April 25th.—For the supply of whinstone and slag, for the urban district council.—Mr. G. Young, clerk, William-street, Houghton-le-Spring, Durham.

SICCA.—April 25th.—For the carting of stone and gravel, for the rural district council.—Mr. Stanley C. Warden, clerk, Stratford-on-Avon.

OLDHAM.—April 25th.—For works of paving and flagging, for the corporation.—Borough Surveyor.

FAREHAM.—April 25th.—For the supply of granite, basalt, or other hard stone, for the urban district council.—Mr. Walter Butler, surveyor.

UXBRIDGE.—April 26th.—For laying down kerb, for the rural district council.—Mr. J. W. Harrison, engineer and surveyor.

BRIGHTON.—April 26th.—For laying wood and Lithofalt blocks, for the corporation.—Mr. H. Talbot, town clerk.

WALTON-LE-DALE.—April 29th.—For work of paving with granite cubes, for the urban district council.—Mr. J. Leigh, surveyor.

TAUNTON.—April 30th.—For the supply of 6,000 to 12,000 gallons of tar, for the corporation.—Mr. D. Edwards, borough surveyor.

GOOLE.—May 1st.—For making up a street, for the urban district council.—Mr. R. Tyson, clerk.

SIDMOUTH.—May 3rd.—For work of road widening, for the urban district council.—Mr. R. Lake, surveyor.

ROWLEY REGIS.—May 3rd.—For work of tar-spraying, for the urban district council.—Mr. D. Wright, clerk.

RICHMOND (Surrey).—May 3rd.—For making a new street, for the corporation.—Mr. J. H. Brierley, borough surveyor.

CRAMLINGTON.—May 4th.—For the supply of broken whinstone chippings and slag chippings, for the urban district council.—Mr. R. Nicholson, clerk, Morpeth.

PLOMESGATE (Suffolk).—May 6th.—For the supply of broken granite and flint, for the rural district council.—Mr. D. R. Read, clerk, Wickham Market.

HORSHAM.—May 6th.—For making up Victoria-road, Albany-road, and Princess-road, Crawley, for the rural district council.—Mr. W. Dengate, 58 Park-street, Horsham, surveyor.

BAILDON.—May 10th.—For the supply of broken granite and broken limestone, for the urban district council.—Mr. J. Bentley, clerk.

WIGAN.—May 10th.—For the supply of road materials, for the rural district council.—Mr. H. G. Ackerley, clerk, 6 Victoria Buildings.

### Sanitary.

WIGAN.—April 20th.—For the supply of stoneware sanitary pipes, bends, and junctions, for the town council.—Mr. W. Henry Tyrer, town clerk.

BACUP.—April 20th.—For work of sewerage, for the corporation.—Mr. J. Entwistle, town clerk.

DONCASTER.—April 20th.—For work of scavenging, for the rural district council.—Mr. H. M. Marshall, clerk.

NORTON.—April 23rd.—For emptying ashpits, for the rural district council.—Mr. J. E. Moulding, clerk, The Edge, Sheffield.

BRIGHTON.—April 23rd.—For the supply of drain pipes, for the corporation.—Mr. H. Talbot, town clerk.

SEVENOAKS.—April 24th.—For the construction of sewerage works at Edenbridge, for the rural district council.—Mr. F. H. Vibert, clerk.

TOTTINGTON.—April 24th.—For taking down existing closets and constructing water-closets, for the urban district council.—Mr. C. Kirkpatrick, clerk.

BARROW-IN-FURNESS.—April 26th.—For alterations to sanitary conveniences, for the corporation.—Borough Engineer.

BRIGHTON.—April 26th.—For the construction of sewers and other works, for the corporation.—Borough Surveyor.

DOWNPATRICK.—April 27th.—For the construction of a sewer, for the rural district council.—Mr. R. L. Morrow, clerk.

HASTINGS.—April 29th.—For laying pipe sewer, for the corporation.—Town Clerk.

RATHMINES.—April 29th.—For the construction of sewers, for the urban district council.—Chairman of the Public Health Committee.

MILTON REGIS.—April 29th.—For laying a sewer, for the urban district council.—Mr. W. R. Warlow, surveyor.

CAMBUSLANG.—April 29th.—For work of scavenging, for the Special Scavenging District.—Mr. J. T. T. Brown, clerk, 97 West Regent-street, Glasgow.

WORCESTER.—April 29th.—For alterations to disintegrating tanks and other works, for the corporation.—Mr. Thomas Caink, city engineer.

SCUNTHORPE.—April 30th.—For the construction of cast-iron and stoneware-pipe sewers, and pile driving, for the Joint Sewerage Board.—Mr. G. E. Davy, clerk, High-street, Scunthorpe.

DAVENTRY.—April 30th.—For the construction of sewers and sewage disposal works, for the rural district council.—Mr. J. D. Spearing, clerk.

STEWARTON.—May 3rd.—For the construction of sewage disposal works, for the corporation.—Mr. W. Macrae, town clerk, Royal Bank, Stewarton, Ayrshire.

TEDDINGTON.—May 15th.—For the erection of sewage disposal and refuse destructor works, for the urban district council.—Mr. G. H. Salmons, clerk.

MATLOCK.—The date for receiving tenders for the sewerage and sewage disposal works has been extended to April 29th.

### Stores.

PRESCOT.—April 20th.—For the supply of pipes, grids, manhole covers, gullies, Yorkshire flags, Yorkshire setts, macadam and Portland cement, for the urban district council.—Mr. Henry Cross, clerk.

DUNDEE.—April 22nd.—For the supply of materials, for the Gas Committee.—Mr. W. H. Blyth Martin, town clerk.

GLASGOW.—April 24th.—For the supply of jobbing and other works, and materials, for the corporation.—Mr. J. Lindsay, town clerk.

SOUTHAMPTON.—April 25th.—For the supply of articles for the Waterworks Department.—Town Clerk.

BOLTON.—April 25th.—For the supply of lubricating oils, cleaning waste, joint boxes, joiners' stores, motors, and transformers, for the Electricity Committee.—Chairman of the Electricity Committee.

NUNEATON.—April 29th.—For the supply of kerbs, iron castings, Portland cement, and petroleum, for the town council.—Borough Surveyor.

COLWYN BAY.—May 1st.—For the supply of cables, engine-room stores, and meters, for the urban district council.—Mr. J. Amphlett, clerk.

WALLASEY.—May 6th.—For the supply of requirements for the Ferries' Committee.—Mr. H. W. Cook, town clerk.

### Miscellaneous.

WILTS.—April 22nd.—For the supply or hire of motor cars, for the county council.—The clerk, County Offices, Trowbridge.

BRIGHTON.—April 26th.—For the supply of Portland cement, for the corporation.—Mr. H. Talbot, town clerk.

# TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

ATCHAM.—For the construction of sewage outfall works, for the rural district council.—Mr. H. Asher, surveyor :—

| | |
|---|---|
| W. Morlay & Sons, Worsley | £889 |
| T. Pace, Shrewsbury | 880 |
| G. P. Trentham, Birmingham | 834 |
| W. Higley, Salop | 722 |
| G. & W. Edwards, Shrewsbury | 719 |
| J. Price, Bayston-hill * | 698 |

Surveyor's estimate, £734.

BOLTON.—The following tenders have been accepted by the water-works committee of the corporation :—

Stanton Ironworks, Limited.—Cast-iron and special pipes.
R. E. Roberts.—Lead service pipes.
Glenfield & Kennedy.—Valves.
G. Taylor.—Stock cocks.
Escrs. of T. Carling.—Hydrants.
J. Booth & Sons.—Blacksmiths' work.
Fisher, Raworth & Co.—Ironmongery.
W. Kay.—Timber.
Ryder Brothers.—Special castings.
W. Priestley & Co.—Purple oxide, linseed oil, turpentine, white lead, and raw oil.

BILLERICAY.—For laying sewers, with manholes, flushing chambers and construction of sewage tanks, for the rural district council :—

Contract No. 1.

| | |
|---|---|
| W. J. Lingwood, Romford | £6,113 |
| J. Ford, Willesden Junction | 5,632 |
| W. Jackson, Forest-gate | 5,085 |
| W. G. Wilmott, Rushden | 4,895 |
| G. Bell & Sons, Limited, Tottenham | 4,856 |
| R. W. Sawker, Hounslow | 4,848 |
| Kemp Brothers, Rainham | 4,843 |
| H. W. Taylor, Chadwell Heath | 4,589 |
| Wilson, Border & Co., Romford | 4,572 |
| T. Wood & Son, Swanley | 4,549 |
| Hardy & Co., Woking | 4,416 |
| G. Porter, Hackney | 4,299 |
| G. Brown, Grays | 4,288 |
| W. & F. French, Buckhurst-hill* | 3,862 |

Contract No. 2.

| | |
|---|---|
| J. Ford, Willesden Junction | £4,687 |
| G. Bell & Sons, Limited, Tottenham | 4,034 |
| Kemp Brothers, Rainham | 3,856 |
| Hardy & Co., Woking | 3,606 |
| W. G. Wilmott, Rushden | 3,549 |
| W. & F. French, Buckhurst-hill* | 3,526 |

BOURNEMOUTH.—The following tenders have been accepted by the corporation :—

G. Rowe & Son, Limited, for the supply of three water-vans, £112.
Griffiths Brothers, Limited, for the extension of the bowling pavilions at Winton and Southbourne, £268.
G. Troke, for making up St. Valerie-road, £432.
G. Troke, for making up Evelyn-road (second portion) and Somerley-road (portion), £552.
G. Troke, for making up the passage at the rear of Richmond-terrace, £143.
M. Loader, for sewering Oakwood-road, £138.

BULKINGTON.—Recommended for acceptance for the supply of stone for the urban district council.—Mr. E. Cuthbert, surveyor :—

Hard stone.—A. & F. Manuelle, blue Guernsey hand-broken granite, prices according to place of delivery.
Tar-painting.—H. V. Smith & Co., London, ¾d. per sup. yard for the first coat, and ¾d. per sup. yard for the second coat.
Steam rolling.—Chittenden & Simmons, Limited, and T. Wood & Sons.
Local materials.—Chittenden & Simmons, Limited, H. J. Smith, Bensted & Son, J. Bevan, J. & B. Martin, T. Wood & Sons, Barnes & Sons, J. Foster, T. Haselden, J. Foster, E. & A. S. Crowhurst.

CANTERBURY.—For the supply of road materials.—Mr. A. C. Turley, city surveyor :—

Basalt.—Johnson Brothers, London : 2-in., 11s. 10d. per ton.
Welsh granite.—United Stone Firms, Limited, Bristol : 1½-in., 10s. 9½d. per ton ; 2-in., 11s. 3½d. per ton.
Guernsey.—Fry Brothers, Greenwich : 1½-in., 12s. 6d. ; 2-in., 12s. per ton.

CHERTSEY.—Tenders were received by the rural district council for the erection of twelve houses under the Housing of the Working Classes Act at Sandhills and Rosemary Lanes, Thorpe, as follows :—

| | |
|---|---|
| W. Beauchamp, Englefield-green | £2,220 |
| Drowley & Co., Woking | 2,187 |
| R. Love & Co., Sunninghill | 2,119 |
| W. G. Tarrant, Byfleet | 1,935 |
| J. Wallace, Beckenham | 1,944 |

The tender of Mr Tarrant was provisionally accepted, subject to the approval of the Local Government Board, and the clerk was directed to send full estimates of the cost of the upkeep, rents, repayments, and income from the houses to the Local Government Board.

EAST GRINSTEAD.—Accepted for the supply of granite, granite screenings, tarred granite macadam, hand-picked surface flints, Kentish ragstone and brick rubble, for the urban district council :—

London Granite Company.—660 c. yds. Quenast granite, 14s. 10d. ; 100 c. yds. Quenast granite screenings, 14s. 4d.
Tarred Granites, Limited, London.—200 tons tarred granite macadam, 24s. 8d.
Bristowe & Co., London.—100 tons tarred granite macadam, 19s. 2d.
Dalley & Co., Binegar.—20 c. yds. Mendip screenings, 11s. 1d.
Hudsons, Limited, Brighton.—240 c. yds. Kentish ragstone, 9s. 3d.
Hall & Co., East Grinstead.—160 c. yds. brick rubble, 3s. 8d.
W. Hillman & Son, Portslade-by-Sea.—145 c. yds. hand picked surface flints, 8s.
Fosters, Limited, East Grinstead.—Steam rolling, £1 5s. 6d. per day.

FAVERSHAM.—For the supply of road materials, for the rural district council.—Mr. J. D. Chittenden, district surveyor :—

| Guernsey Granite. | s. d. | s. d. | s. d. | s. d. | s. d. | |
|---|---|---|---|---|---|---|
| A. & F. Manuelle, London * | 11 1 | 10 11 | 10 11 | 12 5 | per ton. | |
| Griffiths & Co., London | 11 10 | 12 0 | 11 8 | 13 3 | .. | |
| Mowlem & Co., London | 11 6 | 10 0 | 11 3 | 13 3 | .. | |
| Brooks, Limited, London | 12 0 | 11 6 | 12 3 | 14 3 | .. | |
| Chambers Brothers, Faversham | 11 7 | 10 11 | 11 6 | 13 7½ | .. | |

GRIMSBY.—For the construction of 12-in. sewer in Carr-lane, for the corporation.—Mr. H. G. Whyatt, borough engineer and surveyor :—

| | |
|---|---|
| Hewins & Goodhand, Grimsby | £630 |
| Thompson Brothers, Grimsby | 624 |
| W. Gilbert, Grimsby | 583 |
| Swaby & Walsham, Grimsby | 573 |
| Borrill & Cheesman, Grimsby | 572 |
| H. Marrows, Grimsby | 568 |
| Wilkinson & Houghton, Cleethorpes* | 554 |

GRIMSBY.—For taking down and refixing old iron railing and providing and fixing new iron railing 8-ft. high at the new cemetery, for the corporation.—Mr. H. G. Whyatt, borough engineer and surveyor :

| | |
|---|---|
| J. R. Mitchell & Co, Grimsby | £839 |
| Hill & Smith, Brierley-hill | 657 |
| J. Couper & Co., London | 635 |
| J. Ellwell, Limited, Birmingham | 633 |
| C. & C. Wright, Grimsby | 563 |
| M. Marshall, Grimsby* | 483 |

GRIMSBY.—Accepted for annual supplies for the ensuing municipal year—*viz.*, 1st April, 1912, to 31st March, 1913.—Mr. H. G. Whyatt, borough engineer and surveyor :—

Highways Materials.

Chalk.—J. R. Mitchell & Co., Limited, Grimsby.
Northumberland Whinstone.—British Macadams, Limited, Gravesend.
Slag.—Z. G. Yewdall, Winteringham.
Artificial flags.—Dawber, Townsley & Co., Ltd., Grimsby.
Yorkshire flags, kerbs, &c.—S. Marshall & Sons, Limited, Halifax.
Granite setts.—Croft Granite, Brick & Concrete Co., Limited, Leicester.
Granite kerbs and channel.—J. McKelvie & Co., Newcastle-on-Tyne.
Pitch.—Kempson & Co., Limited, Alfreton.
Coal gas tar.—Great Grimsby Gas Company, Grimsby.
Lias lime.—N. Blow & Co., Grimsby.
Portland cement.—G. & T. Earle, Limited, Hull.
Drainage pipes, &c.—Dawber, Townsley & Co., Limited, Grimsby.

Miscellaneous.

Brushes.—J. Duke, Limited, Grimsby.
Drysalteries, &c.—R. C. Johnson, Grimsby.
Lubricating oils.—Lincolnshire Asbestos and Rubber Company, Grimsby.
Oils (except lubricating).—Leeds Oil and Grease Company, Leeds.
Paints.—Middleton Brothers, London.
Plumbing.—J. R. Cole, Grimsby.
Ironmongery, J. Duke, Limited, Grimsby.

Disinfectants.

Bottles and Corks.—M. Cook, Grimsby.
Carbolic acid.—Burt, Bolton & Heywood, Limited, London and Grimsby.
Carbolised oil.—M. Cook, Grimsby.
Disinfectant fluid.—Newton, Chambers & Co., Limited, Thorncliffe.
Disinfectant powder.—Fletcher, Brothers & Co., Grimsby.
Formalin.—Fletcher, Brothers & Co., Grimsby.
Formalin tabloids.—R. C. Johnson, Grimsby.
$SO_2$ tubes.—Fletcher Brothers & Co., Grimsby.

HAMPTON WICK.—Mr. J. Downes' tender, being the lowest, for team labour and scavenging for the year, has been accepted by the urban district council :—

The terms were :—8s. a day for the horsing and driving of water-vans, 8s. a day for the supp'y of men, horses and carts for scavenging, and £150 for the weekly collection and disposal of refuse.

RELMSLEY.—Accepted for materials and works, for the rural council :—

Shovels, spades and tools.—I. R. Trenam and J. Atkinson.
Stone and slag.—C. Bradley, and Craddock, Allison & Co.

HEREFORD.—The following tenders have been accepted by the corporation for the year ending 25th March, 1913, *viz.* :—

South Staffordshire Blue Brick Company.—Kerbs 4s. 9d. and 6s. 3d. per dozen, and gutter bricks 46s. per thousand.
J. Woodward, Limited.—Gullies, 6s. 9½d., 9s. 1½d. and 11s. 7½d. each ; pipes, 7d., 10d., 1s. 6½d. and 2s. 5½d. per yard ; bends, 4s. 1d. and 6s. 1½d. each ; taper pipes, 9½d., 1s. 2d., 1s. 11½d. each ; junctions, 3s. 3½d., 5s. 5½d. and 8s. 1½d. each.
Saxon Portland Cement Company.—Cement £1 9s. 2d. per ton.
Nayler & Co., Limited.—Gullies 15s. 3d. each ; galvanised pans, 43s. each.
Harding Brothers, Limited.—Brushes for elevator, 11s. 9d. per dozen ; brushes for revolver, 25s. per set ; scavenger brushes (large), 16s. 6d. per dozen.
C. F. Jennings.—Scavenger brushes (small), 11s. per dozen ; handles for small scavenger brushes, 1s. 8d. per dozen.
Harding Brothers, Limited.—Whitewash brushes, 1s. 7d. each ; tar brushes, 11d. each.
Seal Brothers.—Dandy brushes, 6¾d. each.
J. C. Vaughan.—Varnish paint £2 7s. 6d., Torbay paint in oils, £15 9s.
Harding Brothers, Limited.—Carson's anti-corrosive paint in powder, £9 14s. 2d.

ISLE OF WIGHT.—Accepted for the erection of cottage and out-buildings, for the county council :—

E. I. & O. A. Hayles, Godshill, £337.

ITCHEN.—For kerbing and channelling, for the urban district council :

F. Osman & Co., Southampton, £2,412.

MIDDLESEX.—For the erection of twelve additional cottages at Napsbury Asylum, St. Albans, for the county council.—Mr. H. T. Wakelam, county architect :—

| | |
|---|---|
| E. Lawrence & Sons, Limited, City-road | £4,500 |
| McCormick & Sons, Limited, Northampton-street | 4,345 |
| Fassnidge & Son, Uxbridge | 4,152 |
| J. Honour & Son, Limited, Tring | 3,996 |
| A. Lowin & Son, Kettering | 3,898 |
| Dorey & Co., Brentford | 3,875 |
| C. Miskin & Son, St. Albans | 3,724 |
| G. Greenwood & Son, Halifax | 3,650 |
| T. Higgs, Northampton | 3,600 |
| W. King & Sons, Watford | 3,600 |
| F. Perren, Rendon | 3,480 |
| A. & B. Hanson, Southall | 3,450 |
| W Lawrence & Son, Finsbury-circus | 3,372 |
| Blow & Bigers, St. Albans | 3,343 |
| F. F. Whyborn, Golder's-green | 3,216 |
| S. J. Hummings, Woodside-park | 3,197 |
| C. W. Dumpleton, St. Albans | 3,120 |
| A. Ivory & Brothers, St. Albans | 3,048 |
| Beardsmore & West, Northampton | 2,990 |
| W. Holloway, Willesden | 2,982 |
| A. Pitkin, St. Albans* | 2,880 |

STAFFORD. For the supply of cast-iron pipes, for the corporation :—

Stanton Ironworks Company, Limited.

# The Surveyor

And Municipal and County Engineer.

Vol. XLI. APRIL 26, 1912. No. 1,058.

## Minutes of Proceedings.

**Road Board Grants: London's Claims and Some Press Opinions.**

In articles which have appeared in several of the organs of motoring interests, dissatisfaction has been expressed in regard to the policy of the Road Board in making a large lump sum grant, or contemplating the making of such a grant, for the purpose of providing a main western approach road to London. The question whether there is any ground for complaint should, perhaps, be preceded by the question whether there is a field for criticism. The Treasury makes a grant for a much-needed improvement in an area occupied by about a quarter of the population of England, the grant being made out of Road Board funds and on the initiative of the Board. This action can hardly be criticised unless on one of the two grounds either that large towns generally, or London in particular, must be regarded as too wealthy to need help of this kind, or, on the other hand, that at the present time such a sum could be better spent if scattered among a large number of small authorities. As regards the local claims on the common purse, the authorities concerned are somewhat in the position of a rural council which has to maintain a road connecting two large manufacturing towns, and this fact has been recognised in the manner in which the preliminary arrangements for raising the necessary sum have been made. Further, the question whether smaller authorities in the country generally have or have not greater claims does not necessarily arise, since it cannot, we think, be shown that there is at the present time the machinery necessary to give them adequate and judicious help. In any case, THE SURVEYOR is concerned rather with the manner of the Board's spendings than with the larger financial policy; and, further, our contention that the Board should have a technical staff involves our recognition of the reasonableness of a course which will at any rate tend to make more effective the scrutiny of the applications sent in. That this scrutiny is at present administrative only and not technical is, as we have often pointed out, very unfortunate, since the whole procedure is precisely that which would make the best and most economical use of qualified professional scrutiny. The Road Board is playing "Hamlet" without the Prince of Denmark, and no possible arrangement of caste and supers can supply the deficiency of engineering in what is essentially an engineering performance. The effectiveness of the parts played by the local surveyors must be to a large extent a matter of rehearsals, and may depend upon their readiness to accept as correct the prompter's reading of the play. If there is to be developed all over the country a spirit of loyalty to sound principles and a sound general policy of road improvement, it must be remembered that structural strength is necessary, and that watertight compartments will not in themselves ensure safety. To revert to the main subject, the manner in which the grants have hitherto been made has given the Road Board a general view of the whole field of their activities, and has been followed by some welcome indications of the development of a technical policy, that outlined in the Board's recent circular. If it now seems good to the Board to make one or two very large grants, which will have the effect of reducing the present disproportion between the staff of the central body and the matter put before them, we should be the last to raise objections to such a procedure as a matter of present efficiency, and especially if advantage be taken of it to develop the work of scrutiny and selection.

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**The State of New York Paving.**

The New York *Municipal Journal and Engineer* deals in the issue received this week with a report drawn up by the Mayor's Committee of New York with respect to the paving of the city streets. The report in question is couched in critical as well as advisory terms. As to the recommendations, including the provision of a "competent corps of assistants," the need for a record of traffic statistics, the removal of "all dead and unnecessary tracks," and the demand for manholes of a design offering less interference with traffic, they are allowed by the *Journal* to be good, but it is explained that the officials of the Paving Bureau have felt constrained themselves to make them so often that they "sound timeworn." The writer protests quite energetically, and apparently with reason, against the attitude taken up with respect to the chief city officials by a committee "composed entirely of mercantile and professional men," who are seeking, on the strength of newly-acquired and undigested information of a few weeks' standing, to call in question conclusions based upon years of intimate study of the problem by trained engineers. Most surveyors are familiar with the time-honoured methods by which they are, so to speak, ground between the upper and the nether millstones, one being represented by noisy outbursts of public dissatisfaction, and the other by irregular fits of a spurious economy on the part of councillors. It appears, however, that to whatever cause may be attributed the spasmodic qualities of our civic administration

on this side of the Atlantic, there is no getting over the fact that in New York the local authority is bound hand and foot by the law of the State Legislature, and that such things as the concentration of power and the creation of a paving authority cannot be achieved until the law is altered. The censure of the Mayor's Committee is not only bestowed upon matters which the city officials cannot control, but is also, with charming impartiality, directed against the extent of their professional knowledge, the complaint being that the engineers had very little acquaintance with the most approved modern methods of paving carried on in places outside the United States. The *Municipal Journal and Engineer* meets this charge with the counter-assertion that "the experience of most engineers who attended the International Paving Conferences of the past two years has been that United States engineers know more of European paving practice than do the Europeans of practice in this country." However this may be, the constant lack of money for the improvement of the paving conditions of New York is emphasised with spirit, and the article concludes with a challenge in these terms: "The heads of the Paving Bureau realise that if an appropriation of, say, 25,000,000 dollars were available they could put the pavements of the city on a satisfactory basis for economical maintenance." Money, as we know, is not everything, but it would appear, at all events, that it is a pressing necessity if the streets of New York are to be placed in a condition to meet the requirements of the city surveyors and the demands of the City Fathers.

* * *

**A New Filtering Material.**

The treatment of sewage on coral filters at Singapore is certainly an original idea—at least we do not remember hearing of this particular material being used as filtering medium before. The claim made by the *Straits Times* that "a new and splendidly successful medium for filtering sewage, which surpasses the virtues of coke (the most universal medium in use in the West)," and generally leaves the technical expert "enlightened and rejoiced," will, we fear, leave the said expert in this country cold. We have in the past fixed our hopes on finding a material of special virtue for filtering sewage, and patentees of material have made similar claims to those of Singapore, but the singularly unsatisfactory results which have followed the use of such media have left a very unfavourable impression behind, and the sewage works manager and engineer are both inclined to regard with suspicion any "new and splendidly successful" filtering medium. The price of coral per cubic yard at Singapore and elsewhere is also a matter which the technical expert will have to take into account, however good the results of working may be; but before doing so it is as well to consider the results obtained at Singapore.

Three small experimental beds were used, and as yet no sewers appear to have been laid sewage was manufactured by mixing a quantity of night soil with water. This was settled, and the liquid was run into tipping troughs which discharged on to the filters. The three filters were filled respectively with coke, laterite and coral, and it was found that the coral filter gave by far the best effluent. The grade of the material in these filters is not stated, neither are we told exactly how long the filters were run, or what volume of sewage per cubic yard was treated; but, assuming that the conditions were the same in each filter, we have to consider why the coral filter gave a better result than the others. Coke may be considered a common filtering material, though clinker is now more generally used; laterite is a red or brick-like rock, composed of silicate, of alumina and oxide of iron; coral is composed of lime, and if new coral were used it would presumably be in a soft state, readily acted upon by the acids present in sewage. In order to obtain the best results from the coke and laterite filters it would certainly be necessary to get them into proper bacterial condition, and to distribute the sewage so as to produce proper contact. On the other hand, the passage of sewage through coral would certainly mix it with lime and cause a deposition of solids which would produce a good effluent at first and then rapidly clog the filter. Seeing that it is proposed to cover about 20 acres with sewage works at Singapore, it would be wise to make a further series of experiments with the materials and distributing appliances which are now generally used as the result of long and painful experience, and to be slow in accepting coral as being "ten times as efficient as coke." We refer to the Singapore experiments at greater length elsewhere in these pages.

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**"Access" to a Private Street.**

Among the advantages of the adoption of the Private Street Works Act, 1892, is the power given by the last clause of sec. 10 to charge premises access to which is obtained from a street through a court, passage or otherwise (notwithstanding that the premises themselves do not front, adjoin or abut on the street), if, in the opinion of the local authority, such premises will be benefited by the works. The expression "or otherwise" seems upon the face of it to give a very wide latitude to the local authority. Read literally, it would apparently enable them to charge premises in a street leading out of the street to be made up, at all events where the side street was a *cul-de-sac*. A little consideration, however, shows that this can hardly have been the intention of the Act. The well-known *ejusdem generis* rule of interpretation usually applied in considering the meaning of general expressions following specific words would seem to point to the conclusion that the connecting link must be something cognate to a court or passage, something in fact (whether you call it court, passage, path, road, or what not), whose sole *raison d'être* is to serve as a means of access from the premises to the street to be made up. And there is high judicial authority for stating that where you have a street, A, with another street, B, leading out of it, access is not obtained from A to the premises in B within the meaning of the Act—at all events where B is, or is about to become, a public street. "Public" in this connection, be it observed, means subject to public rights, though not necessarily repairable at the public expense.

This is the effect of the decision in *Newquay Urban District Council* v. *Rickeard and Another* (1911, 2 K.B., 846). Lord Alverstone, in the course of his judgment in that case, expressed the opinion that the urban authority ought not to include in the apportionment premises whose means of access to the street was by a public street. The real question in the case (the learned judge pointed out) was the nature of the roads leading out of the streets in which the works were to be executed. "The justices," he said, "ought to consider whether these were mere roads for the purpose of giving access to premises from the streets in which the works are to be executed, or whether they are themselves public streets in process of development. If they are not merely for the purpose of giving access to the houses, but are roads about to become public streets, it would not be right to say that there is access through them or either of them to the premises in question from the streets in which the works are to be executed. There would be access from the roads to the premises, or from the roads to the streets, but not from the streets to the premises within the meaning of this enactment. If access is obtained from the streets to the premises, then the latter may be included in an apportionment; but if the access from the streets to the premises is through another public street, then, in

my view, access is not obtained to the premises from the streets within the meaning of sec. 10 of the Act of 1892."

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**The Medical Officer and the Insurance Act.**

It would appear to be repeating a truism to say that the operation of the Insurance Act will have a very widespread effect upon the public health. Yet we venture to think that the precise nature of the provisions of the Act which directly affect public health administration are by no means so widely known or generally appreciated as they ought to be. For example, it is rather surprising that the newly created insurance committees are not brought into closer co-operation with the medical officers of health. It is true that there is a provision that at the request of an insurance committee, and with the consent of the council by whom he is appointed, a medical officer of health *may* attend meetings of the committee and give such advice and assistance as are in his power. But this would not appear to be enough, when it is remembered that the medical officer of health is the man who ought to know most about all matters affecting the health of his district. It is particularly desirable that the assistance of the existing public health officers should be available in the administration of those clauses in the Act which direct what action is to be taken by the insurance committees, where evidence is brought before them that there is excessive sickness in a district due to "bad housing or insanitary conditions, or the neglect on the part of any authority to observe or enforce the provisions of any Act relating to the public health, &c." Yet these very clauses manifest the intention of the Act to set up new and independent authorities, instead of making use of the sanitary authorities which already exist in every district in the country. Of course, a great deal depends upon the spirit in which the Act is administered. We cannot help feeling that the greatest public good will be achieved if the insurance committees manifest a desire to co-operate with the old public health authorities as far as practicable.

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**A Warwickshire Appointment.**

One of the results of the Birmingham extension scheme, by which the Aston Union and the Castle Bromwich Rural District were broken up, has been the formation of a new union and rural district by the amalgamation of several parishes which were not included in Greater Birmingham with the old Meriden Union and Rural District. As a general rule, we have advocated the principle which actuates such combinations as that just mentioned, which is that the creation of districts of sufficient size to engage the services of whole-time officers with proper qualifications must tend to efficient and economical administration. We note with some regret, therefore, that the inauguration of the newly formed Meriden District was marked by certain ideas of false economy in two directions. In the first place, in appointing Mr. T. H. Negus, formerly surveyor and inspector of nuisances to the now defunct Castle Bromwich Rural District Council, to similar offices under the new authority, it appears to have been overlooked that it is quite impossible for any one man properly to discharge even the routine duties of these offices for a district having an area of 55,000 acres and a population of 15,000. Yet this is what Mr. Negus is expected to do, his salary being no more than heretofore in respect of a district of 3,000 inhabitants, and he having now to provide his own office, clerical assistance and travelling expenses. One worthy councillor was even anxious to reduce the salary by £50 per annum, but this proposal was not supported by any of his colleagues. It is a pity that the amalgamation was not made the opportunity of providing the newly formed district with an adequate staff of fully qualified and adequately remunerated public health officials.

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**A Trans-Continental Road Scheme.**

By far the most ambitious plan of road building brought forward for some time past is proposed by the Federal Government—it is nothing less than a national system of highways, the main feature being a road from Halifax to Vancouver—from the Atlantic to the Pacific—a distance of 3,900 miles, and it is expected that the various provincial Governments will follow this up by a series of minor roads. As already announced in these columns, the Quebec Government are prepared to spend £2,000,000 on a road scheme. The national highway will tax the skill of road engineers, for, although part of the route, say the first 1,500 miles, would be through comparatively easy country, other portions would run through rough and sparsely populated territory. Much of this barren country is characterised by abundance of rocks and woods, particularly in the Lake Superior region, while farther west the Rockies are encountered. This will be the most troublesome part of the work, and it will try the nerve and patience of those who will have to handle it. Canada, however, is badly in want not only of a national road, but of a series of small highways, which will assist in developing the resources of many portions of the Dominion now practically unknown.

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**Applications.**

In another column will be found a contribution from the pen of "A Borough Surveyor" which, we hope, will prove of special usefulness to those of our younger readers who, in the stress of competition, frequently find themselves in the position of applicants for public appointments. We are led to believe, from a long observation of the methods by which such appointments are made, that "local influence" and canvassing, although still potent factors in many cases, are gradually becoming less important as elements in deciding to which candidate a post shall be given. It becomes all the more important, therefore, for a candidate to prepare a careful and attractive application, from which the appointing authority can easily judge his qualifications. The practical hints for achieving this object which are given by "Borough Surveyor" are well worth the attention of aspirants to local government appointments, even though they may in some particulars appear to be trivial. Especially we would emphasise the advice given as to accuracy and absence of exaggeration. What is required for a good application is that it should be a neat, business-like document which will impress rather by the absence of embellishments than by any definite attempt to attract attention by startling, if improbable, statements.

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**Housing at Bury.**

In our Architectural Supplement this week we are enabled to give particulars, with drawings, of the very interesting housing scheme which is now approaching completion at Bury. The scheme has been carried out to the designs of Mr. A. W. Bradley, Assoc.M.Inst.C.E., formerly borough engineer and surveyor of Bury, who now holds a similar position under the St. Helens Corporation. Mr. Bradley has for many years been a keen student of all matters relating to housing, and the Bury scheme possesses many points of originality which distinguish it from the usual run of such undertakings. For example, considerable attention has been paid to laying out the site as attractively as possible, a good open space being provided in the centre. Then, again, there is a pleasing variety in the elevations of the houses, which are all built in pairs. Wide roads and the use of privet hedges for garden divisions also assist in producing a "garden suburb" effect.

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# Some Hints to Applicants for Public Appointments.

By A BOROUGH SURVEYOR.

Only a very few of those of us who enter the municipal or local government service can hope to progress very far in our career without undergoing the ordeal of becoming a candidate in open competition for a higher position.

Again, only those who have entered the arena time after time without success can appreciate fully the dreadful sense of discouragement that comes over one on receiving quite a number of polite little circulars informing us that Mr. So-and-So of somewhere else has been successful.

Of course, in the public service, of whatever branch, the stress of competition, as in every other walk of life, grows keener day by day, and disappointments must be expected, if only from a study of the numbers one sees from time to time as having applied for this or that post.

Still, one often wonders just why the successful candidate should have been selected in preference to oneself. He does not come from as good an office as our own, he is younger, and does not appear to have nearly as good qualifications. "Luck," perhaps; well, very often it is just that and nothing more, or at any rate that intangible factor has entered very largely into the result. And yet if you were behind the scenes you would very often see clearly the why and wherefore. For while it is true, no doubt, that such things as "local influence" and "personal canvassing" are still potent powers in the land, I think it must be conceded that in nine cases out of ten nothing more or less than first of all a smart application ensuring a place on the selected list, followed by a favourable impression at the personal interview before the committee or council, has brought about the result. It surely behoves us then to put our very best effort into our application, recognising that nothing but this has the slightest chance among so many aspirants, and always remembering that from this short document alone those who have the selection have to form an estimate not only of our qualifications, but, from internal evidence contained therein, our personal character.

It has been my duty to open, analyse and tabulate the applications received on several occasions, and quite recently to prepare a select list for a junior appointment in my own office. On completing my task I stood contemplating the heaped-up pile of human effort, wondering if I really had selected the best six, or whether lying buried amidst the number of unsuccessful applications was some undiscovered gem of sterling worth.

This would, with every care on my part, have been quite possible, from the fact that so many of the applications bore evidence of want of training and method in preparation, and thus it may be that a candidate having really good points had quite failed to bring them to my notice. Let it be recognised, more especially by younger members of the service, that an application, to stand out from its fellows, must be prepared with that object, and be such as immediately to command attention.

Everything counts, right from the very envelope in which the application is sent to the testimonials it encloses. Handwriting, good paper, legibility, the marshalling of facts in clear chronological order of training and experience, general style and appearance—all lend their weight.

The first point, perhaps, that I can recommend is a very careful study of the advertisement, and having made [illegible] if you are in every way eligible. It is of no use blinking facts to oneself. Competition is so severe that unless you are competent from training and experience, or, for example, are not within the limits of age, it is useless to waste your own and other people's time by applying. Do not think from this that I wish to damp anybody's laudable desire to get on, and, of course, "luck" might come your way. Really, though, there are already so many people who curtail up the candidates' list and who by no possible chance can hope to succeed, that they cause themselves a deal of unnecessary trouble, expense and disappointment. Do not imagine I mean that, supposing a borough surveyor has a vacancy for a qualified "General Assistant," you are eligible because you have just completed your articles with an architect in private practice or that for a public library requiring a librarian you are just the man because you are in a town clerk's office. You have not had the specialised training required, and fifty of the others who apply will have. Take any hint, also, contained in the public announcement of the vacancy, such as "preference given to candidates holding the certificate of the Surveyors' Institution." If you have not this diploma, its equivalent or something better, do not apply. Modern practice all tends towards specialisation in greater or less degree. No, choose your department, and get every qualification you can that it requires, then sail ahead when opportunity offers and "Try, try again." Quite 30 per cent of the applications I referred to a little while since were received from persons having no possible qualifications for the post, and this is no solitary example.

Having decided, then, to become a candidate, let us return once more to the advertisement. Follow its directions implicitly down to the smallest detail. If it asks for everything to be in the candidate's handwriting, do not, for instance, type or print your copies of the testimonials. If it asks for two testimonials, do not send in three, or any like foolishness.

It would be impossible here to do more than indicate generally the lines your application should follow, as the circumstance will vary in some degree with the class of appointment offered. You will, however, have already gathered the care and attention I advise you to pay to many things. As I have already said, you must remember that it will not only be from the subject-matter of your application that you will be judged, but an opinion will be formed of your general character from the internal evidence it contains. For instance, a man who makes careless mistakes there will be likely to make them elsewhere. If you attempt to deceive by palpable exaggeration there you are not likely to be reliable in your everyday dealings in your new post. If you do not produce a neat and business-like document now, with so much depending upon it for your own advancement, are you likely to exert yourself to turn out good work in your employer's interest? Make the very best of your own goods—that's what you must do to succeed. But, on the other hand, do not state anything that will not bear investigation should it come to the test.

Among other small matters, address your application direct to the persons having the power of appointment, as, for example: "To the Mayor, Aldermen and Councillors of the Kirkhampton Town Council," or "To the Chairman and Members of the Wallsend Urban District Council," "Gentlemen." Then go right to the point. Do not say, as nine out of every ten candidates will: "Having noticed your advertisement in this week's *Local Government Gazette* for a general assistant in your surveyor's office, I beg, &c." Never mind how you got to know there was a vacancy. Say: "I beg to offer myself as a candidate for the position now vacant of general assistant to your borough surveyor." Then give your true age on your last birthday. Do not quibble in order to make yourself appear a little older by saying "I am in my twenty-sixth year." If it is the end of February now, of course you can, if you wish, say "I was twenty-six years of age on March 14th last."

Then particularise your present appointment and qualifications, and go on to show (guided, of course, by the nature of the appointment) how your education, your having served your articles of apprenticeship, your subsequent appointments, the examinations you have passed, and your experience generally fit you in every way for the position offered; and, if a junior, impress them with the fact that you will prove a real assistant to your new chief if appointed.

Of course I can do no more than indicate that there are ways, by using your brains a little, of helping you considerably so to frame your application as to meet exactly the requirements of the situation. For example, let us suppose that a bald advertisement appears stating that the council of some seaside resort requires a new borough surveyor. You have never been there, and do not know the town a bit. Well, make it your job to find out everything there is to know of the class of place it is, and what special matters (like waterworks, public baths, or other projects, just a little outside the usual run, perhaps) will be under your control. Or, again, make a special point of enquiring what new large works, if any, are contemplated in the near future, such as an extension

of the sewage system, or a new sea-defence wall and parade. Having gleaned what you require, it is easy to emphasise in your application that part of your experience bearing on the points in question. Obviously, for instance, on the other hand, it is no use to indite long paragraphs setting forth your special knowledge of sewage farms if the sewage is discharged direct into the sea. Need I say more? The advertisement will often give you general information, but frequently it is easy to gather a little particular knowledge of the greatest service. Before leaving this part of our subject, just a word more to the juniors—and that is, "Do not exaggerate." I have before me an application for a junior appointment from a boy in a borough engineer's office—a veritable prodigy if all he states be true, for he claims to have a thorough knowledge of surveying and levelling in all its branches, is an experienced draughtsman, with special knowledge of architectural work, and sewage and drainage, road making, private street works, waterworks and tramways, and yet makes at least two mistakes in spelling. Believe me, the man who is going to look through your application will not expect all these things of you before you are twenty-one. He is more likely to be content with a genuine statement that during your articles your chief has been carrying out works of the comprehensive nature set forth above; that you have got some satisfactory knowledge of office routine, can make an accurate survey, produce a neat drawing, have passed a preliminary examination, or can produce a certificate or two from the Science and Art Department of the Board of Education in building construction or the like. I declare it to be an absolute fact that out of six selected candidates for a junior appointment who appeared before a committee here, and all of whom had stated in their application they they were competent surveyors, only one could read an angle set up on a theodolite standing in the council chamber, and four of the six were not able to make any attempt at all. Be warned, therefore, and do not hope to deceive by claiming to be able to run while still "in arms," for you would only be miserably unhappy if by any chance you managed to secure the post and were found wanting.

And now as to testimonials. I am afraid at this date, while they are still the fashion, their value has been considerably discounted owing to experience common to us all. Let them at any rate have some bearing and be a little varied. By that I mean get them from people competent to form a judgment. To produce one from your schoolmaster when you are twenty-five has only a limited value. He cannot judge but generally of your professional ability. Suppose, for instance, three are required; get two that speak of your professional qualifications, and let one go to show something of your personal character.

Your application is now ready for dispatch, printed it may be, and neatly bound up in narrow green ribbon for an important post, typed or neatly written for others, but always with an outside title page setting forth tersely its contents. Send it off then in good time; do not wait until the very last day or post. There are such things as accidents; and do not forget to put the endorsement on the outside of the envelope.

On the much-debated question of canvassing I shall say but little. In many instances this is now strictly forbidden, but in others "personal" canvassing only is tabooed, and it is still permissible to send a copy of your application and testimonials to the members of the local authority or committee. The names you can easily obtain, as a rule, on application, or from the local newspaper people. Do not forget that you must spare no legitimate effort to make your name stand out from the ruck in some way or other—even if it is only by using blue foolscap instead of white. As to any personal influence you may be able to bring to bear, I can only leave that to your own good sense and taste; but always remember that frequently more harm than good is done by the people who pester on behalf of candidates of whom they have no real personal knowledge whatever.

Now only remains the fateful interview. Our application has done the work required of it, and we have been requested to present ourselves as one of a selected number for inspection. Here, of course, a man's personality counts for a very great deal, and it is everything to create a good impression. I am afraid it is of little use to tell the nervous man, who positively dreads it, not to be afraid, but one can warn the very cocksure of going to the other extreme. All things count, dress and general appearance, of course. Do not overdress, but, at any rate, go looking, as it were, worth your money. Perhaps, however, the one great tip is contained in the words "Speak up." There are sometimes quite a number on the committee or council, and there are certain to be some who cannot hear well; but anyhow it gives a general impression of confidence.

You must be on the alert for opportunities to bring out your strong points. Do not worry by anticipating that they are going to ask you too much or questions you may not be able to answer. They will not; for, as a matter of fact, unless the interview has been arranged beforehand by the chairman or head permanent official, you will be surprised at the somewhat inane things that will be asked of you, or find that you are being merely required to confirm a few points in your application. You will not often get a chance to say much to the point unless you are quick to make the opportunity for yourself as you go along. In conclusion, I wonder if I shall be understood if I tell you never to say "No" to anything.

Reading over the foregoing I very much doubt if I am competent to give you all the advice I should like to give. Certainly I myself have made very nearly all the errors I am asking you to avoid, but if I have succeeded in helping any of those who are coming after me to put up a little better show on the next occasion they enter the list my efforts will not have been entirely in vain.

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**Valuation of Land and Buildings.**—A paper on this subject will be read at a meeting of the Surveyors' Institution on Monday evening next by Mr. G. T. Loban.

**National Association of Local Government Officers.**—A meeting of the National Council of this body will be held at Leamington Town Hall on Saturday, the 4th prox., at 10 a.m.

**Burton on Water Supplies.**—"R. B."—"Water Supplies of Towns and the Construction of Waterworks," by W. K. Burton, is published by Messrs. Crosby Lockwood & Son, at the price of £1 5s.

**Public Health Law.**—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangement well suited for easy reference.—*The Law Times.*

**The National Health Week.**—In connection with this movement, we learn, full programmes for the week—April 28th to May 4th inclusive—have been arranged in many of the metropolitan boroughs and in twenty-six of the great towns, while over 100 other towns will carry out partial programmes. The local arrangements have in most cases been made under the direction of the mayor or the medical officer, and in practically all with the active help of the local health societies. Further particulars can be obtained at the offices of the Central Committee, 28 Fleet-street, E.C.

**Street-Paving Dispute.**—The Recorder of Wigan (Mr. Lancelot Sanderson, K.C., M.P.) had before him recently a case of street improvement of considerable importance to municipal authorities and to owners of property. Colonel Woods, of Wigan, and Warnford Park, Hampshire, appealed from a decision of the Wigan Borough Justices dismissing his objection to the paving of Woods-street, Wigan, on the ground that the work was unreasonable. His council, Mr Gordon Hewart, urged that the colonel was about to submit to the corporation a scheme for constructing an extensive new thoroughfare, which would make the paving of Woods-street unnecessary. Mr. Sutton, counsel for the corporation, contended that the proposed scheme was irrelevant to the real issue in the case, which was whether the street in question was in such a condition that it ought to be paved and completed. The Recorder, after a hearing lasting the greater part of two days, decided in favour of the corporation's contention, and held that the street did require paving. He therefore dismissed the appeal with costs.

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By Sydney G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

# The Main Levelling of Copenhagen, 1907-8.

By C. F. V. BOOCK, Surveyor-in-Chief and Municipal Engineer in Charge of Division B, Copenhagen.

(*Conclusion.*)

To get a general view of the working hours and the amount of work performed, there is at the end of the daily notes in the field books a list which shows the following records:—

| | First party. | Second party. | |
|---|---|---|---|
| Total lengths of sight lines | 262,140 m. | 256,244 m. | Total = 518·4 km. = 324 miles |
| Stations .. | 3,424 | 3,190 | Total = 6,614 |
| Mean length of sights .. | 38 m. | 40 m. | Mean = 39 m. |
| Working hours in field .. | 909 | 665 | Total = 1,565 |
| Instrument stations per hour[1] | 3·8 | 4·8 | Mean = 4·3 |
| Levelled per hour .. | 291 m. | 385 m. | Mean = 338 m. |

[1] In this is included the time spent in transporting the instrument.

These results may appear a little small in comparison with what is reported to have been attained at several places in Germany, but when we take into consideration that in this country we often have a very strong wind, that the traffic in Copenhagen in many places is in the highest degree obstructive to levelling operations, and that the main object was to attain a fine result, the longer time employed could not very well be objected to. In the suburbs, under good conditions, lines of up to 1,000 m. were levelled per hour.

Re-levellings were made for 60 of the 855 lines, or about 7 per cent. The re-levellings have been taken into consideration in the following manner: The time on the day in question has been reduced in proportion to the number of rejected stations, and the time which was used for the re-levelling has been inserted instead.

### THE OFFICE WORK.

The levelling operations in the field were performed from June 25 to December 5, 1907, after which date the arrangement of the observations and the equalisation computations were commenced; lastly, the computations of the heights of the bench marks.

The starting point for these is the gun-metal bolt, denoting mean sea-level, which was fixed in the wall of the quay of the Northern Custom House Wharf by the major-triangulation. This bolt served also as a starting point for the precision levellings of 1887 and 1901, and the datum line was, as formerly, fixed 1·0024 m. lower. Seventeen main circuits were computed. Each main circuit was traversed.

The number of main lines, traverses and tie lines is 544, of which three—namely, 339-353, 367-389 and 410-420—do not enter into the computations of equalisation of errors, but they come in when the closing error of the circuits is computed.

To maintain an effective check during the computation of the observations, these were computed independently in duplicate. The results were entered in two computation books, and the computations were performed by two computers. Most of the computations were again checked by me, and finally the heights over datum line of the stations entered on printed forms, which again were checked.

An extract from the computation book is given below. The computation book is arranged so that the forty-three main lines that constitute the seventeen main circuits are entered first. Next are added lines 10*a* and 10*b*, but they have only been included for the purpose of showing main circuit X on the plan.

The numbers of the main lines, together with their closing points, are entered first.

The numbering of the points was done in such a way that the northernmost point was given No. 1, the other stations getting running numbers, ending with No. 670 at the southernmost point. Next is entered in the computation book the correction and the mean error that were computed later. The next column contains the numbers of the field books and the pages.

And next is entered the chainage between the points and difference of elevation, taken from the field books. The kind of point is denoted by "Plate," H.Bw.H.—*i.e.*, horizontal ironbolt with head, V.T.B.—*i.e.*, vertical ironbolt V.T.B. in S.—*i.e.*, vertical ironbolt in stone, V.B.—*i.e.*, vertical gun-metal bolt, and H.B.—*i.e.*, horizontal gun-metal bolt.

In order to be able to see at once whether the two independent levellings I. and II. agree, and also in order to be able to compute the mean error therefrom, the differences $d = \text{I.} - \text{II.}$ have been computed, where I.—II. means the difference in height of the points measured respectively by the parties I. and II. In the following columns are entered the values of $d^2$ and $\frac{d^2}{s}$, where $s$ denotes the distance between the two points, measured by the telemeter and in whole kms. As $d$ is given in half-millimetres, the mean error, $m$, on the two levellings in mm. per km. is found by the formula—

$$m = \frac{1}{4}\sqrt{\frac{1}{n}\left[\frac{d^2}{s}\right]}$$

where $n$ means the number of lines.

In this way it was found that for the seventeen main circuits, $m = 0{\cdot}88$ mm., and for the whole levelling $m = 0{\cdot}93$ mm.

These are very interesting results with regard to the computation of equalisation.

As above mentioned, the whole of the levelling field was divided into seventeen main circuits, the final error of which was found by adding for each circuit the differences of height, the sign being noted.

It was found that circuit No. 1 had a final error $= -0{\cdot}9$ mm., computed so that the starting point was No. 382, and the direction of working against the sun. There was a rise from No. 382 to No. 131 in line $1 = +0{\cdot}9666$ m., in line $13 = +4{\cdot}6347$ m., in line $14 = -0{\cdot}4657$ m., and in line $15 = -5{\cdot}1365$ m. The mean of these values $= -0{\cdot}9$ mm., which is the final error of the circuit. To make this final error disappear, a minute quantity is added to each of the differences of height $v_1$, $v_{13}$, $v_{14}$ and $v_{15}$, thus:

$$(0{\cdot}9666 + v_1) + (4{\cdot}6347 + v_{14}) - (0{\cdot}4657 + v_{14}) - 5{\cdot}1365 + v_{15}) = 0$$

The signs in the other equations are ruled by the direction in which the lines were entered in the computation book. When the above equation is reduced, it takes this form:—

$$+ v_1 - v_{13} - v_{14} + v_{15} - 0{\cdot}9 = 0$$

If the differences of heights are treated in a like manner in the other (sixteen) main circuits, we arrive at sixteen similar equations, called the "conditional equations," examples of which are as follows:—

By main circuit:

| | |
|---|---|
| I. 0 | $0{\cdot}9 + v_1 - v_{13} - v_{14} + v_{15}$ |
| II. 0 | $0{\cdot}1 + v_2 + v_{17} + v_{16} + v_{35} + v_{34}$ |
| III. 0 | $6{\cdot}6 + v_3 - v_{18} + v_{19} - v_{36} + v_{20}$ |

As the whole levelling was performed in the same manner, they are supposed to be of the same degree of exactness, and, as usual, the mean error in the differences of height in the line is supposed to increase proportionally with the square of the length of the line. As a consequence of this a weight $p = \frac{1}{s}$ is added to the difference of height of each line, the length of the line being $s$. When using the kilometre as unity for $s$, the mean error of the equalisation on the weight unity becomes = the mean error per km. The normal equations are now found by the following formula:—

$$\left[\frac{aa}{p}\right]k_1 + \left[\frac{ab}{p}\right]k_2 + \left[\frac{ac}{p}\right]k_3 + \ldots + \left[\frac{ar}{p}\right]k_r + S = 0$$

where $a$, $b$, $c$, $d$ . . . . are the coefficients to the $v$'s in the conditional equations—that is, either +1, or −1. $S$ is the constant belonging to each conditional equation, or the final error of the circuit concerned, and $\left[\frac{aa}{p}\right]$ is the sum of the squares of the $a$'s divided by $p$, which $= \frac{1}{s}$ *i.e.*, multiplied by $s$. The method of finding the other values in the formula is easily

seen. The links in the first normal equation will then become

$$\left[\frac{aa}{p}\right] k_1 \quad 3{\cdot}3\,k_1 + 0{\cdot}9\,k_1 + 1{\cdot}0\,k_1 + 2{\cdot}7\,k_1 \quad + 7{\cdot}9\,k_1$$

$$\left[\frac{ab}{p}\right] k_2 \quad - \quad 0{\cdot}9\,k_2$$

$$\left[\frac{al}{p}\right] k_{11} \quad - \quad 1{\cdot}0\,k_{11}$$

$$\left[\frac{an}{p}\right] k_{13} = - 2{\cdot}7\,k_{13}$$

The equation itself will then be

$$+ 7{\cdot}9\,k_1 - 0{\cdot}9\,k_2 - 1{\cdot}0\,k_{11} \quad 2{\cdot}7\,k_{13} = + 0{\cdot}9$$

In the same manner, the second normal equation is formed, but it is commenced with the link $\left[\frac{bb}{p}\right] k_2$, &c., until all the seventeen normal equations have been found. The normal equations can, however, also be formed immediately by examining the sketch of the main circuits; thus a check on their correct formation is procured.

The computation of the coefficients to these so-called "transformed equations" is done both with successive and final checking in two forms, one of which contains the coefficients of the unknown quantities, and the other the constants in the equations. Finally the solution of these transformed equations is performed on a third form.

It is of importance in these equations to place the zero coefficients in the right places. To attain this object the original order of the normal equations can arbitrarily be altered, but for the purpose of following the systematic computation, the order of the unknown quantities must be changed in the same manner. After some trials the system of "transported normal equations" was arrived at, and these were a great improvement on the original ones.

It would occupy too much space to record all the computations of the coefficients of the correlatives, the constant links, and the most profitable values of the correlatives. Suffice it to be stated that the two sums which are produced by the computation in duplicate of "M" (G. Zachariae's "De Mindste Kvadraters Metode," page 223) agree exactly, being

CIRCUIT VII.

| — | Line. | Field-book. No. & page I. | Field-book. No. & page II. | $\frac{d^2}{s}$. | $d^2$. | $d$ Half mm | Distance in m I. | Distance in m II. | Distance in m Means | Difference in heights measured. I. | Difference in heights measured. II. | I. + II. 2. Half meter. | I. + II. 2. m. | Correction. | Equalised difference of heights m | Height above datum line. m. | Number. | Nature of the mark. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | From Nr. 621 | | | | | | | | | | | | | | | | | |
| | To " 599 | 621 | 63 4 6 5 | 0·4 | 0·49 | +0·7 | 1097 | 1088 | 1092·5 | ×3·1239 | ×3·1232 | ×3·1236 | ×6·5618 | −3·5 | ×6 5583 | 8 2818 | 621 | Plate |
| (A) | Chainage: 1·1 km. | 599 | | | | | | | | | | | | | | 4 8401 | 599 | H Bw. H |
| | Correction −3·5 | | | | | | | | | | | | | | | | | |
| | per 100 m. −0·32 | | | 0·4 | 0·49 | +0·7 | 1097 | 1088 | 1092·5 | ×3·1239 | ×3·1232 | ×3·1236 | ×6·5618 | −3·5 | ×6·5583 | ×6 5583 | | |
| | m = 0·16 mm. | | | | | | | | | | | | | | | | | |
| | From Nr. 521 | 521 | 62 5 6 3 | 53·3 | 16 00 | +4·0 | 277 | 263 | 270 | ×9·5370 | ·9 5330 | ×9·5350 | ×9·7675 | +1·0 | ×9·7685 | 9 7646 | 521 | Plate |
| | To " 590 | 548 | „ 4 „ 3 | 8·4 | 1·69 | −1·3 | 240 | 238 | 234 | 0·4060 | 0 4054 | 0·4067 | 0·2033 | +0·7 | 0·2040 | 9 5331 | 548 | Plate |
| (B) | Chainage: 1·2 km. | 574 | 63 6 62 3 | 4·1 | 2 89 | 1 7 | 678 | 634 | 656 | ·0 2034 | 0 2021 | ·0 2013 | ×5·1006 | +2·4 | 5·1030 | 9·7571 | 574 | Plate |
| | Correction +4·1 | 590 | | | | | | | | | | | | | | 4·8401 | 590 | H Bw. H |
| | per 100 m. +0·34 | | | | | | | | | | | | | | | | | |
| | m. = 1·17 mm. | | | 65·8 | 20·58 | 1·0 | 1185 | 1135 | 1160 | ·0·1434 | ·0 1424 | ×0·1429 | ×5·0715 | +4·1 | ·5·0755 | ×5 0755 | | |

By looking at the circuits one by one it will be easy to form the links in the normal equations. As was said above, the formula is as follows:

$$\left[\frac{aa}{p}\right] k_1 + \left[\frac{al}{p}\right] k_2 + \left[\frac{ar}{p}\right] k_3 \quad \ldots \quad + S = 0, \text{ where}$$

$s = \frac{1}{p}$ and the $a$'s, the $b$'s, the $c$'s . . . &c. . . + 1 or − 1.

From this it follows that for Circuit No. 1

$$\left[\frac{aa}{p}\right] = 3{\cdot}3 + 0{\cdot}9 \quad 1{\cdot}0 \quad 2{\cdot}7 \quad + 7{\cdot}9$$

$$\left[\frac{ab}{p}\right] = - 0{\cdot}9. \quad \left[\frac{al}{p}\right] = - 1{\cdot}0. \quad \left[\frac{an}{p}\right] = - 2{\cdot}7.$$

This means that the links of the normal equations which are formed by the squares of the coefficients are the same as the sum of the lengths of the main circuits, and that the other links are formed by the length of the sides which are common for the circuit concerned, and the adjoining circuit, when counted negatively. In the same manner the sixteen other normal equations are formed.

The solution of the seventeen numerical equations with seventeen unknowns is naturally an extensive work, even in this case, where the coefficients only consist of a few figures, and many of these are zero.

By using one of the approved methods of elimination and careful systematic computation, great facility in the computation is gained, and almost a certainty of not committing mistakes. A particularly attractive and rational method is that which is described by G. Zachariae in his book, "The Method of the Least Squares," and that is the one here employed.

By this method a system of equations is first formed, each one of which contains one unknown quantity less than the preceding one, the last equation having only one.

both 17·3000.* Thus, the value $m$ is found for the mean error for each unity of weight =

$$\sqrt{\frac{M}{17}} \quad \sqrt{\frac{17{\cdot}3000}{17}} = \sqrt{1{\cdot}0176} = \pm 1{\cdot}01 \text{ mm.}$$

This value gives at the same time the mean error per km. for the two levellings.

Though the two values of M agree exactly, $m$ is again directly computed by the two corrections found later for the forty-three lines (r's), and thus the value of M becomes = $\left[\frac{v^2}{l}\right] = 17{\cdot}3045$. That is a quite satisfactory result, when the accuracy of the computation is taken into consideration, and this forms a check on the correctness of the computation of the $v$'s.

When the correlatives are computed, the corrections for every line ($v$'s) are formed by the correlative equations.

The general aspect of these is

$$r_1 = \frac{a_1}{p_1} k_1 + \frac{b_1}{p_1} k_2 + \frac{c_1}{p_1} k_3 + \ldots + \frac{l_1}{p_1} k_1$$

$$r_n = \frac{a_n}{p_n} k_1 + \frac{b_n}{p_n} k_2 + \frac{c_n}{p_n} k_3 + \ldots + \frac{l_n}{p_n} k_1$$

where $a_1 = b_1 = c_1 \ldots l_1 = 1$ or $1 : p_1, p_2 \ldots$ are the weights.

The corrections—$v$'s—are entered in the computation-book. The correction formed by the equalisation applies then to the whole line concerned, and it is distributed on the single lines according to their length. Some lines do not get any correction if they are short, and the correction little. The equalised difference is now applied, and, lastly, the heights

* By M is meant the minimum value of the sum $[v^2 p]$, $v$ being the corrections to the weight $= v_1^2 p_1 + v_2^2 p_2 + v_3^2 p_3 + \ldots + v_n^2 p_n$.

above datum line of the single points in the main circuits are ascertained. This is performed by a simple addition of the differences of heights, in proportion to the height above datum line through zero point.

After all the lines in the seventeen main circuits had been computed in this manner, all the other lines were treated in a like manner, and in the computation-book they were entered for each main circuit.

The most rational proceeding would naturally be to equalise the whole levelling in a body, but it will easily be seen that it would have caused an immense task which would have had no real significance; by the proceeding here employed, which occupied a reasonable time, important errors were prevented, and, at the same time, all disputes were eliminated.

While, so far as the main circuit was concerned, it was not natural and easy to apply the correlative equalisation by the tie-lines, equalisation of the elements was alone employed, because in this case it was the easiest method; and we never decided the value of more than one element at a time, which could always be done in the simple manner of forming the mean by weight.

Each main circuit was therefore first divided into several sub-circuits by traverses from one station of the main circuit to another. The height above the datum line of the junction point was then used as the element. The main circuits produced in this way were treated in a like manner, and so forth. The whole equalisation proceeded thus step by step, and the tie-lines were successively divided into four classes or orders, as they appeared in the calculations.

In the computation-book the tie-lines were treated exactly as the main circuits.

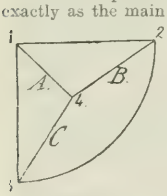


Fig. 14.

The equalisation, as applied to the drawing attached, will serve as an example.

1, 2 and 3 represent points in a main circuit; they are connected to the junction point, 4, by the levelling lines, A, B and C, the lengths of which are respectively $s_1$, $s_2$, $s_3$. The heights above datum of 1, 2 and 3 are $K_1$, $K_2$, $K_3$, and the measured differences of heights of the lines $h_1$, $h_2$, $h_3$.

To these differences of heights are added weights, as usual, inversely proportional to the distances, and then the three values of the heights of datum for the junction point are found thus:—

$K_1 + h_1$ weight $\frac{1}{s_1}$

$K_2 + h_2$ ,, $\frac{1}{s_2}$

$K_3 + h_3$ ,, $\frac{1}{s_3}$

and the most probable value of the element $K_4$ will then be:

$$K_4 = \frac{(K_1+h_1)\frac{1}{s_1} + (K_2+h_2)\frac{1}{s_2} + (K_3+h_3)\frac{1}{s_3}}{\frac{1}{s_1}+\frac{1}{s_2}+\frac{1}{s_3}}$$

In this way, the value of $K_4$ is finally decided, and the corrections for the differences of heights for each line become:—

For $h_1$ $v_1 = K_4 - (K_1 + h_1)$.

$h_2$ $v_2 = K_4 - (K_2 + h_2)$.

$h_3$ $v_3 = K_4 - (K_3 + h_3)$.

These corrections, in the usual manner, are distributed on the differences of height for each line.

As an example, the computation of the height above datum of point No. 197 is given below:—

Line A gives the height above datum = 8·2539

Line B ,, ,, ,, = 8·2537

Line C ,, ,, ,, = 8·2549

Line D ,, ,, ,, = 8·2531

8·2530 is chosen as the approximate value, and then we get:—

| $o$ | $p$ | $po$ |
|---|---|---|
| 9 | 1·07 | 12·6 |
| 7 | 1·12 | 5·6 |
| 19 | 1·18 | 10·5 |
| 1 | 1·1 | 1·0 |
| | 3·75 | 29·7 |

$$\frac{29\cdot7}{3\cdot75} = 7\,9\,8.$$

Then the height above datum after the equalisation is 8·2538 m. While the tie-lines thus are made to come in, the errors in the earlier equalised lines are carried forward to the next lines, and the inaccuracy is increased by every step, but in the present case it is practically of no account, which can easily be shown.

For every tie-line, the expression $\frac{v^2}{s}$ is computed; $v$ means the correction to the line, and $s$ is its length in km. By using the approximate formula for the mean error ($m$) per km.

$$m = \sqrt{\frac{1}{n}\left[\frac{v^2}{s}\right]}$$

The following values for the different classes of lines are arrived at:—

| | | | |
|---|---|---|---|
| 1st class. | Number of lines 85 ; | $m$ | = 1·27 ± 0·10 |
| 2nd ,, | ,, ,, 65 ; | $m$ | = 1·45 ± 0·13 |
| 3rd ,, | ,, ,, 48 ; | $m$ | = 1·58 ± 0·16 |
| 4th ,, | ,, ,, 5 ; | $m$ | = 2·06 ± 0·65 |

From this it will be seen that there is an unmistakable rise in the mean error, as was to be expected. So as to be in a better position to estimate the real importance of the computed mean error, the uncertainty of applying the proper mean error of each line is indicated by the formula $(m) = \frac{m}{\sqrt{2n}}$ where $n$, as before, denotes the number of lines.

It shows that the mean error on the last class of lines $\alpha, \beta, \gamma, \ldots$ is naturally very variable, because it is only dependent upon five lines.

The loss of exactness caused by the division of equalisations is without consequence for the practical use of the levelling, and, moreover, unavoidable; while, as before stated, a collective equalisation would be an exorbitant task.

It should be noted that the mean error per km., whether this is derived from the differences of the duplicate levelling, $d$, or from the corrections found by the equalisation, in both cases is nearly the same —about 1 mm. This is particularly satisfactory, as just this value was adopted as the base for fixing the allowances of errors.

This particularly good conformity between the value of the mean errors, deduced in two ways, entitles one to assume that a reliable expression for the real precision of the levelling has been arrived at, and that no fear need be entertained that it will be encumbered with systematic errors.

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**Stafford Waterworks Extensions.**—The Stafford Corporation waterworks at Milford, which were opened in 1890, after years of failure in the search for water, have been considerably enlarged to meet the increasing demands, and the new machinery was formally started lately. The extensions include the erection of a new engine and boiler house, the installation of a new pumping engine, the deepening of the well to 114 ft. from the surface, the construction of a new rising main to the reservoir, and the laying down of a main from the reservoir to Shugborough Hall. The new engine is capable of raising from the well and delivering into the reservoir at an elevation of 280 ft. 1,000,000 gallons of water in twelve hours, which is equal to about two days' supply. The total cost of the work is about £10,000. It has not been necessary to raise a loan for the purpose, the Waterworks Committee having year by year laid by a sum out of revenue for the purpose.

**Refuse Collection in London.**—Greenwich Borough Council have approved certain amendments in the by-laws of the London County Council as to the collection of house refuse, which have been proposed by the Finsbury Borough Council. The first amendment suggested is that in districts to be selected by the borough council, after written notice to the persons concerned, the occupiers should be required to deposit the refuse for collecting purposes in such conveniently accessible position as the borough council may prescribe, as is the case where a daily collection is in operation. The other matter in which the necessity of a further alteration of the by-law is suggested is that while Clause 18 of the by-laws made under sec. 39 (1) of the Act required the provision of a receptacle fulfilling certain requirements, by Clause 6 of the by-laws made under sec. 16 (2) of the same Act the use of a "movable receptacle" only was required. This allowed the refuse to be placed on the footway in uncovered wooden boxes and other quite unsuitable receptacles, with the result that frequently their contents were scattered by the wind.

## REINFORCED CONCRETE PRACTICE.

### MR. FIANDER ETCHELLS AT THE CONCRETE INSTITUTE.

In continuation of the notice in last week's issue of the meeting of the Concrete Institute, held on the 11th inst., we print below an account of the remarks of Mr. E. Fiander Etchells, F.PHYS.SOC., A.M.I.MECH.E., in the discussion of Mr. Maurice Behar's paper, entitled "The True Bending Moments of Beams with Various Degrees of Fixity." That paper criticised the proposed regulations of the London County Council, and the reply of Mr. Etchells, who is on the staff of the London County Council, is therefore of importance.

Mr. ETCHELLS said the adoption of reinforced concrete work depended upon two factors—first, its cost, and second, its safety—and we should seek a reasonable compromise between these two divergent ideals—that was to say, we wanted the greatest stability with the least cost. He had heard the doctrine that reinforced concrete was subject to the laws of a superstatic of a recondite character, and that reinforced concrete construction was one of the occult sciences, whose laws transcended the laws of physics and of ordinary matter. But now that phase was passing away, even among the specialists themselves. The specialists had tried to lift reinforced concrete out of its cradle of empiricism and put it on a more settled basis. The British specialist had recommended that in all important cases the bending moments under all possible conditions of loading should be accurately determined, and the beams designed at each point in their length to resist the maximum bending moment which might occur at such point, but for small ordinary floors, a sufficiently accurate result would be obtained by using a bending moment of $\frac{wl}{12}$, both over the support and in the centre of the span, for continuous beams.

The second report of the Joint Committee of the Royal Institute of British Architects recommended that the bending moments should be calculated on ordinary statical principles, and the beams or slabs designed and reinforced to resist these moments. Where the maximum bending moments in beams or floor slabs, continuous over three or more equal spans and under uniformly distributed loads, were not determined by exact calculation, the bending moments should not be taken less than $-\frac{wl}{12}$ at the centre of the span, and $-\frac{wl}{12}$ at the intermediate supports. That raised the question as to what the ordinary statical principles were. Would it be in accordance with the ordinary statical principles if, knowing that there is a bending moment of $\frac{WL}{12}$ at the support, we only provided for $\frac{WL}{40}$ or $\frac{WL}{24}$? The report spoke of exact calculations, but the most exact calculations they had were based principally on Clapeyron's famous theorem of three moments, which was first published in "Comptes Rendus," about 1857. It was based on several assumptions, one of them being the constancy of the inertia moment. To solve the problem, it was necessary to employ the double integration of a differential equation, and though they worked out the numerical result to the furthest decimal, what was the good of the result if there was a basic assumption that was far from the truth? Speaking of steel work, where there was admittedly a greater degree of continuity, in general it might be said that the bending moments at the supports next the end were always greatest, and were there about $\frac{WL}{10}$, and near the centre supports they were nearly uniform at about $\frac{WL}{12}$.

Since the draft regulations were written, they had from America, the land of up-to-dateness, two further reports, or codes, and they both fully supported the draft regulations in respect of the bending moments. The Joint Committee representing the American Society of Civil Engineers, and the principal scientific institutions over there, recommended: "That for beams the bending moment at centre and at support for interior spans should be taken at $\frac{WL}{12}$ for both dead and live loads." Then, again, it went on to say: "For spans of unusual length more exact calculations should be made. Special consideration is also required in the case of concentrated loads. Even if the centre of the span is designed for a greater bending moment than is called for by the previous paragraph, the negative moment at the support should not be taken at less than the values there given." Furthermore, it was stated that: "In the design of T-beams, acting as continuous beams, due consideration should be given to the compressive stresses at the support." The New York code, which came into force this year, stated that: "The bending moments at centre and support for beams or girders continuous over two or more supports should be taken at $\frac{WL}{12}$." The regulations of the Royal Prussian Ministry said that: "If conditions at support produce restraint and continuity of slabs and beams, the bending moments which appear at those points must have reinforcement placed near the upper stressed surface in proportion to the bearing area. If a continuous beam or slab cannot be computed, or in regard to the latter, if no restraint is certain at a beam or wall, then, with equal panels and uniformly distributed load, the moment is not to be taken less than $\frac{WL}{8}$ over the supports, or than $\frac{WL}{10}$ at the centre of panels." It had been said that the draft regulations under discussion would prohibit the use of reinforced concrete; that it would kill the trade. In reply, he asked whether the reinforced concrete trade was dead in Germany? Was it dead throughout the United States?

With regard to the breadth of T-beams, they were also told that the regulations would militate against the use of reinforced concrete, but that did not seem probable when they bore in mind that the particular regulation referred to was suggested by the Committee of Specialists themselves. They unanimously and on their own initiative recommended that the width of the area under compression in T-beams should not be greater than fifteen times the thickness of the slab or flange. The New York code revised this year stated that the breadth of the compression flange of the T-beam should not exceed twelve times the thickness of the slab, plus the breadth of the rib. Therefore it would appear that the regulation under discussion of fifteen times the thickness, as recommended by the specialists themselves, was good practice, and also more or less accorded with international practice.

Taking the ratio of the breadth of the flange to the span of the beam, the regulations of the Royal Prussian Ministry said they should only take one-sixth of the span as the breadth of the rib. The New York revised code gave the same figure. The American Joint Committee were a little more lenient; they said they might take one-fourth of the span. The London County Council regulations allowed twice the width of the Prussian, twice the width of the New York, and permitted a breadth of one-third of the span. The complaints seemed to arise irrespective of the weight of evidence.

With regard to formulæ generally, it appeared to him that formulæ represented the engineer's shorthand, and were a symbolic method of representing the truth, and so long as we did not mistake the symbol for the truth itself, all would be well. Formulæ, after all, were merely epigrammatic methods of stating the laws of science. It had been well said that "in physics the memory disburdens itself of its cumbrous catalogue of particulars and carries centuries of observation in a single formula." The regulations were given in words or in formulæ, whichever were the most convenient. Equations were vitally necessary, and they were necessary to ensure that the stresses were within the limits set by the regulations. Everyone had known that many times people had made the assertion that the stresses were under 600 lb. per square inch after having made their own assumption about the bending moment. They knew they had only to make the denominator in the bending moment equation what they liked, and they would get their stresses low enough to comply with any regulations.

Mr. BEHAR said he was of opinion that regulations framed for the purpose of becoming official and legal should not impose formulæ, but only principles, enabling formulæ to be established, or, in any case, if formulæ were given, he was of opinion that these should be given as examples of what would be required, but that these particular formulæ alone should not actually be imposed.

Mr. ETCHELLS suggested that, if principles only were given, very few architects, surveyors, magistrates

or builders would be able truly to affirm whether the statical requirements of the regulations had been complied with. If merely principles were laid down we would require to be Rankines, Clapeyrons and Eulers as well, to convert the basic principles into a form that would be suited for the practical work of design. Basic principles might please the professor of engineering, but would they help the busy builder who had to put up buildings in a hurry?

Mr. Behar contended that an engineer or architect who might be called upon to apply regulations concerning reinforced concrete should have a sufficient knowledge of the laws of mechanics to be able to deal with the various problems which he might have to study, and to oblige him to follow certain formulæ would practically imply that he was incapable of exercising proper control of any scheme or problem in reinforced concrete which he may have to consider.

Mr. Etchells held that such a conclusion was unjustified. The architects and engineers were consulted before any regulations were sent forward to the allowing authority. Then, since the architects and engineers were consulted before the regulations were made, such consultation effectively admitted their competency, not only to carry out the works, but to criticise the draft and to participate in the work of law making. He maintained also that it would be easier to see whether a particular design complied with certain stresses than it would be for the building authority, or any officers of the building authority, to discriminate as to who were competent and who were not. That would be a very arduous task, and a very difficult task, and one open to very grave abuses, and it was much easier to judge a plan than to judge a man.

## MUNICIPAL ENGINEERS AS ARBITRATORS.

### THE BRISTOL DECISION.

Upon the agenda of the Camberwell Borough Council for Wednesday last there appeared the following communication sent to the council from the Corporation of Bristol:—

March 25, 1912.

John Aird & Co. *v.* The Corporation of Bristol.

Dear Sir,—It has been the practice of the Bristol Corporation, in common with many other local authorities, to insert in contracts for the execution of extensive works a clause referring disputes to the arbitration of their own engineer. The validity of the clause was established in the case of Jackson *v.* Barry Railway Company (1893, I., Ch. 238), and experience has proved that it is a very necessary provision in the interest of employers, because it prevents contractors from bringing pressure on the engineer to decide in their favour the numerous points arising in the execution of large works by constantly threatening an appeal to arbitration against the engineer's decisions. The Court of Appeal, while expressing its agreement with Jackson's case, has in several recent instances in which local authorities have been concerned in fact departed from it, and has refused to give effect to provisions referring disputes to the employer's engineer.

The latest example is that of Aird *v.* The Corporation of Bristol, where the Court of Appeal, after expressly exonerating the engineer from all the charges of conduct unfitting him for the position of arbitrator made against him by the plaintiffs, refused to refer the matters in dispute to his decision. The ground of the decision was that, out of a very large number of disputes, two items (amounting to less than one-fourth of the total claim) did not fall within the arbitration clause. Assuming this to be the case (although counsel for the corporation have expressed a strong opinion to the contrary), it does not appear to afford a sound reason for refusing to give effect to the agreement as regards the balance of the claim.

The Committee of the City Council of Bristol, who have had the conduct of the action, are of opinion that it involves a principle of great importance to local authorities; they consider that, inasmuch as the case is not complicated by any finding adverse to the conduct of the engineer, the question actually raised is as to whether the Court has power to eliminate the arbitration clause from the contract, and their counsel advise that it is a case in which an appeal may very properly be taken to the House of Lords.

Very considerable expense has, however, already been incurred in contesting the matter up to the Court of Appeal, and the committee are disinclined to go further unless they can obtain some assistance. They have therefore requested me to inquire whether, in view of the uncertainty now existing as to the form in which contracts for works should be prepared, your council would be willing, with others, to join Bristol in sharing the cost of an appeal to the House of Lords.

I enclose a copy of the arbitration clause and the judgments in the Court of Appeal.

Edmund J. Taylor,
Town Clerk.

The Works Committee of the Camberwell Borough Council, in a report on the subject, state that they are opposed to the council joining with others in sharing the cost of an appeal to the House of Lords. At the same time they recommend that the Bristol Corporation be informed that the following clause has been adopted for most of the contracts by the borough council—*viz.*:—

> Interpretation of Contract.—In case any difference shall arise between the council, or the borough engineer, and the contractor touching the construction or meaning of this contract, or as to the rights or liabilities of either party hereunder, or in respect of any alleged infringement or non-performance of the terms hereof, by either party, or as to the quality, quantity, description, weight or measure, or as to the amount to be paid by either party, or as to anything done or omitted in the execution of this contract, such difference shall be referred to the arbitration of an arbitrator to be named by the Registrar for the time being of the London Chamber of Arbitration, at the request of either party, after ten days' written notice given or addressed, and sent by post to the other party; and this shall be deemed a submission to arbitration within the Arbitration Act, 1889, or any other statutory qualification thereof, and such reference to arbitration may be made either during the progress of the work or after the termination thereof; but before any such arbitration appeal shall be entered into, the contractor shall deposit the sum of £10 with the town clerk, and if the award of the arbitrator is against the contractor, the amount deposited by the contractor shall be forfeited to the council, and if such award is in the contractor's favour, the amount of £10 so deposited shall be returned to the contractor,

and that the only contracts in which the borough engineer (Mr. W. Oxtoby) is sole arbitrator are the new streets, and certain constructional works where the clause is in the following terms—*viz.*:—

> If any difference or dispute shall arise between the council and contractor as to the construction of this contract, or as to the rights, duties or liabilities of the contractor or the council thereunder, or as to the due performance of the contract by the contractor, or as to any materials or workmanship, or any matter or thing arising out of this contract, or in relation thereto, the same shall be referred to the award and decision of the borough engineer as sole arbitrator, whose decision shall be final and conclusive between the parties, and the borough engineer shall have power over the costs of any proceedings under this clause.

**Medical Officer and the Dust Nuisance.**—At a meeting of the Welshpool Town Council last week the medical officer of health, Dr. A. Crump, advised that all the main streets should be tar macadamised without delay "in view of the danger to health of the dust nuisance." In the result the council decided to do a comparatively small proportion of the streets recommended. Upon this Dr. Crump declared that the streets in Welshpool were a disgrace. Which was of more value—human life or whether a horse could stand up? To do the roads within the limits the council proposed was sheer nonsense. They must be done right through the town, and if it were not done by the council he would do all in his power to get the Local Government Board to compel the council to do it. He urged the council to reconsider the decision and have the roads laid in a proper sanitary way as they were in nine-tenths of the towns of Great Britain. A number of members cheered the medical officer's remarks, but the question was not reopened.

# ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

## VISITS TO ACTON AND CHISWICK.

The members of the above-named association met at Acton on Saturday afternoon last for the purpose of inspecting the method of sewage disposal in operation in the district, and were met at the pumping station by Mr. Councillor W. J. Boissonnade, the chairman of the council, and Mr. Councillor G. P. Pratt, A.R.I.B.A., the chairman of the Works Committee.

Mr. Boissonnade, in welcoming the association, remarked that he had been associated with the sewage scheme from its commencement up to the time of its completion. In fact, he looked upon the scheme as his own particular infant, and hoped that the members after their inspection of the works would be thoroughly satisfied with the arrangements made for the disposal of sewage there.

### ACTON SEWAGE WORKS.

Mr. C. J. Yorath, Assoc.M.Inst.C.E., deputy engineer and surveyor, in explaining the details of the scheme, said that unfortunately Mr. F. Sadler, the surveyor, was unable to be present, and he had requested him to meet the association and explain, as well as he was able at such short notice, the system of disposal of Acton's sewage and storm water. Mr. Yorath, continuing, said the development of Acton's sewage scheme to its present stage had been one of the most difficult questions with which the council had had to deal, but he thought the members would agree after making a thorough inspection of the works that the district had one of the most efficient schemes of sewage disposal which it was possible to have under the circumstances.

### PAST METHODS OF SEWAGE DISPOSAL.

Mr. Yorath said he would endeavour to describe as shortly as possible the various schemes of sewage disposal which Acton had had prior to the scheme which it was proposed to inspect that day. Previous to 1855 the drainage of Acton entered the Stamford Brook, which ultimately discharged direct into the Thames at Hammersmith Creek. In 1855 the Stamford Brook became vested in the Metropolitan Board of Works, who diverted it from the river Thames and connected it direct with the drainage system of London.

This might be termed the starting point of Acton's troubles, that was to say, when the Metropolitan Board of Works received into the London sewers the whole of the drainage of Acton, both soil and surface water. Owing to the district of Acton developing somewhat rapidly and London in consequence having to receive a larger quantity of soil and surface water, the Metropolitan Board of Works obtained an injunction in 1882 to prevent the Acton Local Board sending into their sewers any more soil water than came from the then population of Acton of 20,000. It was then decided by the Acton Local Board upon the report of their surveyor, in conjunction with Sir Joseph Bazalgette, to lay down a new system of sewers on the separate principle and construct sewage-treatment works on the site of the present pumping station. The whole of the surface water of the district, and the soil water of the 20,000 population, still went to London, while arrangements were made to bring the soil of the increased and future population to the sewage works for treatment by chemical precipitation. This scheme was completed in 1887. Between 1887 and 1905 the soil drainage of Acton was treated either by the precipitation process or on the bacterial principle—which was adopted in 1896.

### PRESENT METHOD OF DISPOSAL.

In 1905 the Acton Sewage Act was passed, which provided for the whole of the soil drainage for all time being discharged into the London sewers, and the storm water being discharged direct to the Thames.

The principal reasons why Parliamentary powers were sought to compel London to take the whole of the soil drainage of Acton were shortly as follows:—

(1) Frequent floodings at the sewage works.

(2) The bacterial system was only sufficient to deal with a population of 12,000, whereas the population of Acton at that time was about 52,000.

(3) The estimated cost of extending the sewage works was £100,000, and it would have been almost impossible to obtain sufficient land in the vicinity of the works without demolishing a large number of houses.

### ADVANTAGES OF SENDING SEWAGE TO LONDON.

(1) Where as formerly each new house had to construct separate drains in future, combined single drains need only be constructed.

(2) The district had only to repair, cleanse and flush one sewer instead of two.

(3) The sewage problem was settled for all time.

(4) Removal of sewage-disposal work from a thickly populated and residential area.

### REQUIREMENTS OF ACTON SEWAGE ACT.

The principal requirements of the Acton Sewage Act are:—

(1) Discontinue sending storm water to London.

(2) London County Council to take soil drainage of Acton up to 50 gallons per head per diem of the population, with a maximum flow of 100 gallons at any one time.

(3) Pass through screening beds storm water up to a flow of 125 gallons per head per diem.

(4) Storm water when a rate of flow of 175 gallons per head per diem is exceeded to be sent direct to the Thames.

### HOW REQUIREMENTS OF ACT ARE COMPLIED WITH.

In order to bring the whole of the drainage of the district to the pumping station, so that the various volumes could be properly gauged, it was necessary to construct a northern intercepting sewer, and make various alterations to the existing sewers, and in order to comply with the requirements of the Act and those of the London County Council, elaborate means of gauging the varying flow of sewage and storm water were made.

The low-level sewers are connected to a sump below the electrical pumps, and the sewage and storm water is delivered by the pumps into a receiving chamber at the north-west corner of the works. Into this chamber the high-level sewer also discharges, whence the whole discharges into a channel which leads to two circular orifices. Each of these orifices is designed large enough to take a flow equal to 50 gallons per head per day of the population, which for the purpose is 60,000; so that when both are open the maximum flow of 100,000 gallons can pass through. If the quantity of sewage and storm water is too large to allow of its being discharged through the orifices and thence to London, it heads up to the level of a long weir, when, if the volume still increases, it flows over into a channel adjoining and is conveyed to the storm-water filters. If the volume should still further increase it will eventually head up until it finally discharges over a weir and passes direct to the Thames through a storm-water sewer, which was specially constructed under the Act, and is 6 ft. in diameter.

### PUMPS.

Fewer problems (said Mr. Yorath) present greater difficulties than storm pumps.

After careful consideration, it was decided to instal electrical pumps for the following reasons:—

(1) The capital cost for the motors and pumps is small, and the plant is compact and easily housed.

(2) The pumps are immediately set to work automatically by a float when the water in the sump rises.

(3) There need be very little supervision.

There are three pumps of the centrifugal type, coupled with electric motors, a small one (10-in. diameter, of 30 b.h.p.), to deal with the dry-weather flow, and two large ones (22-in. diameter), to deal with the storm water (175 b.h.p. each). The discharge of the dry-weather flow pump is fixed at 2,000,000 gallons per diem, which is two and a-half times the average extreme dry-weather flow from the low-level portion of the district. As a stand-by for the dry-weather flow pump, the old horizontal pumps were repaired and retained. The storm-water pumps will deal with an estimated flow of 26,000,000 gallons per diem when the district is fully developed.

### AUTOMATIC RECORDING APPARATUS.

At the extreme south end of the works an Adie's automatic recording apparatus is fixed, recording on a weekly chart the daily flow of sewage to the London sewers, so that the interests of the London County Council are not only guarded by the orifices before mentioned, but also by the chart, a copy of which is sent to that authority every week.

The whole of the works were designed by Sir Alex. Binnie & Son.

Before closing his remarks, Mr. Yorath said he wished particularly to point out to the members that

the works which they would afterwards inspect were not a sewage-treatment works in any shape or form, but were purely a pumping installation, where arrangements were made for properly regulating the flow of sewage to the London sewers, and for filtering the storm water up to 125 gallons per head of population before being discharged into the Thames.

The members afterwards inspected the works, Mr. Yorath further explaining the details of the scheme.

### THE CHISWICK WORKS.

The sewage works of the Chiswick Urban District Council, which were subsequently visited by the members, were fully described in our issue of May 20, 1910.

The district, which last year had a population of 38,705, is bordered on three sides by the river Thames, and is very flat, the sewers generally being laid at flat gradients. The whole of the sewage has to be pumped to command the tides. Some of the branch sewers have to be flushed regularly by means of a water van to prevent the accumulation of deposit in them. The surface water from streets in the district is partly connected to surface-water drains and soakaway pits in the subsoil, but many of these latter have connections with the sewers. Practically the whole of the roof water from houses and paved yards is admitted to the sewers.

The daily average dry-weather flow of sewage amounts to 1,760,000 gallons, or 45 gallons per head, which is accounted for by the large quantity of waste waters from breweries, factories, and steam laundries, and also by subsoil leakage into some of the older main sewers, which are laid in water-logged ground. During heavy rains storm-water diluted sewage frequently reaches the works at a rate exceeding ten times the average hourly rate of flow in dry weather, and it is necessary to pump at this rate to avoid flooding in parts of the district. It is seldom, however, that the total flow in twenty-four hours in wet weather exceeds three times the volume of the dry-weather flow. The rainfall of half an inch will produce a total flow of twice the average dry-weather flow. The sewage is treated with milk of lime, prepared from slaked Buxton lime, alumino-ferric and copperas. The dose of chemicals is varied to suit the requirements of the sewage, but the usual amounts employed per gallon of sewage are eight grains of Buxton lime and five grains of alum and copperas.

There are eight precipitation tanks, having a total capacity of 1,660,000 gallons, and from these the effluent passes on to the filter-beds, passing thence into the river.

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**River Pollution at Newark.**—When prosecuted by the Notts County Council for continuing to pollute the river Trent with sewage, the Corporation of Newark, through their counsel, raised no objection to a restraining order being made.

**London and Overhead Traction.**—An instruction to the Committee on the London Tramways Bill to introduce provisions to prevent the adoption of overhead traction in Stepney, and to enforce the continuance in that district of the underground conduit system, was carried in the House of Commons on Monday night by a majority of 102.

**Lower Thames Valley District Surveyors' Association.**—The annual dinner of this association—the president of which is Mr. E. Willis, Assoc.M.Inst.C.E., engineer and surveyor to the Chiswick Urban District Council—will take place on Saturday, May 4th, at Chiswick Town Hall. In the course of the afternoon visits will be paid to the isolation hospital and the Metropolitan Electric Supply Company's power station at Willesden and to the Brentford Gas Company's works. Full particulars as to times and other arrangements will be published in our next issue.

**Oswestry Rural Roads.**—Mr. T. Harold Davies, highways surveyor to the Oswestry Rural District Council, has issued his second annual report. "This past year," he says, "has been an exceptionally trying one for the roads, last summer being so very dry and the winter being just the reverse. During the summer the roads in the district did not pick up much, yet when the wet weather came it showed that they wore as much when dry as during an ordinary summer. The expenditure during the last year amounted to £3,503. This district, although having considerably more mileage of roads than any other district in the county, maintains its roads in a manner comparing favourably with the others, this probably being accounted for by the quantity of local limestone quarries in the district, and being well served by railways and canals."

## SEWAGE PURIFICATION IN THE EAST.

### CORAL AS FILTERING MATERIAL.

The authorities at Singapore are apparently congratulating themselves upon having made a great discovery, if the opinions expressed in an article in the *Straits Times* of March 14th may be taken as a guide.

We are told that some useful data which will be applied to the new sewage scheme have been gained from a series of experiments, and that "to technical eyes the results throw a new light on the problem of the disposal of sewage."

Three small experimental beds have been in existence for some months, and have been treating sewage which is prepared by shooting daily a quantity of nightsoil into a mixing chamber, where it is liberally diffused in water. Thence it passes into a settling chamber, where a process of decomposition takes place, leaving a thin, muddy mixture to be carried to the beds. The liquid is distributed over the beds by means of automatic tilting troughs. We are told that various media have been tried in the beds, and that the results have differed enormously. Coke, laterite and coral were used, and the results of filtration are given as follows in parts per 100,000. The crude sewage contained 1·60 parts of albuminoid ammonia, and the oxygen absorbed in four hours was 6·14. The coke effluent contained ·05 parts of albuminoid ammonia, the laterite effluent ·07 parts, and the coral ·005 parts. The oxygen-absorbed figure was ·30 in the case of the coke, ·41 in the case of the laterite, and ·16 in the case of the coral.

A change of media was made later in two of the beds. Coral was retained, but the other media were replaced by clinker and granite. The results were as follows:—

The crude sewage contained 1·25 parts of albuminoid ammonia, and the oxygen-absorbed figure was 5·25. The coral effluent showed ·018 parts of albuminoid ammonia, the clinker ·02 parts, and the granite ·085 parts. The oxygen-absorbed figure was ·177 for the coral, ·428 for the clinker, and ·457 for the granite.

These results are summed up as follows: "The technical expert is enlightened and rejoiced by the discovery of a new and splendidly successful medium for filtering sewage, which surpasses the virtues of coke (the most universal medium in use in the West) by a point of decimals. In other words, coral is ten times as efficient as coke."

It is stated that the proposed new sewage disposal works will cover an area of about 20 acres.

In view of the optimistic expressions quoted, it is worthy of consideration that in the case of the coral filter the sewage was brought into contact with a mass of filtering medium composed of lime. In such a case it would be expected that considerable deposition of solids and clarification of the effluent would result, also that the filter would rapidly clog up and lose its efficiency. This loss of efficiency appears to have actually taken place, for while at first a crude sewage containing 1·6 parts of albuminoid ammonia showed ·005 parts of the albuminoid ammonia in the effluent, we find later on that a weaker sewage containing 1·25 parts of albuminoid ammonia showed ·018 parts of the albuminoid ammonia in the effluent. Similarly the oxygen-absorbed figures were in the first case 6·14 and ·16, and later 5·25 and ·177. It would also be interesting to know what the loss of capacity was in the coral filter, as compared with the others. Also, nightsoil mixed with water is a very different thing from sewage, and any calculations as to the volume of sewage which can be treated per cubic yard of filtering material based on the experiments might be misleading. In comparing the relative efficiency of filtering materials, it is very important to take into account any chemical action which may take place on the medium. This may easily upset all calculations if the material is of such a character that it can be so attacked. Then there is the subsequent disintegration following chemical action which must be taken into account. In deciding to use coral at Singapore, it does not appear that these facts have received the attention they require, and it appears to us to be more than doubtful whether coral is likely to give a good result for the reasons given above.

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**A Borough Council Fined.**—Summoned for failing to remove house refuse after forty-eight hours' notice, Lewisham Borough Council were on Wednesday fined 2s. 6d. and 3 guineas cost.

## CORRESPONDENCE.

*"Men are never so likely to settle a question rightly as when they discuss it freely."*—Macaulay's *"Critical and Historical Essays."*

### NORTH-EASTERN DISTRICT: INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*To the Editor of* The Surveyor.

Sir,—Much as I would like to do so, I cannot permit the letter in your last issue under the *nom de plume* "Auld Lang Syne" to pass unchallenged. In the first place I would suggest that the writer should disclose his identity.

Had time permitted, after the receipt of the forms of nomination, I submit that it would have been better for the district secretary, or one of our representatives upon the council, to have convened a meeting of North-Eastern members to discuss the question of nominations for the various offices. In my opinion, this applies to all the districts of the institution.

The names mentioned in my circular letter of April 3rd have evidently found favour with a considerable number of members who have since communicated with me.

My intention was not to "dictate," and I give credit to every member of the North-Eastern District for being capable of voting and using his own discretion now the ballot list is issued. One very desirable gentleman has been nominated as district chairman without his consent being obtained—this may apply to others.

As a colleague, and one desiring "unity" in the ranks of all members of the Institution of Municipal and County Engineers (members, associate members and students), I ask "Auld Lang Syne," in his own name, unreservedly to withdraw the paragraph in regard to my connection with the Institution of Municipal Engineers.

I do not hold the office he refers to, and resigned membership in that institution almost a year ago.

Would not "Auld Lang Syne" have some difficulty in finding an urban district engineer who could devote the time and expense to attend regularly the many council and committee meetings in London and other centres?

Taking the date of "Auld Lang Syne's" letter, he "refrained" from voting before even being officially asked to do so, as the voting papers were not issued until some days after he had written. Will "Auld Lang Syne" make himself more conversant with the new by-laws and regulations of the institution and stick to facts before rushing into print in the manner he has done?—Yours, &c.,

J. H. Drew,
Engineer and Surveyor.

Town Hall,
Horbury.
April 21, 1912.

### METROPOLITAN DISTRICT: INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*To the Editor of* The Surveyor.

Sir, I should be obliged if you would kindly insert in the next issue of your journal the following letter which I have addressed to the secretary of the institution.—Yours, &c.,

J. Rush Dixon.

Town Hall,
Woolwich.
April 19, 1912.

[COPY OF LETTER.]

Town Hall,
Woolwich.
April 18, 1912.

Dear Mr Colt,

I have just received a ballot paper with names put up for the Metropolitan District, and find my name under the heading of "District Secretary." I have never given any authority for this, and under no circumstances will I allow it to stand in competition with Mr. Scorgie. I cannot again undertake these duties, and must ask you to see that my nomination is struck out, and oblige,

Yours faithfully,
J. Rush Dixon.

### GRANTS TO OFFICIALS.

*To the Editor of* The Surveyor.

Sir,—Can you assist me to ascertain in what towns grants have been made to the borough engineer or other officials for the preparation of new sets of by-laws, and the amounts of any grants so made?

Only those who have prepared such new sets can conceive the amount of trouble and consideration necessary in doing so.

As one having done this, I consider I am entitled to extra remuneration for this work, and to assist one in getting it I shall be grateful for your aid in obtaining this information, for to move the ordinary council no other lever is so strong as precedent.—Yours, &c.,

Jay.

April 19, 1912.

[We invite the assistance of readers in connection with the above.—Ed. Surveyor.]

## INSTITUTION OF CIVIL ENGINEERS.

### STUDENTS' ANNUAL DINNER.

The thirty-seventh annual dinner of the students of the Institution of Civil Engineers, which took place at the Trocadero Restaurant, Piccadilly-circus, on Wednesday night, was attended by a company numbering between sixty and seventy. The chair was taken by Dr. W. C. Unwin, F.R.S., president of the Institution of Civil Engineers, and those supporting him included Dr. T. H. T. Tudsbery (secretary of the institution), Mr. T. Frame Thomson, Mr. Arthur J. Hart, Captain M. Riall Sankey, Mr. G. Sinnett, Mr. Latham Bradley, Mr. H. K. G. Bamber, Mr. T. Douglass, Mr. Basil Mott, Mr. G. Midgley Taylor, Mr. G. N. Yourdi, Mr. W. F. Spear, Mr. A. W. E. Harris, and Mr. Percy G. Bowie (hon. secretary London Students' Committee).

After the loyal toasts had been duly honoured,

Mr. Arthur J. Hart proposed "The Institution, the Secretaries of the Institution, and our Guests," and congratulated the students upon having the president in the chair that evening. He thought the great aim of every young engineer ought to be to endeavour to develop and increase his acquaintance with the engineering branches other than those in which he might be engaged.

The Chairman, in response, observed that the Institution of Civil Engineers was primarily a great scientific society engaged, like kindred societies, in the furtherance of the particular pursuit in which its members were engaged. It sought to raise the status of the engineer, and it had become to be recognised that membership of the institution was a credential which it was the business of members to see was maintained at the highest plane. To a large extent the spirit of equality prevailed in the engineering profession; each had a free field for the exercise of his ability. In advising the students to cultivate the quality of trustworthiness, Dr. Unwin quoted the exhortation of Captain Smith to the seamen of the "Titanic," "to be British." The men on the doomed ship recognised and responded to the call upon their character and courage, and among others the engineers stood to their posts to such good purpose that it was no doubt due to them that the ship was kept afloat as long as she was.

Dr. Tudsbery, in the course of his reply, remarked that the students took a larger share in the institution than they did in his student days, and they deserved to. He was sure it was a great joy to all concerned in the administration of the institution to feel that the students were really part of the institution, and at one with them in their endeavour to discharge their duty to it and promote its interests, prosperity and prestige.

A response was made on behalf of the guests by Captain M. Riall Sankey.

"The Students" was proposed by Mr. T. Frame Thomson, and acknowledged by Mr. Percy G. Bowie.

The programme of music and humorous sketches proved a very popular feature of the proceedings, the selections by Mr. R. Ganthony being specially applauded. The other entertainers were Messrs. P. Fearnley, Wilson, James, and Ambrose Vink.

The annual general meeting of corporate members of the Institution of Civil Engineers will be held on Tuesday next to receive the report of the council, and to elect the council and auditors for the ensuing year.

**Whaley Bridge Sewerage Scheme.**—The Whaley Bridge Joint Sewerage Board have received sanction from the Local Government Board to carry out the scheme, estimated to cost £9,500, for the main sewerage and sewage disposal works for dealing with the sewage of the united districts of Whaley, Disley, Taxal, Chinley and Fernilee. The engineers to the board, Messrs. Brady and Partington, Chapel-en-le-Frith, have prepared the scheme, and it is expected the work will be put in hand as soon as possible.

## SOME RECENT PUBLICATIONS.*

Everybody's Guide to the National Insurance Act. By Thomas Smith, Barrister-at-Law. Price 1s. nett. London: Chas. Knight & Co., Limited.

The Alphabet of the National Insurance Act, 1911. By C. G. Moran, Barrister-at-Law. Price 1s. nett. London: Methuen & Co., Limited.

National Insurance Act: A Full Explanatory Digest. By "An Old Parliamentary Hand." Price 6d. London: Wm. Macdonald & Co.

The National Insurance Act, 1911, has been aptly described as the most complicated Act of modern times, and there can be no doubt, since it directly affects all classes of people, as to the necessity of some guide to its intricate provisions.

Mr. Smith, in his able "Guide," neglects all criticism of the Act, and merely seeks to afford assistance to those who desire explanation shorn of technicality. His explanations are well arranged for ease of reference and clearly expressed. The analytical table of contents and the index will doubtless be appreciated; and there is also an appendix containing the full text of the Act.

Mr. Moran's "Alphabet" is, as its title indicates, arranged under titles in encyclopædic form. Thus any desired subject may easily be referred to, while those who desire systematically to study the main provisions of the Act will find in the preface a list of the chief headings in the order to which they should be referred. The information is clearly and concisely set out, and the author's object—to state the terms of the Act in plain English and to collect in alphabetical order its provisions on each point of interest—has been well carried out.

The digest of the Act, by "An Old Parliamentary Hand," is not so full as either of those just mentioned. He has attempted the task of paraphrasing the Act into narrative form, and caters for the "man in the street," who will doubtless welcome the assistance which this little book will afford him in coming to an understanding of the main outlines of the Act.

Theory and Practice in Designing. By Henry Adams, M.Inst.C.E. Price 6s. nett. London: Constable & Co.

In this work Prof. Adams has dealt with the theory of structures, starting with the most elementary principles, and proceeding step by step to the more involved parts of the work. The book should appeal specially to students by reason of its excellent progressive arrangements, and because the use of the higher mathematics is altogether avoided; moreover, the whole subject is treated in the author's well-known lucid style. Among the many matters dealt with in the thirty chapters into which the book is divided, are the elementary principles of trigonometry; the strength of timber; bressummers and joists; riveting; lattice girders; box girders; design of steel roof trusses; stanchions; suspension bridges; theory of arches; retaining walls, and many others. It will thus be seen that, in addition to being an excellent book for the student, Prof. Adams' new work will also be very useful for reference by engineers and architects who are concerned in the practical work of design. It is well illustrated throughout, and is provided with a good index. It is quite distinct from other books on designing by the same author, and will be found to be complementary to them.

The West Country: Somerset, Dorset, Devon and Cornwall. Price 1s. nett. London: The Homeland Association, Limited.

[illegible] to go to the delightful West Country as a holiday tourist or to live permanently, this book will be of the greatest use. It is on the plan of an illustrated guide to the places in the four counties dealt with, giving in each case practical facts as to [illegible] natural features, educational facilities, people attracted to and the like, but includes also [illegible] special articles on the district generally, evidence for these [illegible] health books on the West Country can especially [illegible] and well-compiled sections [illegible] and motoring. Cheap as the book is (each copy must have cost considerably more to produce than the price charged), it is admirably bound and printed, and the illustrations are numerous and unusually well reproduced. We strongly recommend application to the Homeland Association for a copy of the full list of their publications, which now number over one hundred. They are, in our judgment, quite the best of their kind.

Men and Measures: A History of Weights and Measures, Ancient and Modern. By E. Nicholson, F.I.C., F.C.S. Price 7s. 6d. nett. London: Smith, Elder & Co.

In this volume the author tells in narrative form the history of the weights and measures which are or have been in common use, commencing with the story of the Cubits and of the Talents, and finishing with an account of the metric system and its conflict with the Imperial weights and measures. The author has fulfilled his task, which must have involved an immense amount of research, in an entirely satisfactory manner, and the reader's instinct of curiosity as to origins, coupled with the interesting style in which the book is written, prevents interest from flagging in the perusal of what might at first sight appear to be a rather dry subject.

Public Health Law. By Bertram Jacobs. Price 7s. 6d. London: Sweet & Maxwell, Limited.

In this book the author has attempted to provide within the space of 190 pages a guide to and an outline of the statutes which bear upon the subject of public health. In order to achieve this task it was obviously necessary to treat the various topics in a more or less highly condensed way, and Mr. Jacobs has exercised in the main a wise discretion in his selection of subjects for fuller treatment. The topics to which greatest space is given are those which may be summed up in the phrase "sanitary legislation" as distinguished from such subjects as streets and buildings, highways, by-laws, &c., which are mentioned more or less briefly. The book is intended more especially to assist candidates for various examinations in the subject, to whom it should prove useful. Its value to the legal practitioner, however, would have been enhanced by the citation of more cases and a rather fuller treatment of many branches of the law.

Highway Engineering. By Arthur H. Blanchard and Henry B. Drowne. Price $2 nett. New York: John Wiley & Sons.

This is a condensed record of the papers that were presented at the Second International Road Congress held at Brussels in 1910. This congress numbered 2,118 members, of whom 160 were from Great Britain. The object of the publication as stated in the preface, is to render available to the engineering profession the large mass of information relating to the construction and maintenance of roads and pavements that was presented at the congress, and the larger part of the book consists of a series of abstracts of the papers submitted during the proceedings.

*Denki-no-Tomo* (The Electrician's Friend), price 15 sen. From the offices at 6 Minami-Kinroku-cho, Kyobashi-ku, Tokyo, Japan, we have received a copy of the *Denki-no-Tomo*, and note that it was established in 1891, and claims to be "the oldest semi-monthly journal of electrical engineering, industry, science and finance." We are unable to comment upon the literary merits of its thirty-six pages, as they are printed in Japanese characters, but it is excellently produced typographically.

The 22nd annual edition of "The Handy Newspaper List" (London: Charles & Edwin Layton. Price 6d.) which has just made its appearance, is a publication which should be in the hands of every advertiser. With the exception of London, which, on account of its great importance as a publishing centre, is dealt with in the opening pages of the book, all the towns in the United Kingdom in which newspapers and periodicals are published are arranged in alphabetical order, making reference to the contents the easiest of matters.

Vol. xxxvii of the "Proceedings" of the Institution of Municipal and County Engineers covers the period of Mr. James Paton's successful presidency. The official account of the annual meeting at Plymouth takes up no fewer than 140 pages, and the reports of meetings at Hawick, Dublin, Redditch, Guildford, Torquay, Westminster, Croydon, Cambridge, Stratford-on-Avon, Govan, and Woolwich occupy the greater part of another 500 pages of the book, a feature of which, as usual, is a large number of inset plates illustrating papers read at the various gatherings. An excellent portrait of Mr. Paton serves as a frontispiece to the volume.

* As all the publications reviewed, or referred to as received, will be forwarded by the "Surveyor" Press, Ltd., on receipt of published price.

# Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

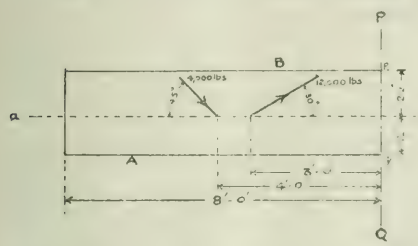
*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

## QUESTIONS.

This week answers are invited to the following questions:—

**238. Small Sewage Disposal Installation.**—Sketch and describe an installation consisting of a septic tank and filters for dealing with the soil sewage of about 750 persons, showing all the calculations for size of filters, &c. The filters are to be arranged so as to be capable of being enlarged if required. It is possible to have land treatment afterwards on about ½ acre to ¾ acre of land. The effluent is to discharge into a ditch, and must be kept to a high standard. The scheme is not meant to be permanent, and is only required for a period of about six years, until sufficient assessable value is created to apply for a sewer loan to connect to a now existing sewerage system. ("Somerset.")

**239. Stresses in a Beam.**—A B is part of a beam, of which *p q* is a cross-section, cut by the plane P Q; *a a* is the axis of the beam. Forces of 4,000 lb. and




12,000 lb. act at the inclinations and distances shown. The moment of inertia of the section is 12-in. units, and its area is 4½ sq. in. Find the total compressive and tensile stresses in the section *p q*. (E. A. B., *Leicester.*)

## REPLIES TO QUESTIONS.

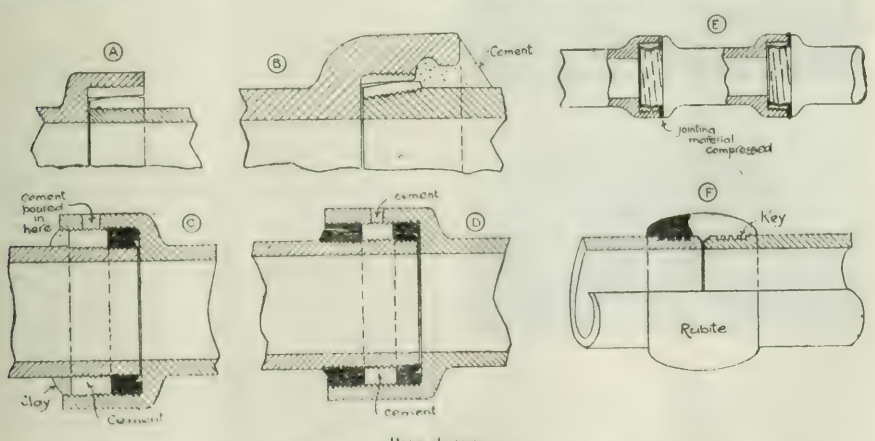
**240. Pipe Joints.**—Sketch and describe some forms of joint suitable for stoneware pipes to be laid in waterlogged ground. (T. R.)

(*a*) "Stanford" Joint.—This is formed of turned rings of the shape shown, made of a special composition, which firmly adheres to the pipe, and at the same time allows a little play. The joint is made by painting, tarring, or greasing the surfaces, and by giving a twist to the pipes to fit them closely together. It is made now by almost all manufacturers of pipes.

(*b*) "Double Seal" Joint.—This is similar to the "Stanford," but has, in addition, a deeper and undercut socket, so that after the pipes have been laid and tested, a fillet of cement may be placed all round the joint, so as to secure it. The concentric fitting of the pipes is ensured, and there is no risk of any obstruction being caused by cement being squeezed up inside the pipe. This joint is made by Messrs. Cliff and Jennings.

(*c*) Hassall's "Single-lined" Joint.—The object of casting on the rings is more particularly to centre the pipes, and hold them in position while the liquid Portland cement is being run in. The rings are not intended to come into contact with each other, but to have between them a cushion of plastic cement to receive and render harmless any grit which may be in the way, and, in addition, make a watertight joint when the Portland cement is setting.

(*d*) Hassall's "Double-lined" Joint.—In this case, also, plastic cement is used, so as to make a tight joint on each side of the groove left in the joint when the spigot end is in its proper position in the socket. The groove is afterwards filled with liquid Portland cement poured through three holes made in the socket for the purpose. Hassall's joints are now made by all the leading pipe makers.




Pipe Joint.

(A) The Stanford joint. (B) The double seal joint; (C) Hassall's single lined joint. (D) Hassall's double-lined joint, (E) Sykes' patent screw joint, (F) The "Rubite" pipe joint.

**241. Strength of Materials.**—Show how to find the moment of inertia of a tee section. What use is made of the moment of inertia in finding the strength?

**242. Joinery.** Show by sketches what is meant by the following terms:—(*a*) Lying panel, (*b*) raised panel, (*c*) frieze panels, (*d*) diminished style, (*e*) bolection moulding, (*f*) dovetailed backings to jamb lining.

**243. Water Supply.**—What kind of water acts upon lead? State the risk incident upon its use, and the means you would adopt for avoiding or reducing such risk. (M. C. E.)

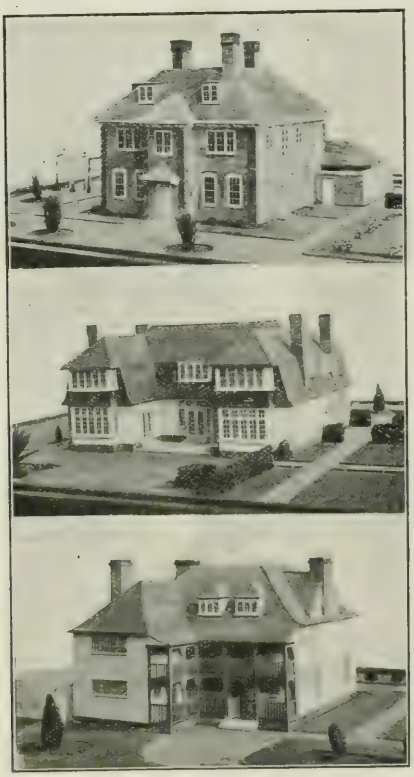
(*c*) Sykes' Patent Screw Joint.—Specially designed for waterlogged ground. On the spigot and in the socket of each length of pipe male and female screw threads are formed of a bituminous composition in such a manner as to afford a certain amount of play in adjusting the joint, and obtaining flexibility without interfering with the level of the invert of the sewer. The spigot is also provided with a strong collar or rim, against which, when jointing the pipes, a fillet of cement composition is placed, which is compressed when screwing the pipes together.

The pressure, when screwing up, forces the superfluous composition into the space left for play in the thread, thus forming an effectual seal. It is claimed that this cement composition is better than Portland cement, being both water resisting and elastic. This joint is made by the Albion Clay Company.

(*f*) The "Rubite" Pipe Joint.—A non-rigid bitumen joint without sockets, made by Messrs. G. M. Callender & Co. Being a flexible joint, several pipes can be jointed on the surface of the ground before being lowered into the trench in bad ground, and the joint is unaffected by slight settlement, either during laying or after. (G. S.—L.)

## ARCHITECTURAL MODELS AT THE IDEAL HOME EXHIBITION.

We commented in our last issue, in the article descriptive of the exhibits at the Ideal Home Exhibition, on the architectural models prepared by Mr. John B. Thorp, of 98 Gray's Inn-road, W.C., and we are now enabled to reproduce photographs of three of these models. Their scale in actual representation is 4 ft.



Mr. John B. Thorp's Models at Olympia.

to 1 in., and readers will be able to appreciate our statement as to the fidelity with which the various materials are represented. Models of the nature of these, in spite of the cunning lavished upon their execution, are, of course, but child's play to Mr. Thorp, whose series of model tableaux, such as those illustrative of "Old London," necessitated an immense amount of research, coupled with a knowledge of ancient buildings and their peculiar forms of construction. We are not called upon here to deal with the architectural features of the buildings Mr. Thorp has so faithfully copied, and we have only to add that the models are composed almost entirely of wood and cardboard, painted in the proper colours. The garden surroundings are a distinctive feature, and afford some revelation of what Mr. Thorp might do did he add landscape gardening to his present work.

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Birmingham T.C.** (April 10th. Mr. T. C. Ekin).—£43,030 for works necessitated largely by the Greater Birmingham scheme.—The money is to be expended upon extensions at the Dale End sub-station, the provision of a new electric supply sub-station at Harborne, high-tension trunk mains between the Summer-lane electricity generating station, and the two stations in Chester-street and Alma-street, Aston; two rotary converters and transformers at the Chester-street electricity generating station, Aston; and high-tension traffic mains between Summer-lane and the Soho-road (Handsworth) electricity generating station. In reply to the inspector, Mr. A. Collins (deputy city treasurer) stated that on March 31st the capital expenditure of the department was both within their sanctioned and their exercised borrowing powers.

**Braintree R.D.C.** (April 12th. Mr. William Henry Collin).—£1,120 for the purposes of a scheme, under Part III. of the Housing of the Working Classes Act, £890 for the purchase of land and the erection of working-class dwellings in the parish of Great Coggeshall.—Mr. Alfred Hills, clerk to the council, said it was the intention of the council to purchase half an acre of land, and to build six cottages for the working classes in Dead-lane, Coggeshall, adjoining the pumping station of the Coggeshall waterworks.

**Chadderton (Lancs) U.D.C.** (April 16th. Mr. R. H. Bicknell).—£1,243 for the construction of the sewer and roadway and the reinstatement of certain property in Thompson-lane, Chadderton.—The roadway sewer and property were considerably damaged last December owing to a large subsidence of the land while a motor lorry was passing over the road.

**Clitheroe T.C.** (April 12th. Mr. O. E. Meade-King).—£1,310 for the acquisition of certain lands in Grindleton and West Bradford for the purposes of water supply.—It was stated that there was a danger of bungalows being erected on the land if the corporation did not acquire it, as the owner had had an offer for it. There was no opposition to the application.

**Eccles T.C.** (April 19th. Major J. Stewart).—£6,819 for works of private street improvement.—According to the evidence of the town clerk, Mr. E. Parkes, the surveyor (Mr. T. S. Picton) and the borough treasurer (Mr. Russell), the work contemplated was not only necessary, but absolutely essential for the development of the districts involved.

**Kingston-on-Thames T.C.** (April 22nd. Mr. R. H. Bicknell).—£15,150 for works of wood paving in the streets of the borough.—The town clerk, Mr. H. A. Winser, stated that the loan was made up of £12,500 for main roads and £2,650 for non-main roads. For the main roads £4,920 was required for concrete foundations and £7,579 for wood blocks. The details were as follows: London-road—foundations £1,895, wood blocks £2,922; Richmond-road—foundations £1,804, wood blocks £2,781; Eden-street—foundations £132, wood blocks £203; High-street—foundations £890, wood blocks £1,373; Surbiton-road—foundations £197, wood blocks £298. For the non-main roads the details were as follows: Church-street—foundations £305, wood blocks £471; Thames-street—foundations £202, wood blocks £311; Market-place—foundations £561, wood blocks £797. Of the sum for main roads the county council would pay approximately £8,530, which was two-thirds of the cost, in the form of yearly payments to meet the principal and interest of the loan.

**Portland (Dorset) U.D.C.** (April 12th. Mr. P. M. Crosthwaite).—£14,250 for waterworks in the Portesham Valley.—The £14,250 required is made up as follows: Machinery for the 24-in. borehole, £4,000; machinery for the 10-in. borehole, £1,800; engine-house, £3,700; meter, £280; fencing, £570; land, £3,500; engineer, £250, legal expenses, £250; clerk of works, £100.

**Portrush U.D.C.** (April 15th. Mr. P. C. Cowan).—£1,500 for the purpose of further improving the water supply by laying an additional 6-in. water main. Mr. H. A. Macaulay, stating the reasons for the application, said the capacity of the existing main, taken at 220,000 gallons per day, was quite sufficient for the requirements of the town; but in practice it had been found that at certain hours of the day—particularly from 9 a.m. to 12—the supply from the main was insufficient, especially in certain streets. The

The Surveyor
And Municipal and County Engineer.

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council had consulted Messrs. Winey & Croasdaile, Belfast, who recommended the laying of an additional 6-in. main for a length of about 435 lin. yds., at a slightly better gradient, which would increase the capacity of that section to 487,000 gallons. Mr. J. S. Kennedy gave details of the proposed works, with details of his estimate. Mr. Cowan expressed his satisfaction with the details of the scheme.

**Ventnor U.D.C.** (April 10th. Mr. P. M. Crosthwaite) —£3,700 for extending the Eastern Esplanade.—Evidence by the surveyor, Mr. H. H. Oakes, showed that the proposed extension was not only necessary for the better accommodation of the summer visitors, but imperative in order to secure the eastern cliffs, which at present were continually slipping away. The clerk asked that the loan might be granted for a period of fifty years. Mr. W. B. Judd said that the building of the present Eastern Esplanade in 1874 had effectively stopped the shifting of the land at the back of it, but the land at the eastern end of the present esplanade, unprotected, was continually slipping, some tons having quite recently gone into the sea. The whole of the land affected had dropped 14 during the last five years.

### APPLICATIONS FOR LOANS.

**Banffshire C.C.** £2,068 for a water supply for Whitehills.

**Chertsey R.D.C.** £2,290 for the Thorpe housing scheme.

**Ealing T.C.** £250 for an iron footbridge over the Brent.

**East Molesey U.D.C.** £1,019 for footpath improvements.

**Falkirk T.C.**—£15,000 for the extension of the electricity works.

**Hastings T.C.**—£200 for shelters on the sea front, £1,112 for repairing footways, and £657 for tar-macadam paving.

**Ilford U.D.C.**—£12,630 for the extension of Valentines Park.

**Market Harborough U.D.C.**—£1,150 for an ambulance shed and the erection of cottages.

**Penybont R.D.C.**—£4,500 for Kenfig Hill sewerage scheme.

**Radstock U.D.C.**—£6,600 for the provision of cottages.

**Rowley U.D.C.** £2,850 for the purchase of a site for a cemetery.

**Woolwich B.C.** £600 for the provision of a women's lavatory.

### LOANS SANCTIONED.

**Clare (Suffolk) R.D.C.**—£226 for the Hundon waterworks.

**Exeter T.C.**—£2,020 for the purchase of land for playing fields.

**Harrogate T.C.**—£19,604 for the Roundhill reservoir, and £1,765 for improving the East-parade.

**Holme Cultram U.D.C.**—£5,600 for a sea wall at Silloth.

**Hoole U.D.C.**—£150 for the extension of the public park.

**Midleton U.D.C.**—£2,700 for the provision of workmen's dwellings.

**Peterborough T.C.**—£300 for fencing a recreation ground.

**Southampton T.C.**—£15,705 for a school at Shirley.

**Surbiton U.D.C.**—£9,058 for the purchase of Alexandra Recreation Ground, repayable in sixty years; £2,200 for the cost of laying out the ground, repayable in twenty-one years; and £3,512 for the purchase of land for allotments, repayable in sixty years.

**Truro R.D.C.**—£2,774 for the Perranporth water scheme.

**Wallasey T.C.**—£793, making an extension of Edinburgh-road; £1,065 for the widening of Church-street and Liscard-road at Gothic House; £370 for the widening of Rake-lane (Mr. Foster's frontage); £1,410 for the widening of Liscard-road (Littler's-terrace); £310 for the widening of Liscard-road opposite the post office.

**Weetslade U.D.C.**—£330 for street works.

### FORTHCOMING INQUIRIES.

APRIL.

| | | £ |
|---|---|---|
| 30. | **Aberavon.** For works of water supply (Mr. R. H. Bicknell) | 5,250 |
| 30. | **Caxton.** For water supply purposes (Mr. W. O. E. Meade-King) | — |
| 30. | **Exeter.** For recreation ground purposes (Major J. Stewart) | 9,520 |
| 30. | **Farnham.** For street and surface drainage purposes (Mr. A. G. Drury) | 632 |
| 30. | **Farnworth.** For the provision of public conveniences (Mr. F. O. Stanford) | 575 |
| 30. | **Halesowen.** For street improvement purposes (Mr. Edgar Dudley) | 800 |
| 30. | **Winchester.** For providing recreation ground and shelter (Mr. F. H. Tulloch) | 1,200 |
| 30. | **Wood Green.** For works of wood paving (Major C. E. Norton) | 8,928 |

MAY.

| | | |
|---|---|---|
| 1. | **Blaydon.** For private street works (Mr. Courtenay Clifton) | 1,750 |
| 1. | **Burnley.** For sewage disposal works (Mr. F. O. Stanford) | 5,200 |
| 1. | **Newport (Mon.).** For works of paving (Mr. R. H. Bicknell) | 2,446 |
| 1. | **Oldbury.** For sewage disposal purposes (Mr. Edgar Dudley) | 790 |
| 1. | **Torquay.** For equipping a pavilion (Major J. Stewart) | 3,000 |
| 2. | **Birmingham.** For street and recreation ground purposes (Mr. Edgar Dudley) | 2,785 |
| 2. | **Cheshunt.** For laying out recreation ground (Mr. M. K. North) | 438 |
| 2. | **Eastbourne.** For sewerage purposes (Mr. H. Shelford Bidwell) | 5,800 |
| 2. | **Halstead.** For experimental works of water supply (Major C. E. Norton) | 400 |
| 2. | **Midsomer Norton.** For works of sewerage (Mr. R. H. Bicknell) | 631 |
| 2. | **Sunderland.** For street works (Mr. Courtenay Clifton) | 4,500 |
| 3. | **Bexhill.** For street, sewerage, and pleasure ground purposes (Mr. H. Shelford Bidwell) | 6,127 |
| 3. | **Derby.** For recreation ground purposes (Mr. Edgar Dudley) | 2,125 |
| 3. | **Okehampton.** For town hall, public convenience, and street purposes (Major J. Stewart) | 1,497 |
| 3. | **Windsor.** For sewage disposal purposes (Mr. R. G. Hetherington) | 55,000 |
| 4. | **Itchen.** For street improvement purposes (Major J. Stewart) | 2,020 |
| 7. | **Bishop Auckland.** For hospital purposes (Mr. R. A. Farrar) | 6,600 |
| 9. | **Southampton.** For the provision of a tuberculosis dispensary (Mr. S. W. Wheaton) | 750 |

# Municipal Work in Progress and Projected.

*The Editor invites the co-operation of* Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Pittenweem £5,000; roads and materials—Wincanton; sewerage and sewage disposal—Ambleside £6,000, Droitwich, Oakengates £13,000, Watford; water, gas and electricity—Banffshire £2,112.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

## BUILDINGS.

**Cardiff T.C.**—The Parks Committee have decided to erect a pierrot stand in Roath Park at a cost not exceeding £150.

**Clare (Suffolk) R.D.C.**—The surveyor, Mr. H. H. Pettitt, reports that a new bridge will be required before long at the Haverhill and Withersfield boundary.

**Denbigh T.C.**—The council recently presented to the Local Government Board an application to sanction a loan for £15,000 to build a new market, public hall, fire station, and municipal buildings. Since the application was submitted certain ratepayers organised opposition and prepared a petition in favour of a modified scheme. The council have met in committee, and of their own initiative unanimously passed a resolution: "That the council withdraw the application made for sanction to the loan of £15,000 for the buildings, and that the whole scheme be abandoned, the council having decided that they would not carry out any modified scheme, which they considered inadequate."

**Derbyshire C.C.**—It has been agreed to spend £800 upon widening and improving Hope Bridge.

**Greenock T.C.**—Consideration is being given to several alternative schemes for public baths.

**Lancaster T.C.**—It has been decided to postpone for the present the carrying out of the widenig of Deep Cutting Bridge, over the canal, at a cost of £1,950.

**Newton Abbot (Devon) U.D.C.**—In the event of the Baths Committee, to whom the consideration of the matter was referred, not presenting a report with respect to the proposed provision of public baths, the General Purposes Committee are to be requested to take the matter up.

**Northallerton R.D.C.**—It has been decided to construct a bridge across Romanby Ford, at an estimated cost of £500.

**Pittenweem T.C.**—A new school is to be erected on the site of the East School at an estimated cost of £5,000.

**Ryde T.C.**—A new wooden groyne is to be constructed between the slipway and Victoria Pier at a cost of £30.

The tender of Messrs. Littlefield, at £63, has been accepted for an awning round the band stand on the Western Esplanade.

**Woolwich B.C.**—It has been decided to construct an underground convenience for women in Beresford-square at an estimated cost of £600.

## HOUSING AND TOWN PLANNING.

**Birmingham T.C.**—A draft scheme has been prepared by the Birmingham Town Planning Committee for what is usually referred to as the Harborne and Quinton area. The scheme has been prepared under the authority of the council and of the Local Government Board, and was last week submitted to a meeting of property owners interested. The area scheduled comprises 2,320 acres, and extends from Lordswood-road and the western side of Harborne Village to Quinton, near Bourne College.

**Ealing T.C.**—The council have decided to offer no objection to Acton's town planning scheme, which includes a small portion of the borough of Ealing, on the east side of the Metropolitan District Railway at North Ealing.

## PARKS AND OPEN SPACES.

**Ilford U.D.C.**—It has been decided to purchase for £25 per acre the whole of the undeveloped portion of the site belonging to the Town Planning and Garden Cities Company, Limited, for the extension of Valentine Park.

## REFUSE COLLECTION AND DISPOSAL.

**Epsom R.D.C.**—The tender of Mr. Artiss, of Lower Green Farm, has been accepted for the weekly removal of house refuse from Cuddington for one year for £24; and also that of Mr. Woods, of Worcester Park, to deliver clinker to Cheam at 3s. 9d. per 1½ cub. yds.

## ROADS AND MATERIALS.

**Derbyshire C.C.**—It has been decided to spend £960 upon improving the main road at Grindleford, conditional upon obtaining a grant from the Road Board. Heanor-road, Ilkeston, is to be widened and improved at a cost of £375, and the footpaths on the Derby-road improved at a cost of £200.

**Essex C.C.**—The council have again ordered supplies of Akonia for dust prevention on some of their roads.

**Hexham R.D.C.**—A scheme of tar-grouting is to be carried out at a cost of 5½d. per square yard, and the Road Board is to be approached for a grant of £300 towards the cost of the work.

**Holborn B.C.**—The council, it is reported, have accepted the proposal of the Works Committee—referred to in our issue of the 5th inst.—to pave parts of High Holborn and of New Oxford-street with granite setts instead of asphalt and wood blocks. It was pointed out by the chairman of the committee that granite had already been laid at Tottenham-circus, and that a special observation at the spot on a Sunday morning showed that the stone pavement was very little noiser than the asphalt adjoining it. "Our experience with asphalt," the chairman said, "is that it wears out very rapidly under the heavy motor-omnibus traffic."

**Hove T.C.**—It has been decided to treat the sea front with Akonia, this being the fifth year of such treatment.

**Lancaster T.C.**—A proposal has been made for making a new street between Scotforth-road and Bowerham, at a cost of £4,550, but the council have decided not to proceed with the scheme at present.—The widening of King-street to 40 ft. has been approved.

**Norfolk C.C.**—The Eastern Highways Committee are considering the question of tar-painting the Cromer-road.

**Oakengates U.D.C.**—The plans of a proposed new street have been passed provided it be made 36 ft. wide, and other conditions acceded to. It was explained that the Housing Act and the by-laws compelled the council to take this course.

**St. Helens (Isle of Wight) U.D.C.**—The Roads Committee of the county council have written that they are prepared to recommend the Road Board to grant the council's application to carry out the proposed improvement from St. John's Park to Hoverton at an estimated cost of £453.

**Stirlingshire C.C.**—At the meeting of the Western District Committee it was stated that the grant from the Road Board this year would be £2,000.

**Wincanton (Somerset) R.D.C.**—An intimation has been received that the county council intend to make two applications to the Road Board affecting this council. One is to continue widening the road between Bow Bridge and Toomer Hill, for which application will be made for £1,500. One half of that will come to the Wincanton district, and the other half will be spent on the Yeovil district. The council will not be asked to pay anything towards that improvement, as the Road Board will pay part and the county council the other part. Another road improvement for which application has been made to the Road Board is in respect of the road between Templecombe and Yenston Hill, beyond Yenston, which will include the widening of Harlock's Bridge and Yenston Bridge, the improving of the gradients, and also the widening of the road where it was possible to do so. For that improvement application has been made to the Road Board for £750, and towards it the county council consider that the Wincanton District Council should pay £350.

## SEWERAGE AND SEWAGE DISPOSAL.

**Ambleside U.D.C.**—A sewerage scheme, estimated to cost £6,000, is under consideration.

**Atcham R.D.C.**—The tender of Mr. John Price, Bayston Hill, at £698, has been accepted for the construction of the outfall works at Pontesbury, and for part of the main sewer.

**Banffshire C.C.**—The Banff District Committee have received a communication from the Local Government Board insisting on the local authority taking effective measures within two months to provide a satisfactory scheme for the drainage of Portgordon, failing which the board would instruct their agents to present a petition to the Court of Session. In this connection there has also been submitted a communication from Mr. George Muirhead, commissioner, Gordon Richmond Estates, Fochabers, transmitting a draft minute of agreement between the County Council of Banff and the Duke of Richmond and Gordon, with regard to Portgordon sewerage outfalls, for the approval of the county council. It was explained that the Duke of Richmond and Gordon objected to the sewage being allowed to go into the sea without first passing through settling beds or tanks. The provision of these would mean a great deal of expense. There was no such system on the whole of the coast on the north-east of Scotland. Other proprietors had salmon fishings in the sea and none of them had ever raised any objections of this kind before. The county council had used every means in their power to have this matter carried out. The scheme proposed was estimated to cost £1,500. The District Committee have decided to adhere to the position they have already taken up—viz., to the scheme showing two outfalls below low water without any intercepting tanks, and to explain the facts to the Local Government Board.

**Droitwich R.D.C.**—Owing to the position taken up by the Worcester Corporation, the sewerage scheme prepared by Mr. Fiddian for the council, for draining the Astwood-road and Bilford-lane areas into the Worcester sewers, has had to be dropped. Mr. Fiddian at the recent meeting again recommended his comprehensive scheme for taking the whole of the drainage required for North Claines to the outfall works at Fernhill Heath. He had no other scheme to suggest. It was decided to adopt this scheme, subject to the details being worked out and developed.

**Erpingham (Norfolk) R.D.C.**—The tender of Mr. J. W. Neale, of Beconsthorpe, at £220, has been accepted for sewerage work at West Runton.

**Oakengates U.D.C.**—The council at their last meeting adopted the plans of Messrs. Berrington, Son & Watney, civil engineers, of Westminster and Wolverhampton, for the extension of the sewerage scheme, and instructed the engineers to prepare the detail plans and estimates for submission to the Local Government Board. The estimated cost of the work is about £13,000.

**Watford (Herts) R.D.C.**—The surveyor, Mr. E. Lailey, has presented a report on several sewerage schemes which are being considered by the council.

**Wellington (Salop) U.D.C.**—The tender of Messrs. M. S. Boswell & Co., Wolverhampton, at £4,932, has been accepted for the carrying out of the Much Wenlock sewerage scheme.

## WATER, GAS, AND ELECTRICITY.

**Banffshire C.C.**—A report has been presented to the Banff District Committee with respect to a new water supply from the Hill of Maud for Findochty, at an estimated cost of £2,112.

**Beverley T.C.**—A letter has been received from the Local Government Board in reference to the water supply of the borough, pointing out that in the interests of the health of the inhabitants the provision of a satisfactory source of water supply was an urgent necessity. As the council did not indicate what action was being taken to obtain such a source the board desired to be informed precisely what was being done in the matter. To this a reply has been sent stating that the council had been unable to find a supply of water better than that now obtained from the existing works, with the additional system of filtration recently installed.

**Invergordon T.C.**—The new water supply for the burgh was turned on last week. The supply is derived from Kinrive springs on the Kindeace estate, and is from there carried in cast-iron pipes to the reservoir on the Newmore estate, and thence to the town.

**Kingston (Surrey) T.C.**—Eight more of the existing street arc lamps are to be replaced by lanterns with high-candle metal-filament lamps.—The plans of the surveyor, Mr. Hampton Clucas, for the extension of the central electric lighting station for the accommodation of the new Diesel oil-engine plant, have been approved.—The two Lancashire multi-tubular boilers which are not now in use at the electric works have been sold for £250.

## PERSONAL.

Mr. F. W. Platt, Salford, has been elected a member of the Royal Sanitary Institute.

Mr. H. Asher, sanitary surveyor to the Atcham Rural District Council, has had his salary increased by £25 a year.

Mr. Harold Hosking, surveyor to the St. Germans Rural District Council, has had his salary increased to £180 per annum.

Mr. John Birtwistle, surveyor to the Northwich Rural District Council, has had his salary increased to £150 per annum.

Mr. C. B. Truscott, of Plymouth, has been appointed building inspector to the Plymouth Corporation at a salary of £100 a year.

Mr. J. S. Ingham, assistant surveyor to the Barnoldswick Urban District Council, has had his salary increased to £100 per annum.

Mr. D. H. Robb, surveyor to the Machars District Committee of the Wigtownshire County Council, has had his salary increased from £250 to £300 per annum.

Mr. Harold Hosking, surveyor to the St. Germans Rural District Council, has had his salary increased by £30 per annum, bringing his remuneration up to £180.

Mr. W. R. Locke, borough surveyor of Hemel Hempstead, has, we regret to state, had a breakdown in health, and has been granted leave of absence to recruit.

Mr. J. H. Drew, surveyor and engineer to the Horbury Urban District Council, has been appointed surveyor to the Wath-upon-Dearne Urban District Council.

Mr. A. C. Cockerton, of the Burgess Hill surveyor's staff, has been appointed assistant surveyor and sanitary inspector to the Steyning East Rural District Council.

Mr. J. J. Budden, surveyor to the Lower District of the Westhampnett Rural District Council, has obtained an appointment under the Hampshire County Council.

Messrs. E. J. Elford, borough engineer, Southend-on-Sea, and James Heron, county surveyor, Co. Down, have been elected members of the Institution of Civil Engineers.

Mr. C. J. Cross, surveyor to the Kirkham Urban District Council, has accepted an appointment in the valuation department of the Inland Revenue at Lancaster.

Mr. W. J. Press, for some years surveyor to the Burnham (Somerset) Urban District Council, and since his retirement a member of the council, died, we regret to state, last week.

Mr. W. H. Butler, chief assistant to the Merthyr Tydfil borough surveyor, has obtained the appointment of assistant surveyor and draughtsman under the Cumberland County Council.

Mr. F. C. Meyrick, highway surveyor and sanitary inspector to the Claypole Rural District Council, has accepted the position of engineer and assistant manager on a rubber plantation in the Malay States.

Mr. Sydney G. Illman, of the waterworks, Dorchester, Dorset, has been appointed to fill the office of water inspector to the Windsor Corporation waterworks undertaking, under Mr. E. A. Stickland, surveyor and waterworks engineer.

Mr. Edward Whitwell, engineer and surveyor to the Abersychan Urban District Council, has had his salary increased by £40 per annum. Mr. Whitwell was also appointed to attend the National Housing and Town Planning Conference as the council's representative.

Sir William Lindley, M.INST.C.E., of Frankfort, has been appointed engineer of the Water Supply and

Sewage Committee of the St. Petersburg Town Council, for whom he will have charge of the design and construction of waterworks and a sewerage system to cost £10,000,000.

Mr. Arthur J. Abbott, P.A.S.I., building surveyor and sanitary inspector to the East Barnet Valley Urban District Council, has had his salary increased to £225, rising by £10 annually to £255. The increase has received the approval of the Local Government Board, and the appointment has been made a permanent one.

Mr. Cyril Bowdler Henry, eldest son of Mr. T. Henry, surveyor to the East Retford Rural District Council, and a student at the Sheffield University, has passed the first professional examination of the Royal College of Physicians and Surgeons in the subject of biology preparatory to engaging in the practice of dentistry.

Mr. J. F. Burns, borough surveyor of Devonport, who has just completed a quarter of a century in the service of the corporation, was recently presented with a silver rose bowl by the Surveyor's Committee and officials to commemorate the interesting event. Upon the same occasion Mr. Charles Phillips, draughtsman in the surveyor's department, who is leaving for Canada, was the recipient of a handsome case of pipes.

Mr. R. O. Wynne-Roberts, M.INST.C.E., in addition to having been appointed consulting engineer for the Regina, Saskatchewan, and Watrous, Saskatchewan, water schemes, has been engaged by the authorities of the first-named city to investigate the resources of the Regina district in the matters of power, light and fuel, the installation of a generating station on the coalfields being suggested. Mr. Wynne-Roberts is the corresponding secretary of the recently formed Regina Engineering Society, the objects of which are the professional improvement of and the encouragement of social intercourse among its members.

Mr. R. A. Webb, assistant surveyor to the East and West Molesey Urban District Council, has been appointed by the Crown agents for the Colonies to the position of assistant engineer to the Lagos Municipal Board in Southern Nigeria, and sails from Liverpool on Wednesday next to take up his duties. Mr. Webb has been the assistant surveyor to the East and West Molesey Urban District Council for nearly twelve years, prior to which he was assistant in the surveyor's department of the Gosport and Alverstoke Urban District Council. He is a member of the Institution of Municipal Engineers, and an associate member of the Royal Sanitary Institute. Mr. Webb was presented on Tuesday with a sealed testimony by the council.

**Sea-water for Baths.**—To enable people to have a sea-water bath in their own homes, it is proposed at Southend to provide taps to the standards in connection with the mains used for the watering of the streets with sea-water.

**Blackpool and Fylde Water Scheme.**—A Select Committee of the House of Lords is considering a Bill promoted by the Fylde Water Board to construct additional waterworks and to make better provision for their undertaking.

**Tavistock Water and Market Undertakings.**—The Local Legislation Committee of the House of Commons have passed a Bill promoted by the Tavistock Urban District Council to purchase the water and market undertakings in the town owned by the Duke of Bedford. It has been arranged that the price of the water and market undertakings shall be settled by arbitration.

FOR OTHER ADVERTISEMENTS
See End of Paper.

URBAN DISTRICT COUNCIL OF ENFIELD.
TO CONTRACTORS.

The Council invite Tenders for Making Up the Private Street known as Rosemary-avenue, Enfield.

Plans and Specifications can be seen, Forms of Tender and all information obtained, on application to Mr. Richard Collins, the Council's Surveyor, at these offices, any day except Saturday, between the hours of 9 a.m. and 5 p.m.

The Contractor will be required to observe Trade Union hours of labour, and to pay the recognised Trade Union rates of wages in force in the district where the work is to be executed.

Tenders (on the forms supplied only) to be sent in to me not later than noon on Wednesday, the 8th May next, endorsed "Tender for Rosemary-avenue."

The Tender must be accompanied by a schedule of prices and wages paid for different classes of work, which schedule will be embodied in the contract.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
T. W. SCOTT,
Clerk to the Council.

Public Offices, Enfield, Middlesex.
April 25, 1912.

COUNTY BOROUGH OF WALSALL.
BOROUGH SURVEYOR'S DEPARTMENT.
APPOINTMENT OF ARCHITECTURAL AND ENGINEERING ASSISTANTS.

The Corporation invite applications for the appointment in the Borough Engineer and Surveyor's Department of an Architectural Assistant, at a salary of £150 per annum, and an Engineering Assistant, at a salary of £117 per annum.

Applicants must be good and rapid draughtsmen, and in case of the Architectural Assistant must have a thorough knowledge of architecture, construction, and the preparation of details, specifications and quantities.

Applications, in Candidate's own handwriting, accompanied by copies of not more than three recent testimonials, must be made on forms to be obtained on application to Mr. J. Taylor, Borough Engineer and Surveyor, Council House, Walsall, and delivered to the undersigned not later than Monday, the 6th May, endorsed "Architectural Assistant" or "Engineering Assistant."

Canvassing will be deemed a disqualification.

(By order)
JOHN R. COOPER.
Town Clerk.

Council House,
Walsall.
April 24, 1912.

DRAUGHTSMAN required by the Government of Sierra Leone for the Public Works Department for two tours, each of 12 months' residential service, with possible extension. Age between 25 and 40, preferably unmarried. Strict medical examination and vaccination if necessary. Salary £300 a year, rising to £350, by annual increments of £10. Free single quarters provided at established stations. Free first-class passage out and home again on satisfactory termination of engagement. Half salary on voyage out, full salary from date of arrival in the Colony. Two months' leave on full pay after 12 months' tour, increased to 4 months if returning to the Colony, with full pay during voyage or voyages and free passages.

Candidates should have had considerable experience in Architectural and Engineering Draughting, and should have held a responsible position in the drawing office of an Architect and Surveyor, or Civil Engineer in good general practice. They should be neat and expeditious draughtsmen, capable of taking levels and making surveys for buildings, bridges, and other works. They should also have had experience in the control of a drawing office staff, and be capable of getting out designs and details of buildings—including steel frame work—bridges and other works, with some experience in Architectural Design. They should be well up in building construction, the preparation of specifications, bills of quantities and estimates, and preference will be given to those applicants who have served articles with an Architect, Surveyor or Civil Engineer with a practice in Constructional Work.

Other things being equal, preference will be given to those Candidates who have passed the examination of the Surveyors' Institute (Building Sub-Division).

Applications, by letter (no special form required), stating age, whether married or single, giving full particulars of experience, accompanied by copies of testimonials (not originals), with names and addresses of referees of whom enquiries can be made as to capabilities and character, should be sent at once to the Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W.

Quote M 5325 on left-hand top corner of application.

## TO CLERKS OF WORKS.

The Surrey Education Committee require in their Surveyor's Department the services of a Clerk of Works. Preference will be given to an applicant who has had experience in the maintenance of public buildings, the preparation of specifications and schedules of alterations, repairs and redecoration, the preparation of working sketches, the supervision of work, and the measuring up and settling of accounts.

Applicants must be cyclists.

The salary will be at the rate of £160 per annum, rising by increments of £7 10s. per annum, subject to approved service, to a maximum of £190 per annum. The appointment will be subject to one month's notice on either side. Travelling and actual out-of-pocket expenses in accordance with the scale will be allowed.

Applications, setting out full particulars of past experience and present employment, together with the names and addresses of at least three references, are to be delivered to the undersigned on or before Saturday, May 4th next, in a foolscap envelope, marked "Clerk of Works."

W. W. FINNY,
Secretary.

County Education Office,
Kingston-upon-Thames.

## TO CONTRACTORS AND OTHERS.

The Council of the Metropolitan Borough of Wandsworth is prepared to receive Tenders for Executing necessary Works of Repair upon that part of Crowborough-road, Streatham, which lies between Chillerton-road and Furzedown-drive.

The Specification and Drawings may be seen, and Forms of Tender obtained of the Borough Engineer, at the office of the New Streets Department, No. 56 East-hill, Wandsworth, S.W., between the hours of 10 and 4 (Saturdays 10 and 12), upon payment of a deposit of Five Guineas.

Tenders, enclosed in sealed envelopes, and endorsed "Tender for Repairing Crowborough-road," must be delivered at the Council House, East-hill, Wandsworth, S.W., and may be placed by the person tendering in the box provided for the purpose, not later than 4 o'clock in the afternoon of Monday, the 13th May next.

Persons tendering must, in the case of all workmen employed by them in and about the execution of the contract, pay wages at not less, and observe hours of labour not greater, than the rates and hours recognised by the Associations of Employers and Employees and in practice obtained in the district where the work is to be executed.

No Tender will be received unless it be made upon one of the forms provided for the purpose. The Council does not pledge itself to accept the lowest or any Tender. If required, the Contractor must provide two sureties for the due execution of the contract.

D. A. NICHOLL,
Town Clerk.

Council House, Wandsworth, S.W.
April 24, 1912

## TO CONTRACTORS AND OTHERS.

The Council of the Metropolitan Borough of Wandsworth is prepared to receive Tenders for the Making Up and Paving of that part of Cowick-road, Tooting, which lies between Church-lane and Okeburn-road.

The Specification and Drawings may be seen, and Forms of Tender obtained of the Borough Engineer, at the office of the New Streets Department, No. 56 East-hill, Wandsworth, S.W., between the hours of 10 and 4 (Saturdays 10 and 12), upon payment of a deposit of Five Guineas.

Tenders, enclosed in sealed envelopes, and endorsed "Tender for Paving Cowick-road," must be delivered at the Council House, East-hill, Wandsworth, S.W., and may be placed by the person tendering in the box provided for the purpose, not later than 4 o'clock in the afternoon of Monday, the 13th May next.

Persons tendering must, in the case of all workmen employed by them in and about the execution of the contract, pay wages at not less, and observe hours of labour not greater, than the rates and hours recognised by the Associations of Employers and Employees and in practice obtained in the district where the work is to be executed.

No Tender will be received unless it be made upon one of the forms provided for the purpose. The Council does not pledge itself to accept the lowest or any Tender. If required, the Contractor must provide two sureties for the due execution of the contract.

D. A. NICHOLL,
Town Clerk.

Council House, Wandsworth, S.W.
April 24, 1912.

## COUNTY BOROUGH OF WEST HAM.
### TO PAINTING AND BUILDING CONTRACTORS.

The Council hereby invite Tenders for Painting, Cleansing, Repairs, &c., of Public Buildings.

Specification, Form of Tender, and further particulars may be obtained at the office of Mr. John G. Morley, Borough Engineer, Town Hall, West Ham, E., upon payment of One Pound, which will be returned upon receipt of a *bonâ-fide* Tender.

NOTE.—No Tender will be considered unless the same is delivered at the office of the Town Clerk, Town Hall, West Ham, E., in the envelope supplied, by registered post, not later than 4 o'clock p.m., on Tuesday, 14th May, 1912.

The Council do not bind themselves to accept the lowest or any Tender. The Contractor will be required to enter into a bond, with one surety, for the due performance of the contract, and no work will be ordered under the contract until such bond has been duly executed.

The Contractor whose Tender is accepted, and with whom a contract is entered into, will be required to pay the whole of his workmen such rate of wages, and observe such hours of labour, as are recognised by the Workmen's Trade Unions, and shall not assign, nor under-let, or make a sub-contract with any person or persons for the execution of any part of such work. In the event of any breach of such agreement the Council will enforce the penalty clause in its entirety.

(By order of the Council)

FRED E. HILLEARY,
Town Clerk.

Town Hall,
West Ham, E.
April 26, 1912.

## COUNTY BOROUGH OF WEST HAM.
### REFUSE DESTRUCTOR.

The Council hereby invite Tenders for the Supply and Erection of a Refuse Destructor and Steam-raising Plant in connection with the Electricity Generating Station, Quadrant-street, Canning Town.

Plan, Specification, Form of Tender, and further particulars may be obtained on and after the 26th instant, at the office of the Borough Engineer, Town Hall, West Ham, E., upon payment of One Pound, which will be returned upon receipt of a *bonâ-fide* Tender.

NOTE.—No Tender will be considered unless the same is delivered at the office of the Town Clerk, Town Hall, West Ham, E., in the envelope supplied, by registered post, not later than 12 o'clock noon, on Wednesday, 5th June, 1912.

The Council do not bind themselves to accept the lowest or any Tender. The Contractor will be required to enter into a bond, with one surety, for the due performance of the contract, and no work will be ordered under the contract until such bond has been duly executed.

The Contractor whose Tender is accepted, and with whom a contract is entered into, will be required to pay the whole of his workmen such rate of wages, and observe such hours of labour, as are recognised by the Workmen's Trade Unions, and shall not assign, nor under-let, or make a sub-contract with any person or persons for the execution of any part of such work. In the event of any breach of such agreement the Council will enforce the penalty clause in its entirety.

(By order of the Council)

FRED E. HILLEARY,
Town Clerk.

Town Hall.
West Ham, E.
April 19, 1912.

CHEAP T-SQUARES (Pearwood). 55-in., bevelled edge, 18-in. movable head, with brass fitting, quite new (cost 14s. 6d), 6s. 6d.; 30-in. by 12-in. ditto, 3s.; 22-in. by 9-in., cedar, fixed head, 1s. 9d.—Box W, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

## URBAN DISTRICT COUNCIL OF HORNCASTLE.

### ROAD MATERIAL.

The above Council invite Tenders for Supplying the following Road Material—*viz.*,

390 tons (more or less) of X Roadstone.
240 tons (more or less) of XX Roadstone.
130 tons (more or less) of X Slag.
70 tons (more or less) ½-in. or ⅝-in. Slag Chips.

To be delivered at Horncastle Station as and when required by the Council's Surveyor (the contract to be completed by 1st December next, and security for the due performance thereof must be given).

Small samples to be sent to the Surveyor, Mr. F. Weeber, Foundry-street, Horncastle.

Forms of Tender can be obtained from the undersigned.

The Council do not bind themselves to accept the lowest or any Tender.

Tenders, marked "Road Material," must be delivered to me not later than 2 p.m. on Monday, 6th May next.

(By order)
R. W. CLITHEROW,
Clerk to the Council.

Court House, Horncastle.
April 22, 1912.

## LLANTRISANT AND LLANTWIT FARDRE RURAL DISTRICT COUNCIL.

### ELY VALLEY-ROAD.

The above-named Council is prepared to receive Tenders for the Completion of the New Ely Valley-road, and Branch Roads, all 36 feet in width.

The contract will consist of a road about 3 miles in length between Mill-street, Tonyrefail, and Talbot Village, Llantrisant, a Branch Road ¼ mile in length between Ynysallan, and Glanmychydd Farm, and a Branch Road about 1 mile in length between Coed Ely and the existing Road leading from Tonyrefail to Gelfach Goch.

The contract will include all excavations, filling and forming, ballasting and metalling, banks and quick-set fencing, post and tube fencing, stoneware and cast-iron surface-water drains, catchpits, manholes, &c. The construction of three masonry and steel River Bridges, and several masonry and concrete Culverts over streams and watercourses.

Plans and Specification may be seen by appointment, and Bills of Quantities and Forms of Tenders obtained from the undersigned, upon the payment of a deposit of £5, which will be returned upon the receipt of a fully-priced Bill of Quantities and *bonâ-fide* Tender.

Sealed Tenders must be delivered to Mr. W. Spickett, Solicitor, Pontypridd, the Clerk to the Council, on or before Wednesday, the 29th proximo.

The lowest or any Tender not necessarily accepted.

(By order)
GOMER S. MORGAN,
THOMAS SAUNDERS,
Engineers.

School-street,
Pontyclun, Glam.
April 24, 1912.


### BARGAINS IN BOOKS.

| | *Cost* | *Sale Price.* |
|---|---|---|
| "Principles and Practice of Modern House Construction." (G. Lister Sutcliffe.) Div. 1. Profusely illustrated, coloured double-page plates | £ s. d. 8 0 | s. d. 3 6 |
| "Modern Buildings, their Planning and Construction." (G. A. Middleton, A.R.I.B.A.) Vols. I., II., III. Several hundred Illustrations and Plates. Almost new | 1 11 6 | 15 0 |
| "Sanitary Engineering." By Col. R. M. Moore, R.E. 534 Illustrations. 70 Folding Plates | 1 10 0 | 11 6 |
| "Dilapidations." (3rd Ed.) A. C. Macer | 5 0 | 2 0 |
| "Fixtures." (3rd Ed.) S. W. Wright, M.A. | — | 1 9 |
| "Book-Keeping." (University Press.) Snailum | — | 2 0 |
| "Building Construction." (Illustrated.) Burrell | 2 6 | 1 3 |
| "Cassell's Popular Educator." 6 Vols. Bound. Profusely Illustrated | — | 5 0 |

Apply "Box W.," office of THE SURVEYOR, 24 Bride-lane, Fleet-street, London, E.C.


## DETAILS OF TOWN PLANNING ADMINISTRATION.

### CONFERENCE OF LOCAL AUTHORITIES.

A large number of public authorities and societies interested in housing and town planning were represented at a conference organised by the National Housing and Town Planning Council which opened on Wednesday at the Westminster Palace Hotel. The object of the conference is to acquire clear and precise information as to the procedure to be followed by local authorities in their own planning work.

Alderman W. Thompson (Richmond), who presided, urged that the duty of local authorities in administering the Town Planning Act was not to put a heavy burden on the owners, because by so doing they were putting a burden on the occupiers. It was extremely important for local authorities to consider what they were going to give the owners in return for the restrictions put upon them. If they were not able to offer some cheapening in the cost of development, he thought there would be a reaction against attempts to give ideal conditions to the people.

Some practical papers were submitted to the conference showing the methods that might be followed by local authorities in the first and second stages of a town-planning scheme. These included contributions by Mr. R. Reay Nadin (town clerk, Sutton Coldfield), Mr. Harold Shawcross, of Rochdale (vice-chairman of the English Town Planning Committee), Mr. Raymond Unwin, Mr. J. A. Brodie (city engineer of Liverpool), Mr. J. S. Pickering (borough engineer of Cheltenham), Mr. G. L. Pepler, and Mr. Reginald H. Jeffes (engineer and surveyor to the Malden and Coombes Urban District Council).

Mr. Jeffes said that in his experience the cost of making a roadway under ordinary by-law conditions was 12s. 8d. a yard, whereas he calculated that under the proposed town-planning conditions it would be only 11s. 1d.

It was resolved to ask the Local Government Board to consider the advisability of dispensing with the service of personal notices beyond Article I., all subsequent notice to be given by public advertisement only.

**The Last Private Toll.** Said to be the last of the private tolls across the King's highway, that of Horsey, 4 miles from Peterborough, on the road to Whittlesey, has been removed. The owner of the toll, Colonel C. J. Strong, has been paid £1,000 jointly by the Huntingdonshire, the Isle of Ely and the Soke of Peterborough County Councils, and the Town Council of Peterborough. The origin of the toll is not quite clear, but it was certainly in existence in 1816. Latterly it has been let at £41 per year.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President*—Mr. Albert D. Greatorex, M.Inst.C.E., Borough Engineer and Surveyor of West Bromwich.

The official programmes of the meetings of the Institution of Municipal and County Engineers to be held at Exmouth, Nuneaton, and Stirling are appended:—

### SOUTH-WESTERN DISTRICT MEETING AT EXMOUTH.

(May 4th.)

Programme.

10.50 a.m. Reception at the public hall by the chairman of the district council, Mr. Henry Blackmore, J.P.

11 a.m.—Discussion on paper (which will be taken as read) entitled, "A Decade of Progress in a Residential Seaside Town," by Samuel Hutton, surveyor and water engineer to the council.

12 noon.—Visit Beach Garden extension; pile driving in progress.

1 p.m.—Lunch at Thorn's Hotel by kind invitation.

2 p.m. (sharp).—Drive (tickets 2s. 3d. each) to Dotton pumping station (8 miles), calling at filter-beds and reservoirs, and passing through Knowle, East Budleigh, and Colaton Raleigh.

4.15 p.m. Leave Dotton and return to Exmouth *viâ* Newton Poppleford, Aylesbeare Common, Woodbury Castle, arriving back 6 to 6.30 p.m.

Thomas Moulding, M.Inst.C.E.,
*Hon. District Secretary.*
City Surveyor, Exeter.

### MIDLAND DISTRICT MEETING AT NUNEATON.

(May 11th.)

Programme.

11.30 a.m.—Assemble at the Law Courts, where members will be received by his Worship the Mayor (Councillor Thomas Horton, J.P.), district business, minutes, &c. Paper by the borough surveyor, Mr. F. C. Cook, Assoc.M. Inst.C.E., "Ten Years of Municipal Work in Nuneaton."

1 p.m.—Lunch at the Newdegate Arms Hotel, by invitation of the mayor and members of the corporation.

2 p.m.—Leave by brakes (tickets, 2s. each) for inspection of sewage pumping station, refuse destructor, open-air swimming baths and public slaughter-houses.

3 p.m.—Leave for the sewage outfall works at Hartshill to inspect silt and humus tanks, contact beds, percolating filters, &c.

5 p.m.—Tea at the farm buildings by invitation of Mr. Cook.

5.30 p.m.—Leave for Nuneaton.

6 p.m.—Arrive at Nuneaton.

Should any members desire to return earlier from Hartshill, arrangements can be made for them to do so.

Members must give notice of their intention to be present not later than May 4th.

H. Richardson,
*Hon. District Secretary.*

Council House,
Birmingham.

### SCOTTISH DISTRICT MEETING AT STIRLING.

(June 7th and 8th.)

Programme.

*Friday, June 7th.*

11 a.m.—Reception in the Albert Hall, Stirling, by Provost Bayne and the magistrates of Stirling.

11.10 a.m.—District business.

11.30 a.m.—Discussion on papers (which will be taken as read) entitled, "The Municipal Works of Stirling," by Mr. A. H. Goudie, burgh surveyor, Stirling.

12.15 p.m.—Discussion on papers (which will be taken as read) entitled, "Work Carried Out in Central Stirlingshire under the Road Development Grant," by Mr. D. R. Cox, county road surveyor.

1 p.m.—Luncheon, provided by Stirling Town Council.

2 p.m.—Inspection of burgh works, &c., and county improved roads and quarry.

Mr. Morris, town clerk, Stirling, has kindly consented (should a sufficient number so desire) to conduct members and their lady friends through the Castle and upper part of the town, and point out and describe the buildings of historical and antiquarian interest.

6.30 p.m.—Annual dinner, Golden Lion Hotel, tickets 5s. each.

*Saturday, June 8th.*

Circular tour by motor char-a-banc from Stirling to Lochearnhead, *viâ* Callander and Strathyre, and returning by St. Fillans, Comrie and Crieff.

The following is the probable time table of the tour:—

9.30 a.m.—Leave Stirling, Golden Lion Hotel.

12.30 p.m.—Lunch at Lochearnhead Hotel.

1.30 p.m.—Leave Lochearnhead Hotel.

3.15 p.m.—Afternoon tea, Drummond Arms Hotel, Crieff.

3.45 p.m.—Leave Crieff.

5.45 p.m.—Arrive Stirling.

Tickets for the tour, including lunch, 8s. 6d. each (exclusive of tea at Crieff, which can be arranged personally), can be obtained from the honorary district secretary. Those intending to make the tour should intimate their intention at least a week before the date.

David Ronald,
*Hon. District Secretary.*

Falkirk, N.B.

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Provincial members who propose to take part in the visit to Paris will, in cases where the journey exceeds a distance of 30 miles, be able to obtain return tickets to London at a single fare and a quarter.

Thomas Cole,
*Secretary.*

11 Victoria-street, S.W.

## INSTITUTION OF MUNICIPAL ENGINEERS.

*President*—Mr. E. A. Stickland, Assoc.M.Inst.C.E., Borough Surveyor, Windsor.

### SOUTHERN DISTRICT MEETINGS IN LONDON.

A meeting of the Southern District will be held at the institution offices on Wednesday, May 8th, at 7 o'clock, when a paper, "The Design and Planning of Working-Class Dwellings," will be presented by Mr. Sidney Palmer (member) for discussion.

Members of the South-Eastern District are particularly requested to attend and join in the discussion.

A further meeting of the district will be held on Wednesday, June 5th, at 7 o'clock, at which will be discussed the advisability of the Southern District forming a local association for the purpose of becoming federated with the N.A.L.G.O.

E. W. Veale,
*Hon. District Secretary.*

Frensham,
Surrey.

## ROYAL SANITARY INSTITUTE.

### MEETING AT BLACKPOOL.

On May 24th next, at Blackpool Town Hall, discussions will take place on "The Card Index System as applied to Public Health Work," to be opened by E. W. Rees-Jones, M.D., D.P.H., M.O.H., and on "A Description of the Joint Scheme of Sewerage for Thornton-le-Fylde, Bispham-with-Norbreck, and Carleton," by Arthur Hindle, Assoc.M.Inst.C.E. On Saturday, May 25th, visits will be arranged to the new promenades, the new main sewerage works for Thornton-le-Fylde, Bispham-with-Norbreck, and Carleton, and the new main drainage works of the Fleetwood Urban District Council.

## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their insertion at the weekly cost of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1430 Holborn), subject to later confirmation by letter.*

ROAD FOREMAN.—April 27th.—Inverness Town Council. 35s. per week.—Mr. T. H. Scott, burgh surveyor.

SURVEYOR'S CLERK AND ASSISTANT. — April 27th.—East and West Molesey Urban District Council. £70—£100.

INSPECTOR OF NUISANCES.—April 29th.—Sedgefield Rural District Council.—£110 per annum.—Mr. J. W. Lodge, clerk.

SANITARY INSPECTOR.—April 29th.—Southwark Borough Council. £150—£180 per annum.—Mr. Percy H. Gray, town clerk.

SEWAGE FARM FOREMAN.—April 29th.—Corporation of Bolton. 30s. per week, with house, coal, and light.—Mr. S. Parker, town clerk.

JUNIOR CLERK.—April 29th.—Public Health Department of Finsbury Borough Council. £40—£60 per annum.—Mr. G. W. Preston, town clerk.

ASSISTANT INSPECTOR OF NUISANCES.—April 29th.—Gloucester Urban and Port Sanitary Authorities. £90 per annum.—Mr. G. S. Blakeway, town clerk.

CLERK OF WORKS.—April 29th.—Pontardawe Rural District Council. £2 10s. per week.—Mr. W. Lewis, clerk.

CLERK OF WORKS.—April 30th.—Corporation of Nelson.—£2 10s. per week.—Mr. J. H. Baldwick, town clerk.

ASSISTANT SURVEYOR.—April 30th.—Bushey Urban District Council. £80—£120.—Mr. John Wilson, clerk.

CLERK OF WORKS.—April 30th.—Corporation of York. £3 per week.—Mr. F. W. Spurr, city engineer.

BOROUGH SURVEYOR'S JUNIOR ASSISTANT.—May 1st.—Corporation of Stoke-on-Trent. £65 per annum.—Mr. A. Burton, borough engineer.

INSPECTOR OF NUISANCES.—May 1st.—St. Colomb Major Rural District Council.—Mr. C. E. Whitford, clerk, Council Offices.

CHIEF INSPECTOR OF NUISANCES.—May 1st.—Corporation of Hull. £250 per annum.—Mr. H. A. Learoyd, town clerk.

SURVEYOR'S GENERAL ASSISTANT.—May 1st.—Corporation of Devonport. £75—£100.—Mr. John F. Burns, borough surveyor.

CONSULTING SANITARY ENGINEER.—May 2nd. —Flaxton Rural District Council.—The Clerk.

SURVEYOR'S ASSISTANT. — May 3rd. — Earby Urban District Council. 25s. per week.—Mr. Jas. E. Aldersley, engineer and surveyor.

INSPECTOR OF NUISANCES.—May 3rd.—Fordingbridge Rural District Council. £120—£140.—Mr. H. G. Beach, clerk.

SANITARY INSPECTOR.—May 3rd.—Elgin County Council. £140 per annum.—Mr. E. D. Jameson, county clerk, Elgin.

CLERK OF WORKS.—May 4th.—Gosport and Alverstoke Education Committee. £2 10s. per week.—Mr. G. R. Walker, secretary, Education Offices, Gosport.

SUB-FOREMAN OF WORKS.—May 4th.—Corporation of Swindon. £2 per week.—Mr. R. Hilton, town clerk.

TEMPORARY ASSISTANTS (2).—May 6th.—Corporation of York. £100 per annum.—Mr. F. W. Spurr, city engineer.

SURVEYOR'S ASSISTANT.—May 6th.—Bedwellty Urban District Council. £2 per week.—Mr. T. J. Thomas, clerk, High-street, Bargoed.

ARCHITECT.—May 6th.—Hackney Borough Council.—Mr. W. A. Williams, town clerk.

ASSISTANT SURVEYOR.—May 8th.—Kerry County Council. £150 per annum.—Mr. P. M. Quinlan, county secretary, County Hall, Tralee.

ASSISTANT INSPECTOR OF NUISANCES.—May 11th.—Corporation of Warrington. £78—£125.—Mr. J. Coote Hibbert, medical officer of health, 78 Sankey-street.

DISTRICT MAIN ROAD SURVEYOR.—May 13th.—Derbyshire County Council. £200—£250.—Mr. N. J. Hughes-Hallett, clerk.

SURVEYOR.—May 29th.—Carmarthenshire County Council. £200 per annum.—Mr. J. W. Nicholas, clerk, county offices, Carmarthen.

ASSISTANT ENGINEER FOR BUILDINGS AND ARCHITECTURE.—May 31st.—Municipality of Bombay. 600 rupees—800 rupees per month.—Mr. P. R. Cadell, municipal commissioner.

ASSISTANT ENGINEER.—Public Works Department of the Government of Ceylon. £300—£350 per annum.—Messrs. Gregory, Eyles & Waring, 12 Dean's-yard, Westminster, S.W.

## MUNICIPAL COMPETITIONS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their insertion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

WOMBWELL.—May 1st.—Designs for public swimming bath, for the urban district council.—Prizes of £40, £30 and £20 are offered.—Mr. W. Quest, surveyor.

CLONAKILTY.—May 3rd.—Plans for a water supply scheme, for the rural district council. A premium of £10 is offered, and 2½ per cent on the outlay for inspection and carrying out the works.—Mr. H. V. Spiller, clerk.

HALE.—June 28th.—Designs for a town planning scheme for the urban district council. Premiums of £50 and £25 are offered.—The Clerk.

DUSSELDORF.—July 1st.—Plan for the extension of the city. Premiums of £1,000 and £375 are offered. —The Chief Burgomaster.

## MUNICIPAL CONTRACTS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their insertion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

### Buildings.

WEST SUFFOLK.—April 27th.—For repairs and painting at police stations, for the Joint Committee. —Mr. A. A. Hunt, county architect, 51 Abbeygate-street, Bury St. Edmunds.

COVENTRY.—April 27th.—For the erection of three branch libraries, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

PONTYPOOL.—April 27th.—For the erection of 100 dwellings, for the urban district council.—Mr. H. H. Haden, clerk.

GLASGOW.—April 29th.—For the construction of a public convenience, for the corporation.—Mr. J. Lindsay, town clerk.

WIDNES.—April 29th.—For alterations at Farnworth Grammar School, for the Education Committee. —Mr. G. H. Danby, director and secretary, Town Hall, Widnes.

TRURO.—April 29th.—For rebuilding a bridge, for the rural district council.—The Clerk.

BRADFORD.—April 29th.—For the reconstruction of conveniences, for the Education Committee.—Director of Education, Town Hall.

THETFORD.—April 30th.—For the erection of fifty workmen's dwellings, for the urban district council.—Mr. J. Houchen, clerk.

ISLE OF WIGHT.—April 30th.—For the erection of a house at the county asylum, for the Committee of Visitors.—Mr. J. H. Green, clerk, Whitecroft.

WALLSEND.—April 30th.—For the erection of public conveniences, for the town council.—Mr. W. V. Mulcaster, town clerk.

LEXDEN AND WINSTREE.—April 30th.—For the erection of a steel girder and concrete bridge, for the rural district council.—Mr. George E. Thompson, clerk.

LONDON.—April 30th.—For the erection of hostels and kitchen block at Eltham, for the county council.—Superintending Architect, 19 Charing Cross-road, W.C.

GLAMORGAN.—May 1st.—For the erection of three schools, for the county council.—County Council Offices, Westgate-street, Cardiff.

PORTSMOUTH.—May 1st.—For additions to hospital and other works, for the corporation.—Mr. G. H. Etherton, town clerk.

LLANELLY.—May 6th.—For the erection of twenty-four houses, for the urban district council.—Mr. H. V. Spowart, clerk.

MANCHESTER.—May 6th.—For the construction of a subway, for the corporation.—Mr. Thomas Hudson, town clerk.

CHESTER.—May 6th.—For the erection of laundry work centre, for the corporation.—Mr. J. H. Dickson, town clerk.

NUNEATON.—May 7th.—For additions to the engine-house at electricity works, for the corporation.—Mr. F. C. Cook, borough surveyor.

MARGATE.—May 7th.—For the erection of a sheltered seat and ten bungalows, for the corporation.—Mr. Edward Brooke, town clerk.

BUCKLOW.—May 7th.—For the execution of earthwork and the erection of a retaining wall, for the rural district council.—Mr. George Leigh, clerk.

SOUTHEND.—May 9th.—For erecting a chimney, for the corporation.—Mr. E. J. Elford, borough engineer.

WEST RIDING.—May 10th.—For the erection of a school, for the Education Committee.—Education Architect, County Hall, Wakefield.

CORNWALL.—May 11th.—For alterations at Connor Downs school, for the Education Committee.—Mr. R. Pascoe, secretary, Education Office, Truro.

RYDE.—May 13th.—For building a pumping station at waterworks, for the corporation.—Mr. Charles G. Vincent, town clerk.

PONTYPRIDD.—May 13th.—For the extension of refuse destructor, for the urban district council. Mr. J. Colenso Jones, clerk.

LANCASHIRE.—May 14th.—For the erection of an elementary school, for the Education Committee.—Mr. H. Littler, county architect, 16 Ribblesdale-place, Preston.

WEST SUFFOLK.—May 14th.—For the erection of new infants' school, and alterations to existing buildings, for the Education Committee.—Mr. Fred. R. Hughes, secretary.

ESSEX.—May 14th.—For the erection of a school at Leigh-on-Sea, for the Education Committee.—Mr. Herbert Bell, clerk.

SOUTHEND-ON-SEA.—May 22nd.—For the erection of a council school at Hamstel, for the Education Committee.—Mr. J. W. Barrow, clerk.

BRADFORD-ON-AVON.—May 31st.—For the construction of a retaining wall, for the urban district council.—Mr. James Compton, clerk.

## Iron and Steel.

SCUNTHORPE.—April 30th.—For the supply of spigot and socket pipes and specials, for the Joint Sewerage Board.—Mr. G. E. Davy, clerk, High-street, Scunthorpe.

RHYL.—April 30th.—For the supply of 8-in. and 4-in. socket and spigot cast-iron pipes, for the urban district council.—Mr. Arthur Rowland, clerk.

ABERGAVENNY.—May 1st.—For the construction of spring and stream intakes, collecting, balancing and dividing chambers, laying pipes, and formation of service reservoir, for the corporation.—Mr. W. H. H. Hopwood, town clerk.

DOVER.—May 6th.—For laying 1,060 yds. of water main, for the corporation.—Mr. R. E. Knocker, town clerk.

MARGATE.—May 6th.—For laying 320 yds. of 6-in. water main, for the corporation.—Mr. Edward Brooke, town clerk.

RICHMOND (Surrey).—May 7th.—For the supply of spigot and socket pipes and irregular castings, for the corporation.—Town Clerk.

CLUN (Salop).—May 8th.—For laying cast-iron water pipes and fittings, for the rural district council. —Mr. Percy H. Newill, clerk.

ECCLES.—May 8th.—For fixing heating apparatus in school, for the corporation.—Mr. Edwin Parkes, town clerk.

CARRICK-ON-SUIR.—May 11th.—For laying iron pipes and fittings and constructing service reservoir, also supplying cast-iron pipes and valves, for the urban district council.—Mr. James Verrington, clerk.

## Roads.

DUNMOW.—April 26th.—For the supply of broken granite, for the rural district council.—Mr. A. E. Floyd, clerk.

WROTHAM.—April 27th.—For supply of stone and steam rolling, for the urban district council.—Mr. F. T. Elliott, surveyor.

SOUTHWICK (Sussex).—April 27th.—For the supply of flints, for the urban district council.—Mr. G. W. Warr, surveyor.

GODSTONE.—April 29th.—For the supply of flints and cartage, for the rural district council.—Mr. G. E. Crowter, surveyor.

NUNEATON.—April 29th.—For the supply of materials, for the corporation.—Mr. F. C. Cook, borough surveyor.

EASINGTON.—April 29th.—For making up a private street, for the rural district council.—Mr. J. M. Longden, clerk.

CAMBERWELL.—April 29th.—For making up Red Post-hill, for the borough council.—Mr. C. William Tagg, town clerk.

WANDSWORTH.—April 29th.—For the purchase of twelve water vans, capacity about 400 gallons, for the borough council.—Mr. P. Dodd, borough engineer.

PRESTWICH.—April 29th.—For works of private street improvement, for the urban district council.—Mr. Lewis A. Orford, law clerk.

BRECHIN.—April 29th.—For street causewaying work, for the corporation.—Burgh Surveyor.

WALTON-LE-DALE.—April 29th.—For work of paving with granite cubes, for the urban district council.—Mr. J. Leigh, surveyor.

TAUNTON.—April 30th.—For the supply of 6,000 to 12,000 gallons of tar, for the corporation.—Mr. D. Edwards, borough surveyor.

KIRKCALDY.—April 30th.—For laying granite setts, for the corporation.—Burgh Surveyor.

CAERPHILLY.—April 30th.—For making up four streets, for the urban district council.—Mr. Alfred O. Harpur, engineer and surveyor.

LLANDAFF AND DINAS POWIS.—April 30th.—For private street improvement works, for the rural district council.—Mr. M. Warren, clerk.

WEST HARTLEPOOL.—April 30th.—For making up certain streets, for the corporation.—Mr. Nelson F. Dennis, borough engineer.

STOWMARKET.—April 30th.—For works of rolling and scarifying, for the urban district council.—Mr. P. C. G. Hayward, clerk.

SWANSEA.—April 30th.—For carrying out private street work, for the corporation.—Borough Surveyor.

ROCHDALE.—May 1st.—For work of making good, for the corporation.—Borough Surveyor.

LANCHESTER.—May 1st.—For making up a new road, for the rural district council.—Mr. W. R. Ritson, clerk, Lanchester, Durham.

CARSHALTON.—May 1st.—For tar-spraying 74,000 yds. super. of road, for the urban district council.—Mr. C. P. Lovelock, clerk.

INVERNESS.—May 1st.—For new road diversion of 1 mile and construction of bridges, for the Lochaber District Committee.—Mr. Thomas Allison, district clerk, Fort William.

LAUNCESTON.—May 1st.—For cement paving works, for the corporation.—Mr. W. Grace, borough surveyor.

CRANBROOK.—May 1st.—For the supply of road materials, for the rural district council.—Mr. T. H. Crampton, clerk.

HAWARDEN.—May 1st.—For the supply of road stones, for the rural district council.—Mr. H. G. Roberts, clerk, Broughton, near Chester.

GOOLE.—May 1st.—For making up a street, for the urban district council.—Mr. R. Tyson, clerk.

ROMSEY.—May 2nd.—For tar-painting 23,000 super. yds. of road, for the corporation.—Mr. B. W. Attlee, town clerk.

MALDON.—May 2nd.—For the supply of granite and flints, and hire of steam roller with scarifier, for the corporation.—Mr. Thos. R. Swales, borough surveyor.

JARROW.—May 2nd.—For the supply of road materials, for the corporation.—Mr. J. S. Weir, borough engineer.

SIDMOUTH.—May 3rd.—For work of road widening, for the urban district council.—Mr. R. Lake, surveyor.

SLOUGH.—May 3rd.—For the supply of materials and labour, for the urban district council.—Mr. W. W. Cooper, town surveyor.

MANCHESTER.—May 3rd.—For making up and draining certain roads, for the Withington Committee. —Mr. Thomas Hudson, town clerk.

ROWLEY REGIS.—May 3rd.—For work of tar-spraying, for the urban district council.—Mr. D. Wright, clerk.

HARROGATE.—May 3rd.—For widening East-parade, for the town council.—Mr. C. E. Rivers, borough engineer and surveyor.

RICHMOND (Surrey).—May 3rd.—For making a new street, for the corporation.—Mr. J. H. Brierley, borough surveyor.

JARROW.—May 4th.—For cementing certain footpaths, for the corporation.—Mr. J. S. Weir, borough engineer.

CRAMLINGTON.—May 4th.—For the supply of broken whinstone chippings and slag chippings, for the urban district council.—Mr. R. Nicholson, clerk, Morpeth.

PLOMESGATE (Suffolk).—May 6th.—For the supply of broken granite and flint, for the rural district council.—Mr. D. R. Read, clerk, Wickham Market.

MANCHESTER.—May 6th.—For making up Charlton-street, for the corporation.—Mr. Thomas Hudson, town clerk.

HORSHAM.—May 6th.—For making up Victoria-road, Albany-road, and Princess-road, Crawley, for the rural district council.—Mr. W. Dengate, 58 Park-street, Horsham, surveyor.

RICHMOND.—May 7th.—For making good certain streets, for the Paving Committee.—Mr. J. H. Brierley, borough surveyor.

REIGATE.—May 7th.—For the supply of granite-macadam, basalt and flints, granite kerb and setts, Kent ragstone, tar paving, artificial stone paving, gravel, concrete beach, pea beach, compo. grit, Portland cement, and Beddington grit.—Mr. Alfred Smith, town clerk.

FRINTON-ON-SEA.—May 7th.—For making up Crescent-road, for the urban district council.—Mr. E. M. Bate, surveyor.

WOOLWICH.—May 8th.—For the supply of one 400-gallon water van (cylindrical tank), for the borough council.—Mr. Arthur B. Bryceson, town clerk.

WEST RIDING.—May 8th.—For asphalting work at Darfield school, for the District Sub-Committee.—Mr. T. Graham, Education Offices, Obelisk Chambers, Barnsley.

THAMES DITTON.—May 9th.—For making up a certain road, for the urban district council.—Council Offices, Brabant Villa.

BAILDON.—May 10th.—For the supply of broken granite and broken limestone, for the urban district council.—Mr. J. Bentley, clerk.

WIGAN.—May 10th.—For the supply of road materials, for the rural district council.—Mr. H. G. Ackerley, clerk, 6 Victoria Buildings.

LONG CRENDON.—May 14th.—For the supply of broken granite and chippings, for the rural district council.—Mr. Edward N. Purcell, clerk.

ISLEWORTH.—May 15th.—For making up portion of a road, for the urban district council.—Mr. H. J. Baker, clerk.

DAWLEY.—For the supply of 300 tons of tarmacadam, for the urban council.—Mr. R. Lewis Price, surveyor.

THINGOE.—For a supply of granite, for the rural district council.—Mr. A. R. Cameron, surveyor.

HOWDEN.—For works of channelling and repaving, for the rural district council.—Mr. John Anderson, highway surveyor.

## Sanitary.

DOWNPATRICK.—April 27th.—For the construction of a sewer, for the rural district council.—Mr. R. L. Morrow, clerk.

HASTINGS.—April 29th.—For laying pipe sewer, for the corporation.—Town Clerk.

RATHMINES.—April 29th.—For the construction of sewers, for the urban district council.—Chairman of the Public Health Committee.

MILTON REGIS.—April 29th.—For laying a sewer, for the urban district council.—Mr. W. R. Warlow, surveyor.

HADDINGTON.—April 29th.—For laying pipeclay sewer and necessary works, for the county council.—Mr. G. S. Carfrae, 1 Erskine-place, Edinburgh.

CAMBUSLANG.—April 29th.—For work of scavenging, for the Special Scavenging District.—Mr. J. T. T. Brown, clerk, 97 West Regent-street, Glasgow.

NORTH DUBLIN.—April 29th.—For the construction of sewers, for the rural district council.—Mr. P. H. McCarthy, 39 Westmoreland-street, Dublin.

WORCESTER.—April 29th.—For alterations to disintegrating tanks and other works, for the corporation.—Mr. Thomas Caink, city engineer.

SCUNTHORPE.—April 30th.—For the construction of cast-iron and stoneware-pipe sewers, and pile driving, for the Joint Sewerage Board.—Mr. G. E. Davy, clerk, High-street, Scunthorpe.

DAVENTRY.—April 30th.—For the construction of sewers and sewage disposal works, for the rural district council.—Mr. J. D. Spearing, clerk.

NEWRY.—May 3rd.—For the construction of a new sewer, for the urban district council.—Mr. William M. Cronin, town clerk.

STEWARTON.—May 3rd.—For the construction of sewage disposal works, for the corporation.—Mr. W. Macrae, town clerk, Royal Bank, Stewarton, Ayrshire.

MARKET HARBOROUGH.—May 6th.—For the construction of new sewerage with manholes, for the urban district council.—Mr. Herbert G. Coales, engineer.

SAWBRIDGEWORTH. — May 6th. — For house scavenging work, for the urban district council.—Mr. W. Morris, clerk.

WATFORD.—May 6th.—For the construction of stoneware pipe sewer, storm-water sewer, and manholes, for the urban district council.—Mr. W. W. Newman, engineer pro tem.

FOLKESTONE.—May 10th.—For the construction of sewage outfall works, for the corporation.—Mr. A. E. Nichols, borough engineer.

MILFORD HAVEN.—May 10th.—For the supply of drain pipes and bricks, for the urban district council.—Mr. Thomas H. Lewis, clerk.

BRADFIELD.—May 13th.—For the construction of main sewerage and sewage disposal works at Pangbourne, for the rural district council.—Mr. R. E. Rawstone, clerk, 4 Bridge-street, Caversham, Reading.

GLASTONBURY.—May 13th.—For alterations and additions to sewerage system, with manholes, lamp-holes, flushing tanks, storage tanks, erection of two pumping stations, and storm-water lagoons, for the corporation.—Mr. Reginald T. Gould, town clerk.

EAST GRINSTEAD.—May 15th.—For the construction of sewage disposal works, for the rural district council.—Mr. Francis S. White, clerk.

TEDDINGTON.—May 15th.—For the erection of sewage disposal and refuse destructor works, for the urban district council.—Mr. G. H. Salmons, clerk.

HOLLINGBOURN.—May 15th.—For the construction of main sewerage and sewage disposal works, for the rural district council.—Mr. H. J. Bracher, clerk, 33 Earl-street, Maidstone.

MATLOCK.—The date for receiving tenders for the sewerage and sewage disposal works has been extended to April 29th.

## Stores.

NUNEATON.—April 29th.—For the supply of kerbs, iron castings, Portland cement, and petroleum, for the town council.—Borough Surveyor.

ARBROATH.—April 30th.—For the supply of fireclay pipes, bricks, lime, cement, pavement, kerbs, and channels, whin and granite setts, iron pipes, castings, and brass, for the corporation.—Mr. P. C. Smith, burgh engineer.

COLWYN BAY.—May 1st.—For the supply of cables, engine-room stores, and meters, for the urban district council.—Mr. J. Amphlett, clerk.

WALLASEY.—May 6th.—For the supply of requirements for the Ferries' Committee.—Mr. H. W. Cook, town clerk.

RICHMOND.—May 7th.—For the supply of Welsh steam coal, house coal, Buxton lime, grey lime, sulphate of ammonia and green copperas, and filter cloth, for the Main Drainage Board.—Mr. J. Leslie G. Powell, clerk.

## Miscellaneous.

ARBROATH.—April 30th.—For the supply of fireclay pipes, bricks, lime, cement, kerb, channel, granite setts, and castings, for the corporation.—Mr. P. C. Smith, burgh engineer.

CLACTON.—May 1st.—For the supply of clean ballast, for the urban district council.—Mr. D. J. Bowe, surveyor.

LONDON.—May 6th.—For the supply of sand, for the Water Board.—The Clerk, Savoy-street, Strand, W.C.

WEST RIDING.—May 8th.—For asphalting playground, for the county council.—Mr. T. Graham, Education Offices, Obelisk Chambers, Barnsley.

# TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BARNOLDSWICK.—For sewerage extension works, for the urban district council.—Mr. W. Bennett, engineer and surveyor:—

| | |
|---|---|
| Clegg Brothers, Burnley | £610 |
| Ward & Tetley, Bradford | 597 |
| W. J. J. MacDonald, Barnoldswick | 596 |
| W. Morley & Sons, Keighley | 552 |
| R. Wood, Bingley* | 493 |

BARROWFORD.—For works of paving and flagging, and the supply of road materials, for the urban district council.—Mr. G. W. Hewes, surveyor:—

Read Brothers, Burnley.—Labour only, private street works, £477.
T. Dent & Sons, Nelson.—Random stone for pitching, 3s. 6d. load delivered.
H. Marsden, Salterforth.—Random stone for pitching, 1s. 8d. ton at canal wharf.
R. Haighton, Limited, Nelson.—Castings, £65.
W & J. Baldwin, Burnley.—Brushes, £9.
Threlkeld Granite Company, Keswick.—2½-in. granite, £50.
P. W. Spencer, Skipton.—2½-in. limestone, 1s. 5d. ton, Nelson station.
H. Marsden, Salterforth.—2½in. limestone, 4s. 3d. ton, canal wharf.
J. Sagar & Sons, and Salterforth Stone and Brick Company, Limited, Salterforth.—6-in. setts, 12s 6d. ton at canal wharf; 12-in. × 6-in. channels, 2s. 4d. lin. yd. at canal wharf; 12 in. × 8 in. kerbs, 3s. 1d. lin. yd. at canal wharf.
Brooks & Brooks, Limited, Cloughfold.—3-in. flags, 3s. 8d. sup yd 6-in. flags, 4s. 6d. sup. yd.

CUCKFIELD (Sussex).—The tender of Hall & Co. for sand at 6s. 1d. per ton has been accepted by the urban district council.

ELY.—For the erection of chief constable's offices and police houses for the standing joint committee.—Mr. R. S. W. Perkins, county surveyor:—

Quantities by Mr. F. T. Mullett.

| | |
|---|---|
| Morriss Brothers, Ely | £2,520 |
| Coulson & Lofts, Cambridge | 2,412 |
| H. J. Linzell, Newmarket | 2,377 |
| Rands & Son, Wisbech | 2,193 |
| Parren & Son, Ely | 2,175 |
| Redding & Son, Cambridge | 2,175 |
| Clarke & Sons, Cambridge | 2,161 |
| Kidman & Son, Cambridge | 2,160 |
| R. Shanks, Chatteris | 2,130 |
| H. Feast, Haddenham | 2,126 |
| J. G. Cowell, Soham | 1,976 |
| Lawrence & Tucker, Ely | 1,848 |
| G. W. Heath, March* | 1,738 |

ELY.—Accepted for alterations and additions to the high school for girls.—Mr. R. S. W. Perkins, county surveyor:—
Quantities by Mr. F. T. Mullett.
Elworthy & Co, Wisbech, £541.

HINDLEY.—Accepted for the construction of cast-iron main sewer, for the urban district council.—Mr. O. P. Abbott, surveyor:—
J. Horrocks, Westhoughton.

HORSHAM.—Accepted for the supply of granite, team labour, hire of two steam rollers, and two tar boilers, for the rural district council.—W. Dengate, surveyor:—
Cherbourg Quartzite.—Road Maintenance Company, Gravesend, 13s. 9d. per cubic yard.
Alderney Granite.—Rowe & Mitchell, London Bridge, 13s. 2d. per cubic yard.
Jersey Granite.—Croft Granite Company, Leicester, 13s. 6d. per cubic yard.
Guernsey Granite (hand broken).—Fry Brothers, Greenwich, 14s. 9d. per cubic yard.
Penlee Stone.—Penlee and St. Ives Stone Company, Bristol, 12s. 2d. per cubic yard.
Mendip Granite.—Emborough Stone Company, Bath, 10s. 7d. per cubic yard.
Flints (Chichester).—Hall & Co., Croydon, Limited, 4s. 9d. per cubic yard.
Flints (Portslade).—Hudson Limited, Brighton, 5s. 5d. per cubic yard.
Flints (Portslade).—Hillman & Son, Portslade, 5s. 5d. per cubic yard.
2 Tar Boilers (180 gallons).—Municipal Appliances Company, Bamber Bridge, £17 10s. 6d. each
Hire of Steam Roller with scarifier.—J. Sparks Yapton, 24s. per day; Chittenden and Simmons, Maidstone, 24s. 6d. per day.

ITCHEN.—For sewer work, for the urban district council:—

| | |
|---|---|
| Grounds & Newton, Bournemouth ... ... ... ... | £1,094 |
| Streeter & Co., Guildford ... ... ... ... ... ... ... | 962 |
| Osman, Southampton* ... ... ... ... ... ... ... | 895 |
| Douglas, Southampton ... ... ... ... ... | 840 |

Surveyor's estimate, £904.

KEITH.—For widening and improving a bridge, for the corporation:—

| | |
|---|---|
| D. Forsyth, Elgin ... ... ... ... ... ... ... ... | £1,293 |
| J. Lawrence, Craigellachie ... ... ... ... ... | 1,204 |
| W. Alexander & Son, Dufftown ... ... ... | 794 |
| R. Mitchell, Huntly ... ... ... ... ... ... ... | 761 |
| W. Cruickshank, Keith* ... ... ... ... | 755 |

LEWISHAM.—For paving certain roads, for the borough council:—
J. Mowlem & Co., Limited,† —Sangley-road-passage (roadway), £112; Phœbeth-street (roadway), £385; Francemary-street (roadway), £645.
Gibson & Co.,†—Sangley-road-passage, Phœbeth-street and Francemary-street (footways), 3s. 7½d. per square yard.

LEWISHAM.—The following tenders have been accepted by the borough council:—
Constable, Hart & Co., Limited.—Coarse and fine tar paving and Kent rag chippings.
S. West, Limited.—Crushed Thames ballast and screened shingle.
Crayford Sand and Gravel Pits.—Pit sand.
J. & B. Martin.—Pit sand.
W. G. Penfold.—Pit ballast and Thames sand.
W. Pearce.—Screened shingle.
Fry Brothers.—Broken 2½-in. Guernsey granite
Fry Brothers.—Broken 2-in. Guernsey granite and dug flints.
Chittenden and Simmons, Limited.—Broken Kentish ragstone.
W. Pearce—Dug flints
J. & B. Martin. Dug flints.
J. Weston & Sons.—Thames ballast and sand, and Croydon gravel.
W. B. Cunis, Limited.—Thames sand, crushed Thames ballast and screened shingle.
Sanitas Company, Limited.—Disinfectants.
Savannah Chemical Company, Limited.—Disinfectants.
Middleton Brothers.—Disinfectants.
W. Dowell & Co., Limited.—House and steam coal.
Seyssel and Metallic Lava Asphalte Company.—Repair of asphalte paths.
A. J. Hewens.—Tools, implements, etc.
Globe Foundry, Stratford, Limited.—Ironwork to sewers and drainage
Catford Timber Company, Limited.—Timber.
Middleton Brothers.—Oilman's goods.
F. Smith & Co.—Brooms, brushes, etc.
Howell & Co—Oats.
A. May.—Hay, clover, straw, bran, and linseed.
Browning & Hoar, Limited.—Peat moss litter.
W. Pearce.—Artificial stone.
Doulton & Co., Limited.—Stoneware goods.
C. Pearce.—Cement.
W. Whiteway & Co.—Lime and bricks.
Fry Brothers. Road repairs with dug flints.
J. T. Gloag.—Road repairs with dug flints.
J. Woolf & Co.—Clothing.
J. T. Gloag.—Sewerage jobbing works.
S. West, Limited.—Removal of house and trade refuse.
S. G. Pimm.—Horse hire (Public Health Department).
Freame, Manning & Co.—Printing.
J. Truscott & Son, Limited.—Stationery, books, and office sundries.

MARKET BOSWORTH.—For the supply of broken granite and team labour, for the rural district council.—Mr. I. Thorpe, highways surveyor:—
A separate tender has been accepted for each of 40 parishes. Generally stones at the quarry are about the same figure as last year, but in nearly every parish where there is rail delivery, there is an increase of 3d. a ton, and the carters all round are 3d. a ton up, making an increase of 6d. for many parishes.

NORWICH.—The following tenders have been accepted by the corporation:—
Norwich Water Works Company, for approximately 90 lead-lined flushing cisterns, at £1 9s. each.
Lambeth Brass and Iron Company, Limited, London, for lead-lined flushing cisterns, at £1 9s. each.
London Granite Company, to supply (subject to a satisfactory sample) 200 tons of 3-in. by 5-in. secondhand setts at Norwich, at 20s. 6d. per ton.
Atlas Stone Company, Limited, Cambridge, for the supply of 2½ in. Atlas Stone Paving, at 4s. 1d. per yard for a further twelve months.
S. Smith, for 20 tons of hay, at £6 5s. per ton.
R. Arthurton, for 25 tons of hay, at £6 per ton.

POOLE.—For road sweeping brushes the corporation received tenders from W. Haydon, E. Godwin, G. Simmonds, Boone & Co., F. Bird & Co., Poole Brush Company, Bacon & Curtis, Limited, and Sharp & Son. The tender of the Poole Brush Company at 25s. 6d per dozen was accepted.
The General Purposes Sub committee considered tenders received from the following firms for supplying granite for the ensuing 12 months—*viz.*, J. Mowlem & Co., W. Griffiths & Co., A. & F. Manuelle, United Stone Firms, Limited, Brookes, Limited, Fry Brothers, St. Keverne Stone Company, Penlee and St. Ives Stone Quarries, Limited, Hudsons, Limited, Rowe & Mitchell, Croft Granite Company, and W. S. Hoare & Son. The tenders received were for the supply of granite of 2-in gauge, but the committee were of opinion that it is desirable to increase the size of the stones, and they have accordingly instructed the borough surveyor, Mr. S. J. Newman, to obtain from J. Mowlem & Co. and A. & F. Manuelle, those being the two lowest tenders for Guernsey granite, amended tenders for Guernsey granite of 2½-in. gauge, and also tenders for supplying granite chippings. The committee also instructed the borough surveyor to purchase a small quantity of Mendip granite for the purpose of testing its suitability for use on tarred surfaces.
Amended tenders for supplying granite referred to in the report were received from A. & F. Manuelle and J. Mowlem & Co., Limited. The tender of A. & F. Manuelle for granite at 10s. per ton, and for granite chippings at 6s. 9d., 7s. 8d., and 7s. 11d. per ton respectively was accepted.

PORTSLADE (Sussex).—The tender of F. Hillman to supply 150 cubic yards of clean hill surface flints at 5s. 9d. per cubic yard has been accepted.
The tenders of A. & F. Manuelle to supply 50 cubic yards of 2-in. broken granite at 14s. 3d. per cubic yard have also been accepted.

QUORN (Leicestershire).—Tenders were received by the urban council, from J. & G. Gamble, to cart stone from Mountsorrel Quarry on to the council's roads at 1s. per ton, to the Reservoir-road at 1s. 6d. per ton, and day work for man and horse 7s., and from Facer Brothers at 1s. 1d. per ton, 1s. 6d. per ton, and 7s. 6d.—It was resolved to accept Messrs. Gambles' tender.

RAUNDS.—For the construction of sewage disposal works, for the urban district council:—

| | |
|---|---|
| P. Wilson, Dunstable ... ... ... ... ... ... ... | £1,400 |
| G. P. Trentham, Handsworth ... ... ... | 1,363 |
| C. Chamberlain, Leicester ... ... ... ... | 1,265 |
| W. Packwood, Rushden ... ... ... ... ... | 1,180 |
| W. G. Wilmott, Rushden* ... ... ... ... ... | 1,143 |

STOCKBRIDGE.—Accepted for the supply of road material, for the urban district council:—
Whinstone.—J. Carr & Co., Dronfield, 11s. 9d. per ton; Ord & Maddison, Bawtry, 12s. 6d.
Granite.—Basalt Road Stone Company, Buxton, 9s. 5d. per ton.
Dross.—J. Carr & Co., Dronfield, 7s. 9d. per ton; T. Feather, Mirfield, 4s. 10d.; F. Whitworth & Co., Sheffield, 4s. 11d.

SUTTON (Isle of Ely).—Accepted for the erection of police constable's cottage for the standing joint committee.—Mr. R. S. W. Perkins, county surveyor:—
J. Parren & Son, Earith, £245.

TWICKENHAM.—The following tenders have been accepted by the urban district council:—
J. Knowles & Co. (London), Limited, for the supply of blue bricks and copings for landing steps on The Embankment, £13 4s. 6d.
Ham, Baker & Co., Limited, for the supply of two swan necks and three 2½-in. sluice valves for street watering posts, £7 9s.
G. Slark, for the supply of water ballast roller, 30 in. diameter by 32 in. in width, £9.

URMSTON.—For paving, flagging and improvement works, for the urban district council.—Mr. J. Heath, surveyor:—

| | |
|---|---|
| W. H. Worthington, Limited, Manchester ... ... ... ... | £1,586 |
| Hewdley & Brown, Patricroft ... ... ... ... ... ... | 1,460 |
| W. Snape & Sons, Eccles* ... ... ... ... ... ... | 1,454 |

WHITLEY.—For the construction of back street, laying wood blocks, and construction of footway, for the urban district council:—

| | |
|---|---|
| Cook, Starkey & Co., Hull ... ... ... ... ... ... ... | £1,345 |
| R. Fisher, North Shields ... ... ... ... ... ... ... | 1,224 |
| G. Armstrong, Whitley Bay ... ... ... ... ... | 1,198 |
| M. D. Young, Newcastle ... ... ... ... ... | 1,166 |

## MEETINGS.

*Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.*

APRIL.

26.—Institution of Civil Engineers: Students' Meeting: Mr. T. Frame Thomson, M.Inst C.E., on "The Principles and Practice of Accountancy in Relation to Engineering Design and Work." 8 p.m.
27.—Institution of Municipal and County Engineers: Council Meeting.
29.—Surveyors' Institution: Mr. G. T. Loban on "Some Principles in the Valuation of Land and Buildings." 8 p.m.
30.—Institution of Civil Engineers: Annual General Meeting of Corporate Members to receive Report of Council and elect council and auditors. 8 p.m.

MAY.

4.—Institution of Municipal and County Engineers: Meeting at Exmouth.
4.—Lower Thames Valley District Surveyors' Association: Annual Meeting and Dinner.
4.—National Association of Local Government Officers: Meeting of National Council, Leamington Town Hall. 10 a.m.
11.—Institution of Municipal and County Engineers: Meeting at Nuneaton.
11.—Society of Engineers: Annual Dinner, Criterion Restaurant, 7 p.m.
24-29.—Institution of Municipal and County Engineers: Visit to Paris.
24.—Royal Sanitary Institute: Meeting at Blackpool; Mr. A. Hindle, Assoc.M.Inst C.E., on "The Joint Scheme of Sewerage for Thornton-le-Fylde, Bispham-with-Norbreck and Carleton;" Mr. E. W. Rees Jones on "The Card Index System as Applied to Public Health Work," Town Hall. 7.30 p.m.
30-31.—Surveyors' Institution: Country Meeting at Nottingham.

JUNE.

1.—Institution of Municipal and County Engineers: Council Meeting.
6-8.—Institution of Water Engineers: Summer Meeting at Cheltenham.
7-8.—Institution of Municipal and County Engineers: Meeting at Stirling.
15.—Institution of Municipal and County Engineers: Meeting at East Ham.
22.—Association of Managers of Sewage Disposal Works: Metropolitan District Meeting, Southall-Norwood and Hanwell.
22.—Institution of Municipal and County Engineers: Meeting at Lowestoft.
29.—Institution of Municipal and County Engineers: Meeting at Bridlington.

JULY.

6.—Institution of Municipal and County Engineers: Meeting at Stourbridge.
11-13.—Institution of Municipal and County Engineers: Annual Meeting, London.

## APPOINTMENTS OPEN.

### CITY OF YORK.

SEWAGE DISPOSAL WORKS.

Wanted, Two Clerks of Works for the Construction of Sewage Disposal Works. Preference will be given to men who have been engaged on similar work. Wages £3 per week.

Applications (form to be obtained from the undersigned), with copies of three testimonials, to be sent in on or before the 30th April.

F. W. SPURR.
City Engineer.

Guildhall, York.

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WANTED, in the City Engineer's Office, York, Two Temporary Assistants, with knowledge of Town Planning requirements. Salary £100 per annum. Applications to be made on a Form to be obtained from the undersigned, and to be sent in not later than noon, May 6th, 1912.

F. W. SPURR,
City Engineer.

Guildhall, York.
April 22, 1912.

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### COUNTY BOROUGH OF DEVONPORT.

Applications are invited for the position of General Assistant in the Borough Surveyor's Department at a salary of £75 per annum, rising to £100 by yearly increments of £5.

Applicants must have a good knowledge of Surveying and Levelling, and preference will be given to candidates experienced in Municipal Work generally.

Canvassing, either directly or indirectly, will disqualify.

A list of duties and Form of Application can be obtained from the undersigned, and must be returned, filled up, not later than the 1st May, 1912.

JOHN F. BURNS.
Borough Surveyor.

Municipal Offices,
Devonport.
April 22, 1912.

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### DERBYSHIRE COUNTY COUNCIL.

APPOINTMENT OF DISTRICT MAIN ROAD SURVEYOR.

Applications are invited for the post of District Surveyor for the Bakewell Main Road District. Candidates must be between 25 and 45 years of age, and must have had experience in the direct maintenance of a considerable mileage of macadamised roads.

Salary (which is inclusive of travelling expenses) at the rate of £200 per annum, rising by increments of £10 per annum (subject to the recommendation of the County Surveyor) to £250 per annum. A further allowance of £10 per annum will be made in respect of office, Stationery, books, postages, &c., will be provided by the County Council.

Forms of application, and particulars of duties and terms of engagement, may be obtained from the County Surveyor, at the County Offices, and will be forwarded through the post on receipt of a stamped addressed foolscap envelope.

Applications, endorsed "District Surveyor," must be upon the form provided, and must reach me not later than 10 a.m. on Monday, the 13th day of May next.

Canvassing in any form will be a disqualification.

Dated this 22nd day of April, 1912.

N. H. HUGHES-HALLETT,
Clerk to the Derbyshire County Council.

County Offices, Derby.

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### BOMBAY MUNICIPALITY.

Applications are invited for the post of Assistant Engineer for Buildings and Architecture in the Public Works Department of the Bombay Municipality.

(2) Applicants must have had at least seven years' architectural training in some recognised firm of repute or in some important Municipal or Public Office, and be capable of assisting the Executive Engineer generally in the work of his Office.

(3) The duties of the post will, however, consist chiefly in the supervision of the staff engaged in the preparation of plans, estimates and designs for and in the efficient maintenance of the numerous buildings under the control of the Corporation, as also in the examination and disposal of the plans of all buildings submitted by the public to the Executive Engineer for approval.

(4) Preference will be given to candidates who have qualified as Associates of the R.I.B.A., and to those who have had experience in the administration of Municipal Acts and By-laws.

(5) Age between 26 and 35 preferred.

(6) The appointment will be at a salary of Rs.600/- per mensem, rising to Rs.800/- per mensem by annual increments of Rs.50/-. A conveyance allowance of Rs.50/- per mensem is attached to the post.

(7) The successful candidate will be required to produce a certificate (from a competent source) of fitness for service in the tropics, and if he elects to subscribe to the Municipal Pension Fund will also have to pass a medical examination conducted by the Municipal Medical Examiner in Bombay.

(8) Joining the Municipal Fund is optional. Contribution is levied at the rate of ½ anna in the rupee (1s. 4d.).

Subject to good conduct and approved service a monthly pension will be granted as follows:—

After 15 years' service—One-third of the average monthly emoluments for the preceding 3 years.

After 20 years' service—Five-twelfths of the average monthly emoluments for the preceding 3 years.

After 25 years' service—One-half of the average monthly emoluments for the preceding 3 years.

After 30 years' specially meritorious service—An additional one-twelfth of the average monthly emoluments for the preceding 3 years.

No contributor can retire before the age of 55, except on medical certificate.

Contributions also confer the right on dependent relations of receiving a compassionate allowance in case of death of the employee at certain rates, which may be generally said to be represented by one month's pay for each year of completed service after the first five years.

(9) The leave regulations are the uncovenanted leave rules of the Government of India, the prominent features being:—

1. One month's privilege leave for every eleven months' active service, subject to a maximum of three months at any one time.
2. Furlough (which can be combined with privilege leave) after ten years' service—1 year. After further eight years—1 year.
3. Sick leave and leave on urgent private affairs are also granted under conditions.

(10) The successful candidate, if appointed in India, will be allowed first-class railway fare to Bombay. If appointed from the British Isles a first-class free passage out to Bombay with full pay during the voyage.

(11) Applications, with one copy each of three recent testimonials, should be addressed to the undersigned, and should reach him not later than 31st May, 1912. Applicants should state the earliest date at which they can take up the appointment after receiving intimation of appointment.

P. R. CADELL.
Municipal Commissioner for the City of Bombay.

Municipal Commissioner's Office,
Bombay.
April 4, 1912.

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WANTED, by London Firm of Contractors, thoroughly competent Road Foreman. Apply A. B. C., office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

BOROUGH ENGINEER AND SURVEYOR (A.M.Inst.C.E.) of large town in the Midlands (40,000) has vacancy for Pupil. Address Box 1,144, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

## TENDERS WANTED.

### METROPOLITAN BOROUGH OF WOOLWICH.

TENDERS FOR WATER VAN.

The Council of the Metropolitan Borough of Woolwich invite Tenders for the Supply of—

One 400-gallon Water Van (Cylindrical Tank).

Sealed Tenders, with Specification and full particulars, must be delivered to me at the Town Hall, Woolwich, not later than 12 noon on Wednesday, the 8th May, 1912, in envelope endorsed "Tender for Water Van."

The person or firm whose Tender is accepted will be required to enter into a formal contract (and to pay the stamp duty of 10s. thereon), and to pay Trades Union rates of wages and observe Trades Union hours of labour.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

ARTHUR B. BRYCESON,
Town Clerk.

Town Hall,
Woolwich.
April 19, 1912.

### EAST GRINSTEAD RURAL DISTRICT COUNCIL.

GROOMBRIDGE SEWERAGE AND SEWAGE DISPOSAL WORKS.

The above Council invite Tenders from Builders and Contractors for the Construction of Sewage Disposal Works, comprising Detritus Tanks, Settling Tanks, Storm-Water Stand-by Tanks, Filter-Beds and Humus Tanks, together with the Laying of about 450 lin. yards of 12-in. and 9-in. Sewers, and the Construction of Manholes and other appurtenant works.

On and after April 29th, 1912, Plans may be seen and Specifications, Quantities and Form of Tender obtained, at the office of the Engineer to the Council, Mr. Charles Turton, 6 High-street, East Grinstead, on deposit of Three Guineas in cash, which sum will be returned only on the receipt of a *bonâ-fide* Tender, which is not withdrawn before June 30th, 1912, and the return to the Engineer of all documents received.

The Council will not necessarily accept the lowest or any Tender, and persons tendering do so at their own risk and cost.

Tenders, endorsed "Groombridge Sewerage," must reach the Clerk to the Council, Mr. Francis S. White, 6 High-street, East Grinstead, on or before the 15th May, 1912, before 5 p.m.

FRANCIS S. WHITE,
Clerk to the Council.

6 High-street, East Grinstead.
April 23, 1912.

### PONTYPRIDD URBAN DISTRICT COUNCIL.

EXTENSION OF REFUSE DESTRUCTOR BUILDINGS.

The above Council invite Tenders for the Extension of their Refuse Destructor Buildings at Treforest.

Plans and Specifications may be seen, and Forms of Tender and Bills of Quantities obtained, at the office of Mr. W. E. Lowe, Surveyor to the Council, upon receipt by the undersigned of a deposit of One Guinea, which will, after the Council shall have entered into a contract upon the Tenders received, be returned to the tenderer, provided he shall have sent in a *bonâ-fide* Tender and shall not have withdrawn the same.

Tenders, on the prescribed form, sealed and endorsed "Refuse Destructor Extension," must be received by the undersigned not later than Monday, May 13th, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

J. COLENSO JONES,
Clerk to the Council.

Municipal Buildings,
Pontypridd.
April 23, 1912.

### BOROUGH OF REIGATE.

TO CONTRACTORS.

The Council of the Borough of Reigate invites Tenders for the Supply of the following Materials, and for the execution of the following Works—*viz.*:—

Granite Macadam, Basalt and Flints.
Granite Kerb and Setts.
Kent Ragstone.
Tar Paving.
Artificial Stone Paving.
Gravel.
Concrete Beach.
Pea Beach.
Compo. Grit.
Portland Cement.
Beddington Grit.

Forms of Tender, Conditions of Contract, and full particulars may be obtained upon application to Mr. Fred. T. Clayton, the Borough Surveyor, and every person tendering will be required to deposit at his Office, at the Municipal Buildings, Reigate, a sample of the Material for which he tenders.

Every person whose Tender may be accepted will be required to enter into a Contract in writing, the Form whereof may be seen at my Office, and himself and his sureties will be required to enter into a bond for the due performance of his Contract.

Sealed Tenders, endorsed "Tender for Granite-Macadam," or as the case may be, are to be delivered at my Office at the Municipal Buildings aforesaid, on or before Tuesday, the 7th day of May next.

The Council does not bind itself to accept the lowest or any Tender.

Dated this 17th day of April, 1912.

(By order of the Council)

ALFRED SMITH,
Town Clerk.

PUBLIC HEALTH ACT, 1875.

### BRADFIELD RURAL DISTRICT COUNCIL, IN THE COUNTY OF BERKS.

PARISH OF PANGBOURNE.

TO SEWERAGE CONTRACTORS.

The Rural District Council of Bradfield are prepared to receive Tenders for Main Sewerage and Sewage Disposal Works in the Town of Pangbourne, in the County of Berkshire.

Particulars and Forms of Tender may be obtained, and plans may be seen, at the Offices of the Consulting Engineer, Mr. H. Howard Humphreys, 28 Victoria-street, Westminster, S.W., on Friday, the third day of May, 1912, between the hours of 10 a.m. and 5 p.m. only.

Intending Contractors will be required to deposit a sum of Five Pounds prior to particulars being furnished, such sum being returned on receipt of a *bonâ-fide* Tender.

Tenders, endorsed "Outfall Works," must reach the undersigned not later than 4 p.m. on 13th day of May, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

Given under my hand this 20th day of April, 1912.

R. E. RAWSTORNE,
Clerk to the Council.

4 Bridge-street,
Caversham, Reading.

### RURAL DISTRICT COUNCIL OF LONG CRENDON.

The Rural District Council are desirous of receiving Tenders for the Supply of 1,330 tons of the Best Machine-Broken Granite and 60 tons of Granite Chippings, to be delivered, carriage free, at the Stations mentioned in the Form of Tender, before the 1st October next.

Tenders must be actually received by me, endorsed "Tender for Materials," before Tuesday, the 14th day of May next.

Forms of Tender and other particulars can be obtained from the Council's Surveyor, Mr. A. J. Webb, Long Crendon, Thame.

The lowest or any Tender will not necessarily be accepted.

(By order)

EDWARD N. PURCELL,
Clerk to the Council.

2 High-street, Thame.
April 18, 1912.

## RICHMOND MAIN SEWERAGE BOARD.
### CONTRACTS FOR STORES.

The Board are prepared to receive Tenders for the Supply of the following STORES required at their Works during the year ending May 31st, 1913:—

1. Steam Coal (Welsh).
2. House Coal.
3. Buxton Lime.
4. Grey Lime.
5. Sulphate of Alumina and Green Copperas.
6. Filter Cloth.

Specifications, Forms of Tender, and any further particulars may be obtained, on personal application only, at the Office of the Engineer to the Board, West Hall-road, Kew Gardens.

Sealed Tenders, on the Forms supplied by the Board, to be delivered to the undersigned on or before May 7th, 1912.

Security for the due fulfilment of the Contracts will be required in accordance with the provisions of the Public Health Act, 1875.

The Board do not bind themselves to accept the lowest or any Tender.

J. LESLIE G. POWELL,
Clerk to the Board.

The Sessions House,
Richmond, Surrey.
April 17, 1912.

## BOROUGH OF CAMBERWELL.
### TO ROAD CONTRACTORS AND OTHERS.

The Council invite Tenders for Kerbing, Channelling, Foundations for Asphalt Paving and Roadwork in the following New Streets—viz.:—

Red Post-hill (between North Dulwich Station and Beckwith-road).

Specifications and Form of Tender can be obtained from Mr. William Oxtoby, Borough Engineer, Town Hall, Camberwell, S.E., and Tenders must be delivered on or before Monday, April 29th, not later than 6.30 p.m.

C. WILLIAM TAGG.
Town Clerk.

## BOROUGH OF GLASTONBURY.
### SEWERAGE AND SEWAGE DISPOSAL WORKS.
### CONTRACT No. 1.

The Corporation of the Borough of Glastonbury invite Tenders for the work required in Alterations and Additions to the existing Sewerage System, comprising about 2,600 yards of 12-in., 9-in. and 6-in. Stoneware Pipe Sewers, and the appurtenant Manholes, Lampholes, Flushing Tanks and Ventilating Shafts, also in providing and laying about 2,700 yards of 14-in., 12-in., 9-in. and 6-in. Cast-Iron Mains, the construction of Two Storage Tanks and erection of Two Pumping Stations, the construction of Vertical Settling Tanks, Storm-Water Lagoons, and in laying out an Irrigation Area, and other works incidental to the above, in accordance with the Plans and Specification prepared by their Engineers, Messrs. A. P. I. Cotterell & Carr, M. and A.M.INST.C.E., of 26 Victoria-street, Westminster, and 28 Baldwin-street, Bristol.

Plans may be seen at the office of the Engineers, 28 Baldwin-street, Bristol, on and after Friday, the 26th April, until Saturday, the 11th May, during the usual office hours.

Copies of the Specification, Form of Tender and Bill of Quantities may be obtained from the Engineers on and after the 26th April by intending Contractors on payment of the sum of Three Guineas, which will be returned on receipt of a *bonâ-fide* Tender and all other documents supplied.

Tenders, on the forms provided, must be delivered to me under seal, and endorsed "Glastonbury Sewerage, Contract No. 1," not later than 10 a.m. on Monday, the 13th day of May next.

The Corporation do not bind themselves to accept the lowest or any Tender.

Contractors will be required to find approved Sureties for the due performance of the contract under Sect. 174 (4) of the Public Health Act, 1875.

(By order)
REGINALD T. GOULD,
Town Clerk.

Town Clerk's Office, Glastonbury, Somerset.
April 18, 1912.

## CARSHALTON URBAN DISTRICT COUNCIL.
### TAR-SPRAYING ROADS.

Tenders are invited for Treating about 74,000 yds. super. (more or less) of Road in this District with Bituminous Dust-preventing Material, which will not be harmful to fish or vegetation in the streams into which the surface-water runs.

An undertaking to this effect will be required.

Tenders are also invited for Treating about 30,000 yds. super. (more or less) of Road with Best Refined Tar, applied at a temperature of 230 deg. Fahr.

The price in each case to be at per yard, the preliminary work of surface preparation and the after treatment being carried out by the Council. Full details of the materials to be used and the method of application, whether by hand or machine, should be supplied.

Tenders, addressed to the Chairman of the Council, marked "Tender for Tar-spraying," to be delivered at this Office not later than 12 noon on Wednesday, May 1st, 1912.

(By order)
C. P. LOVELOCK,
Clerk.

District Council Offices,
The Square, Carshalton.
April 18, 1912.

## TEDDINGTON URBAN DISTRICT COUNCIL.
### SEWAGE DISPOSAL AND REFUSE DESTRUCTOR WORKS.
### CONTRACT No. 1.

The Council are prepared to receive Tenders for the Construction of Buildings, Chimney Shaft, Roadways, Sewers, Tanks, Filters and other works, comprised in the above contract, in connection with their Sewage Disposal Works at Broom-road, Teddington, Middlesex.

Drawings and Specification of the proposed works may be inspected on application at the office of Mr. Marshall Hainsworth, Surveyor to the Council, Public Offices, Teddington, and also at the office of Mr. William Fairley, M.INST.C.E., Parliament Mansions, Victoria-street, Westminster.

A copy of the Bill of Quantities and Form of Tender may be obtained on deposit of a crossed cheque for Five Guineas, made payable to the Council, which deposit will be returned on receipt by the Council of a *bonâ-fide* Tender.

Sealed Tenders, on the forms provided by the Council, are to be delivered to the undersigned not later than noon on Wednesday, the 15th day of May, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
G. H. SALMONS,
Clerk to the Council.

Public Offices, Teddington.
March 27, 1912.

## MARKET HARBOROUGH URBAN DISTRICT COUNCIL.
### TO SEWER CONTRACTORS.

The Market Harborough Urban District Council are prepared to receive Tenders from Competent Contractors for the Construction of New Sewerage, comprising 123 yards of 21-inch, 479 yards of 15-inch, 57 yards of 12-inch, 495 yards of 9-inch Sewers, with Manholes, &c.

The Drawings may be seen at my office on and after April 26th, 1912, and the Conditions of Contract, Specification, Bill of Quantities and Form of Tender obtained on deposit of £2, which will be refunded on the return of a *bonâ-fide* Tender, together with the other documents.

In the event of a Tender being withdrawn, the £2 deposit will be forfeited.

Sealed Tenders, endorsed "Sewerage Works," are to be delivered at my office not later than Monday, May 6th, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
HERBERT G. COALES, A.M.I.C.E.,
Engineer.

Council Offices, Northampton-road,
Market Harborough,
April 18, 1912.

APETHORPE WATER SUPPLY.

Tenders are required from experienced Waterworks Contractors for the Construction of a Brick Reservoir of 150,000 gallons capacity, with Reinforced Concrete Columns and Roof, and Brick Engine-house, with Oil Engine and Three-throw Pumps, nine inch Gravitation and five inch Pumping Main. Six inch Main and three inch Mains to the Village, and all connections for the Supply and Fire Protection of Apethorpe Hall and Village, Northants, for H. L. C. Brassey, Esq., M.P.

Drawings and Specification may be seen at the Offices of the Engineers, Messrs. G. and F. W. Hodson, M.INST.C.E., Bank Chambers, Loughborough, and copy of Specification and Schedule of Quantities obtained from them on deposit of £1 1s., which will be refunded to all persons making a *bonâ-fide* Tender after they have returned the documents to the Engineers.

April 25, 1912.

METROPOLITAN BOROUGH OF WANDSWORTH.

DISUSED ROLLING STOCK.

Tenders are invited for the Purchase of 12 Water Vans; capacity about 400 gallons each.

The vehicles can be seen at Clapham Depot, 374a Wandsworth-road, Clapham, S.W., any day between the hours of 9 a.m. and 4 p.m. (Saturdays 9 a.m. to 1 p.m.).

Form of Tender can be obtained on application here any time during office hours.

Tenders, on the prescribed form, to be sent to the undersigned not later than 12 noon on Monday, April 29th next.

The Council does not bind itself to accept the highest or any Tender.

P. DODD, M.INST.C.E.,
Borough Engineer.

215 Balham High-road, London, S.W.
April 17, 1912.

PUBLIC HEALTH ACT, 1875.

RURAL DISTRICT OF HOLLINGBOURN. IN THE COUNTY OF KENT.

PARISH OF LENHAM.

TO SEWERAGE CONTRACTORS.

The Rural District Council of Hollingbourn are prepared to receive Tenders for Main Sewerage and Sewage Disposal Works at the Town of Lenham, in the County of Kent.

Particulars and Forms of Tender may be obtained, and plans may be seen, at the Offices of the Consulting Engineer, Mr. H. Howard Humphreys, 28 Victoria-street, Westminster, S.W., on Tuesday, the 7th day of May, between the hours of 10 a.m. and 5 p.m. only.

Intending Contractors will be required to deposit a sum of Five Pounds prior to particulars being furnished, such sum being returned on receipt of a *bonâ-fide* Tender.

Tenders, endorsed "Outfall Works," must reach the undersigned not later than 4 p.m. on 15th May, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

Given under my hand this 19th day of April, 1912.

H. J. BRACHER.
Clerk to the Council.

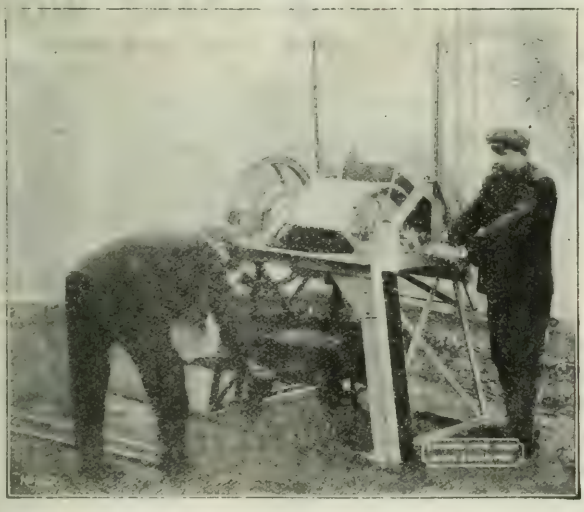
33 Earl-street
Maidstone, Kent.

## EX-PUPILS AND ASSISTANTS.

ASSISTANT (39), Lic.R.I.B.A., A.R.San.I., desires engagement, 21 years' general experience with Private Architects, County and Municipal Surveyors; Street Works, Sewerage, Buildings, Quantities, Surveying, Superintendence and General Work. —"W. F. R.," office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

*(Continued on p. xxi.)*


# RANSOME HAND MIXER



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509 Caxton House, LONDON, S.W.

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## MISCELLANEOUS.

FIRE-ENGINE, by Merryweather, in good working order, on wheels, fore-carriage, pole and horse gear. To throw two powerful jets. Price £75. Can be seen and tried at Lynn by arrangement.—Apply to Dodman & Co., Limited, Highgate, King's Lynn.

## PREPARATION FOR EXAMINATIONS.

UNIVERSITY OF LONDON, GOLDSMITHS' COLLEGE, NEW CROSS, S.E.

LAND SURVEYING.—Classes are held during May and June: Elementary lectures with practical work on Chain Surveying and Levelling, and advanced lectures, with practical work on the Theodolite and all other Angular Instruments. Fees, 10s. Elementary + 10s. advanced. Also Special Summer Courses in Electric Traction, Reinforced Concrete, Drawing Office and Engineering Workshop Practice.—For details apply THE WARDEN.

## SURVEYORS' INSTITUTION EXAMINATIONS.

Complete COURSES of PREPARATION for these EXAMINATIONS are given either in Class, by Correspondence, or in Office, by Messrs.

## PARRY, BLAKE & PARRY.

The twelve months' and two years' Courses are about to commence.

For full particulars of these Courses, or for any advice with respect to the Examinations, apply to—

Messrs. PARRY, BLAKE & PARRY,
82 Victoria-street, Westminster.

*Telephone:* Gerrard 5680.


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ADDS TO THE STRENGTH.
Faija says so.
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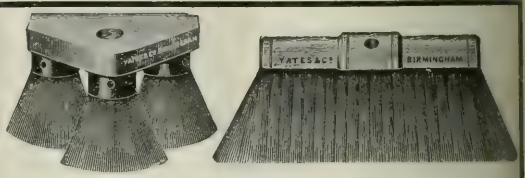
157 St. Ann's,
King's Lynn.

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"The Surveyor" Supplement.

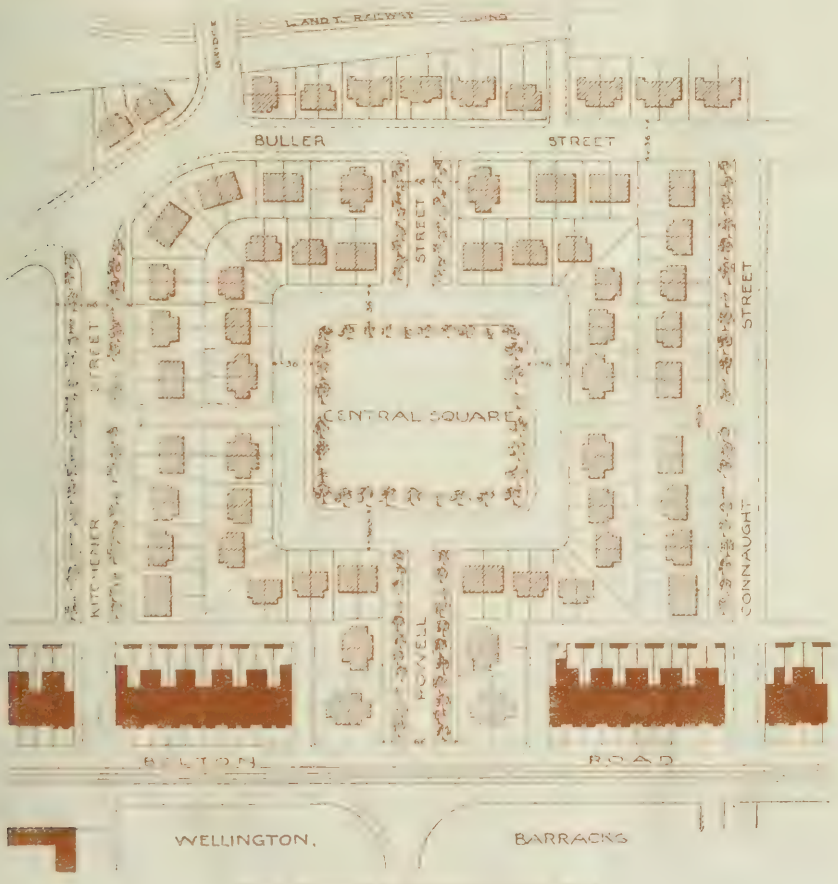
FOR ARCHITECTS, QUANTITY SURVEYORS, CONTRACTORS, AND ALL USERS OF REINFORCED CONCRETE.

# Bury Housing Scheme.

## FIVE TYPES OF SEMI-DETACHED COTTAGES.

The Bury Corporation, in common with other governing bodies, have set themselves to solve the housing problem, and an interesting scheme of workmen's dwellings has received the sanction of the Local Government Board and is now almost completed.

Mr. Arthur W. Bradley, ASSOC.M.INST.C.E., borough engineer and surveyor of St. Helens, late borough engineer and surveyor of Bury, who has for some years made the question a special study, and has attended many housing conferences, has brought to fruition in this scheme his investigations of this difficult and perplexing problem, and the result is one which will redound to Mr. Bradley's credit, and is

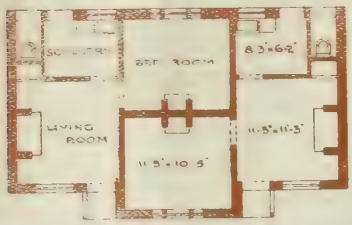



BURY WORKMEN'S COTTAGES—BLOCK PLAN.

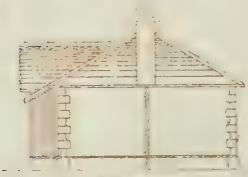
*Mr. Arthur W. Bradley, Assoc.M.Inst.C.E., Engineer.*

likely to give satisfaction both to the council and the tenants.

The scheme provides for 132 houses, all built on the estate, but only 121 can be erected at present. The site, which is of irregular shape, comprises about



Front Elevation.



End Elevation.

Back Elevation.

Block Workmen's Cottages. Type A.

[illegible] ride from the centre of the town. The land was purchased from the Earl of Derby for £3,875.

It will be seen from the block plan that the site has been attractively laid out with a good open green space in the centre. Furthermore, the houses are [illegible] by privet hedges. There is a pleasing variety in the elevations, and the different types are well distributed and provide a desirable contrast in the frontage.

The [illegible] 6 to 1 Portland cement concrete. The external walls are faced with best selected hand-pressed bricks in [illegible] and best glazed bricks and glazed quarries and sillings. A portion of the [illegible] is rough cast. The roofs are slated and ridge tiles are red cotta. The roofs are slated and ridge tiles are red. The interior walls are built of common bricks [illegible] and plastered. The [illegible] with a 2½in. cavity. The floors of the living-rooms are wood blocks, the others on the ground floor are [illegible] The upstairs floors are boarded. Tiled floors in the vestibules are provided. The garden walls [illegible]

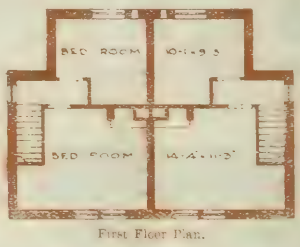
[illegible] "A" are provided with [illegible] and gas wash-boilers.

Type "A" [illegible] living-room, scullery and one bedroom. It is intended solely for aged or unmarried persons, and not for young or newly-married people. The rent is 4s. 2d. per week. This should prove a very interesting experiment, and, if successful, suggests an example to be followed.

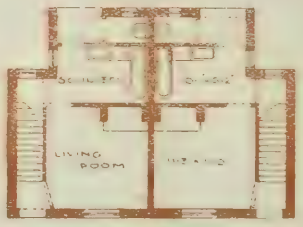
Type "B" contains living-room, scullery and two bedrooms. The bath is in the scullery on the ground floor. The rent is 5s. 4d. per week.

Type "C" contains living-room, scullery and three bedrooms. The bathroom is on the ground floor. The rent is 6s. per week.

Type "D" contains living room, scullery and three




First Floor Plan.




Ground Plan

Front Elevation.

End Elevation.

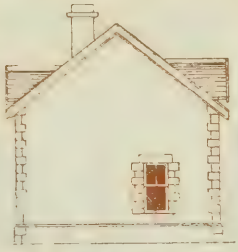
Back Elevation.

Block Workmen's Cottages. Type B.

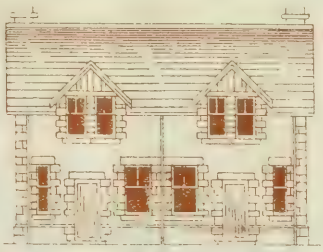
[illegible] bedrooms upstairs. The rent is 5s. 2d. per week.

Type "E" contains living room, scullery and three bedrooms. The bathroom is on the ground floor. The rent is 6s. 3d. per week.

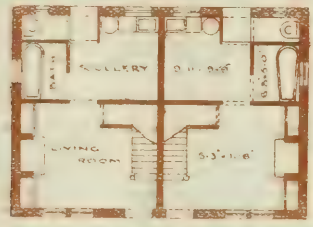
Front Elevation.



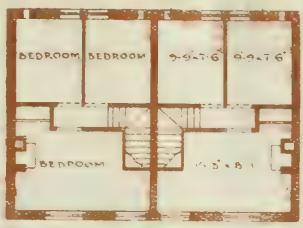
End Elevation.



Back Elevation.



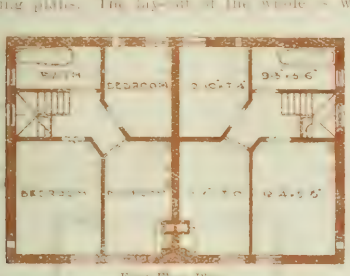

Ground Plan.



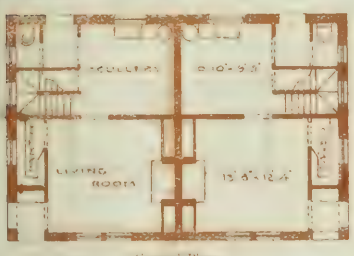

First Floor Plan.

BURY WORKMEN'S COTTAGES: TYPE C.

The [illegible] and the dimensions of the rooms will be seen from the accompanying plans. The lay-out of the whole is worthy



First Floor Plan.




Ground Plan.

End Elevation.

Front Elevation.

Back Elevation.

BURY WORKMEN'S COTTAGES. TYPE D.

[illegible] which may [illegible] a [illegible] The work is well to hand, and many of the houses

is now occupied. In selecting tenants preference will in all cases be given to the lowest wage earner. The number of persons to occupy a house will be strictly limited, and this will be a condition of tenancy. The rent covers all charges except Poor Rate (3s. 4d. in the £, which includes the borough rate), which all occupiers pay. The rents are arranged to cover all outlay, so that the scheme will not in any way be a charge on the rates.

The cost of [illegible] is the actual amount paid. The cost of the buildings stated is the actual builder's tender on a bill of quantities.

The private street works in connection with the scheme are estimated to cost £2,234 17s. 9d. The carriageways, 22 ft. and 14 ft. wide, will be constructed of 4-in. tar-macadam or granite macadam on 8-in. stone pitching with 7-in. sett paved channels. The [illegible] will be constructed of 12-in. by 8-in. Haslingden kerbs and 2½-in. concrete flags laid upon a 2-in. bed of cinders. It is interesting to note that the Bury Corporation Act, 1909, requires

BURY HOUSING SCHEME. STATEMENT OF EXPENDITURE AND INCOME PER HOUSE.

| Type of house | "A" | "B" | "C" | "D" | "E" |
|---|---|---|---|---|---|
| Rent per week | 4 2 | 5 4 | 5 10 | 6 2 | 6 8 |
| *Capital Outlay—* | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. |
| Land, ⅛ of £3,875 | 29 7 1 | 29 7 1 | 29 7 1 | 29 7 1 | 29 7 1 |
| Buildings | 120 0 0 | 163 0 0 | 184 5 0 | 194 15 1 | 197 13 4 |
| Private street works, ⅛ of £2,230 17s. 9d. | 16 18 7 | 16 18 7 | 16 18 7 | 16 18 7 | 16 18 7 |
| Total | £166 5 8 | £209 5 8 | £230 10 8 | £241 1 0 | £243 19 0 |
| Income per annum | £10 16 8 | £13 17 4 | £15 12 0 | £16 0 8 | £16 5 0 |
| *Annual Expenditure—* | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. |
| Capital charges: Sinking fund and interest on land 80 years, buildings 60 years, and private street works 20 years | 7 5 5 | 9 0 10 | 9 18 4 | 10 3 0 | 10 5 4 |
| Rates, including general rate, sewer and water rates, water closet and bath | 2 10 2 | 3 10 8 | 3 18 0 | 4 0 6 | 4 1 2 |
| Insurance, repairs, and collection of rents 7½ per cent on rent, and property tax | 1 1 8 | 1 7 8 | 1 11 7 | 1 12 0 | 1 12 9 |
| Total | £10 17 3 | £13 19 2 | £15 7 11 | £15 15 6 | £15 19 3 |

The rents have since been amended as follows: Type "A" 4s. 3d. per week, type "B" 5s. 4d. per week, type "C" 6s. 2d. per week, type "D" 6s. 9d. per week, type "E" 6s. 9d. per week.

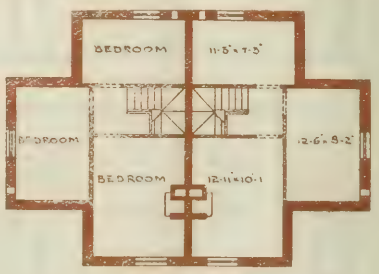
front streets to be not less than 36 ft. wide, and back streets (called footways) to be not less than 20 ft. wide.

The sewers are provided by the corporation out of a sewer rate levied upon all owners of property within

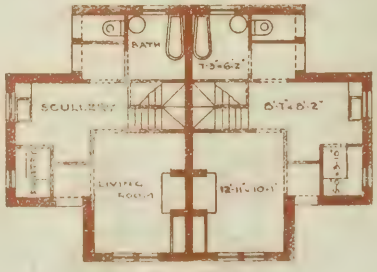
End Elevation.

Front Elevation.

Back Elevation.




First Floor Plan.




Ground Plan.

BURY WORKMEN'S COTTAGES. TYPE E.

adopted by the corporation. A cheaper method of construction has been adopted, but the streets will not be taken over by the corporation. The maintenance will be provided out of the rents.

The whole scheme gives evidence of careful thought and skill, and will be a valuable contribution to what has already been accomplished by other governing bodies. The corporation are to be heartily congratulated on their first choice and the example they have set.

**The Tower Bridge.**—The cost of maintaining the Tower Bridge last year amounted to about £17,000. The number of vessels which passed under the bridge was 10,169. The bascules were raised 8,836 times. The expense is borne by the corporation from the Bridge House Trust.

**Castle as Municipal Offices.**—The Corporation of Hertford, who were obliged by a referendum of the electors in January to reject the offer of the historic Hertford Castle made to the town by the Marquis of Salisbury, have now decided that they can take over the castle under an Act of 1882. The castle will be used for municipal offices instead of a museum, as at first proposed. A new approach to the castle is to be made and an offer of a boundary wall and wrought-iron entrance gates has been accepted.

# The Surveyor

And Municipal and County Engineer.

Vol. XLI. MAY 3, 1912. No. 1,059.

## Minutes of Proceedings.

**Radial Roads for London's Through Traffic.**

An important article, the main points of which are referred to on another page, was recently contributed to the *Times*, on the subject of the proposed western approach road to London. The writer points out that the Road Board has powers to make the road itself, if the local authorities fail to co-operate in the matter, but, he remarks, the board has no staff for such a purpose, and he suggests that the work might be carried out under the authority of an Act of Parliament, as a railway is constructed. Who would play the part of the railway company he does not say, and it is hardly likely that Parliament would pass an Act other than one to assist the proper authorities. In what respect the promoters would be better able than are the board or the councils to command the necessary talent we do not see.

As regards the width of the proposed road, we commend to the notice of all concerned the considerations raised by Mr. Reginald Ryves, ASSOC.M. INST.C.E., in the "notes" which follow our references to the *Times* article. Mr. Ryves points out that the amount of traffic which the road will have to take will depend upon the directions chosen for such other roads as may afterwards be made, and he gives reasons for supposing that the use of both north-westerly and south-westerly routes will lessen the proportion of through traffic to be carried in the future by this particular road. The point is specially worthy of attention, as it involves the idea that no great mistake will be made if the road were narrower than the average width desirable for such radial roads. If, for instance, the next radial road were one to the north-east, and the third were one to the south, we should be able, soon after the construction of the latter, to decide whether to make a northerly radial road or whether to relieve the western road by making the fourth road a north-westerly one. There would be another chance of adjustment. If the western road were overcrowded, the next improvements could be such as to lead traffic to the Portsmouth Road, or a new radial thoroughfare could be made to reach the Portsmouth Road at Roehampton. It would, of course, be necessary to supplement the Portsmouth Road by a new road alongside it for some way beyond Surbiton, but the cost of this would be small compared to the main expenditure.

The tendency of Mr. Ryves' argument is, then, to justify the making of a relatively narrow and cheap road; but he goes much farther than this, and, taking advantage of the comparative certainty with which the traffic capacity of a purely motor road can be calculated, he obtains striking figures in support of his advocacy of such special roads. So great is the expenditure involved in buying strips of land in London, that the element of certainty in these calculations has a value of its own and might go some way to justify the making of one such thoroughfare, which, if of moderate width, would almost certainly be used to an extent which would justify its construction. If it were not so used in the first place a few cross connections to other main routes in the country and in London would bring about the desired result. The construction of special roads, bridged across other roads, involves a number of somewhat difficult points; but, after all, the main element is cost, and we should much like to see three comparative estimates for a given radial route, one for a street, one for a main avenue, and one for a special motor road.

* * *

**Sterilisation of Sewage Effluents.**

It is probable that there is no better example of the confidence which is now reposed in hypochlorite sterilisation in America than is to be found in the case of the works at Pleasantville, New York. Here we find that an institution having an estimated daily flow of 50,000 gallons discharges its effluent into a river which is not only the source of the water supply to the City of Yonkers, but which contains an ice pond situated at a point about a quarter of a mile below the sewage works. From this pond the bulk of the ice used for domestic consumption in Pleasantville is drawn. It is to be remembered that in New York State the amount of ice used for consumption is considerable, and its pollution would certainly be a very serious matter, more serious than the pollution of drinking water, which might be purified. We find that the authorities at Pleasantville appear to put absolute faith in sterilisation with hypochlorite nevertheless. It was mostly found necessary to take special precautions in purifying the effluent "so as to insure against the possibility of a damage suit for the contamination of the ice." The words are quoted from the *Engineering Record* of New York.

It appears that about 400 cities in America have adopted hypochlorite sterilisation for their water supplies, and at many of these the quality of the raw water is extremely bad, and known to be sewage polluted. Yet it is found that with careful treatment and filtration, followed by sterilisation, a water of excellent quality, free from dis-

ease germs, can be produced. If this can be done for water, it would be illogical to argue that the same treatment applied to sewage in sufficient degree would fail to produce an effluent which diluted with the river water would be quite harmless to the ice pond and to the water supply. The works, which we describe more fully elsewhere, are therefore of considerable interest, showing as they do a clear example of what may be done where there is possible danger to health from the discharge of sewage into sources of water supply or near shellfish layings. If the effluent is harmless at Pleasantville, it is clear that the method might be equally useful elsewhere "to insure against the possibility of a damage suit."

Sterilisation of sewage effluents is by no means unknown in England. Years ago the town of Hertford sterilised the effluent from chemical settling tanks with chloros, and they still do so up to the present time. It is now no uncommon thing for an engineer to advise his client to adopt works similar to those constructed at Pleasantville, where there is the possibility of a private house or institution polluting a public water supply; but notwithstanding these early results, and without any very apparent justification, sterilisation of sewage is generally looked upon as impracticable, and even as impossible. The method is not one for general application, but it certainly has its uses, as shown by the instance recorded.

* * *

**"Ratione Tenuræ" Roads on Settled Estates.**

In our issue of May 5, 1911, we referred to the case of *Re Earl of Stamford and Warrington's Settled Estates—Payne* v. *Grey*, in which Mr. Justice Warrington upheld an agreement between the Limehurst Rural District Council and the estate trustees with reference to certain *ratione tenuræ* roads. The agreement provided for the payment by the trustees to the council of the sum of £500, in consideration of which payment the council took upon themselves all liability for the future maintenance and repair of the roads in question. In considering the validity of such an agreement it is evident that it has to be looked at in two aspects. Not only is it necessary to inquire whether a district council have power to take over a *ratione tenuræ* road by agreement, but also whether trustees are justified in applying trust moneys for the object proposed. With regard to the first question, by sec. 148 of the Public Health Act, 1875 (the application of which is extended to rural district councils by sec. 25 of the Local Government Act, 1894), urban authorities are empowered by agreement with any person liable to repair a road to take on themselves its maintenance, repair, cleansing, or watering. The language of the section is wide and general, and there seems to be no reason why (as was contended in the course of the arguments) its operation should be restricted so as merely to enable the local authority to contract with an occupier to do for him the actual physical work of repairing, &c., but not to bind themselves to take over the entire liability for all time. At all events, this narrow view of the section was not accepted by Mr. Justice Warrington. His Lordship also held that it was within the powers of the trustees to enter into such an arrangement.

In *Re Hodgson's Settled Estates—Altamont* v. *Forsyth* (noted at p. 536 *ante*) the same questions were considered by Mr. Justice Neville. As to the powers of the district council, that learned judge agreed with Mr. Justice Warrington; but with regard to the powers of the trustees he took a contrary view, and he therefore declined to sanction the carrying out of the agreement. It is beyond our province to enter into the somewhat technical reasons which influenced the decision, but it is to be regretted that there should be a difference of opinion upon the point between two judges of concurrent jurisdiction, and it is to be hoped that the question may be referred to the Court of Appeal for an authoritative decision. Pending such a pronouncement the powers of trustees to enter into such arrangements must remain in doubt. Of course, however, such doubts cannot affect agreements between district councils and absolute owners.

* * *

**The Manufacture of Road Dust.**

It is difficult to find any ground upon which the manufacture of dust on main roads or important secondary roads can be defended. Under the old traffic conditions there was something to be said for the use of earthy material in droughts, since it steadied the top layer of stones and, by choking the pores in the crust, retarded evaporation. This still holds good to some extent in the case of flint by-roads, and some other roads of a similar character, especially where water is scarce; and the reader who is interested in this matter will find that it is discussed in an article on p. 437 of our issue of October 13, 1911, and in a letter contributed by "Cretacious" to the succeeding issue. On roads with considerable traffic, however, the stuff is so soon ground up fine and so quickly lifted and distributed by the motor vehicles that its value, if it have any, is pitifully small compared with the cost of applying it. The worst cases, of course, are those in which chalk or earth is strewn liberally over roads where water is readily accessible in every furlong, and where the dust settles in large quantities in roadside houses. If the road is subsequently to be tarred the powdered stuff, unless carefully removed, may form a parting layer which will—and does—lead to the peeling off of the tar film. If *lumps* of chalk are used they tend to loosen rather than to steady the stones, unless the road crust is very firm. The occasional sealing of the surface with a "batter," made by crushing earth or chalk under the roller with a liberal supply of water, is quite another matter. The material stays in place much longer than when put on dry, and may be kept in place longer still if the road be watered. Strewing dry blinding material is, or should be, almost the last resort of the desperate, except on roads with very light traffic, and it may be suggested that the use of a stiff clay binder *in* the crust might be less objectionable and more economical in some cases than the use of dry stuff on the crust and in the air. Roads can be designed to resist drought, and they can be designed so as to economise the use of water in dry weather. In some cases there will be counterbalancing disadvantages; but these must be serious indeed if they are worse than road dust manufactured afresh every few days. Such dust is worse than the very fine dust caused by wear of the surface. It is much more irritating to the eyes and breathing apparatus, and the fact that it is not a natural product makes it more strongly resented by the users of the roads and the inhabitants of the villages through which the road passes.

* * *

**The Concrete Institute.**

It will be within the recollection of our readers that some time ago the Concrete Institute appointed a Standing Committee on the testing of concrete, reinforced concrete, and the materials employed therein. The committee have just issued an interim report, which contains the results of the investigations which have already been made. The opinion is expressed that in order to obtain the best results in concrete, the coarse material and sand should be properly graded. Unfortunately the principle of grading has hitherto been very little resorted to, so that the committee were not well supplied with data. They therefore content themselves for the moment with a mere expression of opinion, and will later on issue a further report on the subject. The present report contains a very interesting diagram, which gives the

results of a series of tests as to the percentages of voids in various aggregates. These percentages are shown to vary from 35 per cent to 48 per cent according to the different sizes and grading. In dealing with materials for aggregate the committee also emphasise the importance of excluding dust from the sand. The chief recommendation in regard to cement is that it should be tested and analysed in accordance with the latest specification of the Engineering Standards Committee. The committee also advise an additional method of ascertaining the crushing strength; and they further express the opinion that it is not advisable to define the proportion of water to be used in making up concrete or test specimens. The report further specifies appropriate tests for steel, and concludes with some pertinent observations on the testing of complete structures. In regard to the latter point the committee point out that it is frequently specified that test loads should be applied to finished structures of reinforced concrete shortly after completion. It should be recognised, however, that such tests should in no wise reduce the care to be exercised in the supervision of the work by those responsible. Since the test loads are generally applied only to specific parts of the work, such tests do not necessarily prove that the work has been properly executed either in whole or in part. Moreover, if systematic and thorough supervision be given by the professional adviser during course of construction the application of test loads to the finished structure is not so necessary.

* * *

**The New Delhi.**

The fact that a new and beautified Delhi is soon to take the place of the older and historic city has prompted the Delhi *Morning Post* to review the activities of the local authorities, with the view of proving that the Delhi Municipality does not, so to speak, allow any grass to grow under its feet. The work of the new town planners will conceivably be considerably helped by the improvements on the Bela, which has converted "a dense jungle full of insanitary depressions" into "a fine open expanse of park-like country," where, it is fondly hoped, "the mosquito will no longer find its happy hunting ground of yore." Qudsia Creek has been filled up, and the completion of a great sanitary work will, to some extent, be achieved by extending the city ditch from the point at which it empties into the new watercourse, across the Bela, and utilising the sullage water for irrigating an area of 50 acres. In yet another direction a large area is in process of being reclaimed, and will probably in time form the site of the new municipal lighting undertaking, and, consequent upon recent extensive additions to the filters and pumping plant, the promise is held out of a considerable improvement in the water supply. In addition, large drainage operations are approaching completion in the suburban areas, while road renewals have been commenced with a view to meeting the requirements of modern traffic. The provision of market buildings is also engaging the attention of the municipality, and altogether there is plenty of evidence to be gathered from the article in the *Morning Post* that the city engineer, Mr. T. Salkield—who is now on his way to England and his staff are anticipating the enlarged future of Delhi by the variety and thoroughness of their present works.

* * *

**The Valuation of Land and Buildings.**

Although the valuation of land and buildings is not usually reckoned among the diverse duties which fall to the lot of a municipal surveyor, the subject is one which is sufficiently direct in its interest to them to merit at least some attention. In another column, therefore, we reproduce a short extract from a paper read at a meeting of the Surveyors' Institution on Monday evening, by Mr. G. Taylor Loban, in which he gave an exceedingly interesting account of the principles which underlie the science and art of valuation. One of the chief difficulties is that value is not an unalterable and fixed thing. On the contrary, it is continually fluctuating, the variations being not infrequently due to causes of an entirely capricious or fitful character. This being recognised, it is plain that (to use Mr. Loban's phrase) the essence of valuation is comparison—that is to say, placing the property to be valued in the company of its likes as regards character and time, and establishing its true value by comparison with what is known of other similar properties. Skill in the use of the tables, by which the value of property is determined from given data, depends entirely upon the judgment in the selection of a proper percentage and multiplier. It is impossible, however, here to enter into any full discussion of the principles of valuation. Those who are interested would do well to procure a copy of Mr. Loban's paper and to peruse it well. It is full of useful and practical ideas from beginning to end.

* * *

**The National Health Week.**

Now that the celebration of "National Health Week" is drawing to a close, it is possible in some measure to gauge the success of the work of the committee by what has actually been accomplished. We have already pointed out that the Health Week Campaign is really a fight against ignorance, and so should command the special sympathy of all who are engaged in the practical administration of the public health law. One of the objects of the movement, as stated in a letter to the Press from its originators, is to drive home the concrete statistical facts of the waste of national health and life; tragical facts of actual death and disease; hopeful facts as to what has already been accomplished, and what can be accomplished in the way of prevention. The appalling waste of infant life alone would more than justify all the efforts which are being exerted in connection with Health Week. The *preventable* infant mortality in England and Wales in a *fortnight* is approximately equivalent in the number of lives lost to a *Titanic* catastrophe. This is a fact which ought to strike the imagination and the conscience of the country at large, and to enlist widespread support for the establishment on a permanent basis of a movement which is designed to combat this and many kindred evils.

* * *

**A Sheffield Improvement.**

Few members of the municipal engineering profession are regarded by their *confrères* with greater confidence and esteem than Mr. C. F. Wike, M.INST.C.E., the city engineer of Sheffield, and it is therefore with some degree of surprise that we observe from a recent issue of our contemporary the *Sheffield Daily Telegraph* that certain members of the city council in a debate on a scheme for the provision of a new street to form improved access to Victoria Station, made observations which implied reflections upon Mr. Wike as the author of what is known as the diagonal street scheme. Time alone can show whether the views which Mr. Wike has not hesitated to express as to the lettability of surplus lands are justified, and we cannot enter into the merits of his scheme or of any suggested alternative. Our contemporary's description of Mr. Wike as "an old servant of the city, whose chief fault is that he is anxious to do more than he can," will, however, we are confident, be generally endorsed by those who know him; and the action of those who have reflected upon him merely because he has emphasised the merits of his own scheme in spite of exceptional opposition will be regarded as unworthy of the best traditions of a great corporation like that of Sheffield.

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# Singapore Waterworks Extensions.

## NEW RESERVOIR AND FILTERS.

An extension of the Singapore waterworks, comprising an extensive reservoir and filters, was formally inaugurated on March 26th last by Sir Arthur Henderson Young, K.C.M.G., Governor and Commander-in-Chief of the Straits Settlements.

### GENERAL STATISTICS.

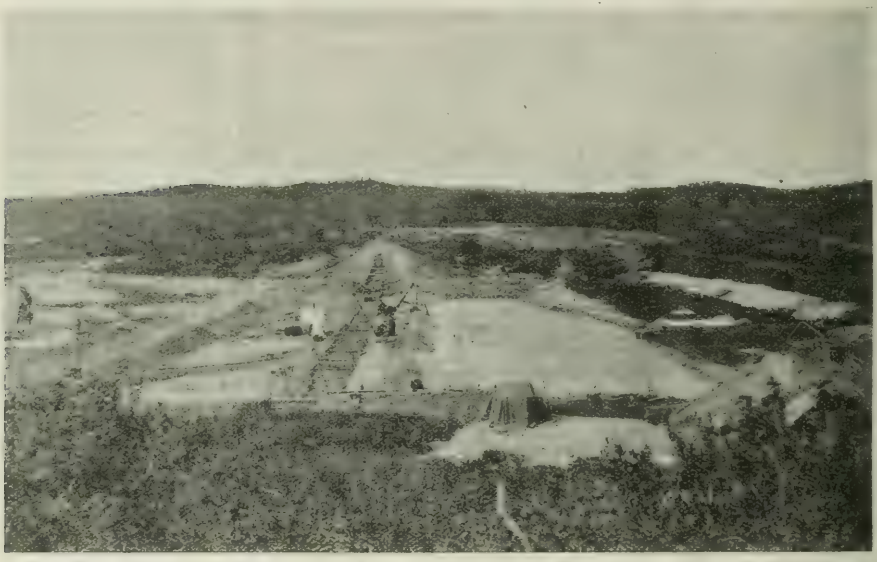
The 1911 Census showed that Singapore has a population of 265,474, made up as follows: European, 4,981; Eurasian, 4,427; Malay races, 28,000; Chinese, 194,016; Indian, 24,494; other races, 3,692; floating population, 5,864.

In regard to area, that within municipal limits (excluding watersheds) is 27½ square miles, and that within water limits 14 square miles, the probable population within water limits being 250,000. The average daily supply of water during 1910 was 5,775,000 gallons, distributed as follows: Domestic metered, 2,117,000 gallons; domestic unmetered, 1,296,000 gallons; trade metered, 897,000 gallons; shipping, 247,000 gallons; public standpipes, 834,000 gallons; street watering, 96,000 gallons; drain flushing, fires, &c., 288,000. According to the 1910 records the supply per head per day was 30·4 gallons, and the maximum daily supply, 7,687,000 gallons. The total length of distributing main, 96 miles. The total number of services was 11,103, the number of metered services 8,953, public standpipes 271, and fire hydrants 1,020. On all property within the water limits a 3 per cent rate is charged, and in addition the following charges by meter are made*: Domestic supply, $0.30 per 1,000 gallons; domestic supply with stables, $0.40 per 1,000 gallons; trades, $0.50 per 1,000 gallons; manufacturing supplies (plus meter rent), $0.80 per 1,000 gallons; water boats (plus meter rent), $1.00 per 1,000 gallons; prime movers (plus meter rent), $1.00 per 1,000 gallons; shipping over wharves (plus meter rent), $1.50 per 1,000 gallons. Services not yet metered (chiefly on old services) are charged as follows: One tap on ½-in. service, $2.00 per month; one tap on ¾-in. service, $4.00 per month; one tap on 1-in. service, $6.00 per month. For the second or each subsequent tap beyond the first: On ½-in. service, $1.00 per month; on ¾-in. service, $1.50 per month; on 1-in. service, $2.00 per month. Meters are now compulsory to all new services. Rainfall is distributed fairly evenly throughout the year, being, however, more prominent between the months of October and January. Over a period of thirty-two years the rainfall has varied from a maximum of 132·08 in. to a minimum of 61·75 in. per annum, the annual average over that period being 94·12 in. The heaviest rainfall registered in any one day of twenty-four hours is 9·37 in. Evaporation varies between 5 in. and 8 in. per month, the monthly average being about 6 in. The shade temperature of the air may be said to vary from 72 deg. Fahr. to 94 deg. Fahr., the average being about 85 deg. Fahr. The temperature of still water usually lies between 83 deg. Fahr. and 87 deg. Fahr.

* The value of the dollar in Singapore is approximately 2s. 4d.

### HISTORICAL.

The first public works for the supply of water to Singapore were undertaken in the year 1857. They comprised an intake in the vicinity of the present Thomson-road reservoir and a masonry conduit to convey the water to the town. Alterations and extensions to these works were made from time to time, and pumps and distributing works were constructed in town prior to the year 1878, while in 1886 the masonry conduit was replaced by a cast-iron main, 24 in. diameter, laid along the Thomson-road. The Thomson-road reservoir, as at first constructed, was completed in the year 1868, but in 1894 it was enlarged by the construction of the present embankment at a point lower down the valley. A second line of cast-iron pipes, 24 in. diameter, was laid along the Thomson-road, and brought into use in the year 1898. A further enlargement of the Thomson-road reservoir was completed in 1905 by raising the embankment an additional 5 ft., thus making the maximum depth 26½ ft. and the total capacity 1,003,600,000 gallons. This enlargement was necessary for the reception of the water brought in from the upper portion of the Kalang river by the Kalang tunnel works, which were completed in 1907, ensuring a minimum supply of 5,500,000 gallons per day.



Singapore Waterworks: Site of Embankment and Puddle Trench.

The necessity for securing additional sources of supply was recognised in 1901, and in the following year Mr. R. Peirce, M.Inst.C.E., the municipal engineer, outlined the present scheme of extensions, which received the approval of the Government in 1904, actual construction being commenced in 1906.

The works lately opened form the first portion of this scheme.

### THE KALANG RIVER RESERVOIR.

The new reservoir is known as the "Kalang river reservoir," and has been formed by constructing an

embankment across the valley of the Kalang river. The total catchment area contributing to this reservoir is 3,007 acres, comprising 1,538 acres in the upper part of the valley (known as Kalang valley extension), and 1,469 acres in the lower part of the valley. The water collected in the upper part of the valley may be intercepted and diverted through the Kalang tunnel into the Thomson-road reservoir, or may be allowed to flow into the Kalang river reservoir.

The top water area is 253 acres, the maximum depth 27 ft., the total capacity 845,000,000 gallons, and the available storage 211 days' supply when delivering at the rate of 3,500,000 gallons per day, which is the estimated safe yield of this reservoir in the driest season, making a total of 9,000,000 gallons per day in the driest season, including Thomson-road reservoir supply.

The preliminary surveys for this reservoir led to the selection of a site two miles lower down the Kalang valley as a suitable position for the embankment, and a series of borings were made at that point to ascertain the nature of the subsoil. These borings were sunk through loose material to a depth of 85 ft. without reaching a sound foundation, so the site was abandoned. Trial borings were then made on the present site, and indicated that a sound foundation for the puddle wall would be reached at a depth not greater than 60 ft., which was considered satisfactory.

The site of the embankment having thus been settled, arrangements were made for the purchase of the whole watershed above this site; the tenants and cultivators received notice to quit, and in due course their houses were demolished and all trace of human habitation was removed. The original route of Thomson-road ran along a valley which now forms one arm of the reservoir, and a diversion of nearly 3 miles was made so as to keep the road entirely outside the catchment area.

SINGAPORE WATERWORKS. SINKING OF PUDDLE TRENCH FOR EMBANKMENT.

CONSTRUCTION OF EMBANKMENT.

The earthen embankment is 1,260 ft. in length, 238 ft. in width at the base, and 30 ft. high, and contains 140,000 cub. yds. of material. The site of the dam was first prepared by removing the soft, loose top soil and mud to a depth of from 6 ft. to 15 ft., after which the trench for the watertight puddle wall was excavated and filled with puddled clay; selected earth, dug from the adjoining hills, was then deposited on each side of the central puddle wall as it was raised above the surface of the ground, being well consolidated by watering and rolling. The embankment thus consists of tenacious hill earth thoroughly consolidated, with a continuous core wall of clay puddle, the latter being continued below the original surface of the ground to a depth sufficient to form a tie with watertight material at the base.

At one stage of the work an unexpected subsidence of a portion of the bank gave some concern, but the construction of drains and the weighting of the toe of the dam arrested further movement.

Since completion, observations have been taken which show the settlement and consolidation of the dam to have occurred with satisfactory regularity, and to have amounted in twelve months to about 4 in.

The puddle trench has been carried to a depth of 47 ft. at its deepest point, and has a maximum width of 15 ft. 9 in. Steel interlocking sheet piling was used to support the sides of the trench during sinking, and at the time when the whole length of trench was open 500 tons of these piles were in use. Heavy and continuous pumping was necessary to keep the trench free of water. The object in view was to give the clay puddle a foundation in an impermeable strata, and this was effected throughout the whole length of the trench. At the south end of the trench granite was reached, the surface of which was cut out to form a groove for the seating of the clay puddle wall.

As the clay employed for puddle was rather soft it was mixed in a pug mill with an equal quantity of tenacious red earth before being placed in the trench. The total quantity of clay puddle used in the work was 25,000 cub. yds. The inner slope of the embankment is pitched with coral, bedded on laterite beaching.

The overflow from the reservoir passes over a sill 190 ft. long, and discharges through a bywash channel, 40 ft. wide, into the old course of the Kalang stream below the dam. A steel bridge was constructed to carry Thomson-road over the bywash channel. The valve tower is provided with draw-off pipes at various levels, thus enabling water to be drawn always from the top, where it is more clear and pure. The water is passed through copper screens in the tower before entering the supply pipes. The supply pipes from the valve tower pass along a tunnel driven through the hill round the north end of the dam. The tunnel is 520 ft. in length and 11 ft. in internal diameter. For the greater part of its length it is lined with cast-iron rings, of which 547 tons were used in the work. The tunnel terminates in a meter chamber, where a 36-in. Venturi meter has been fixed.

While these works were under construction the whole of the area to be submerged was cleared of all trees, roots, and undergrowth, nothing but short grass being left on the site. Water was first allowed to rise in the reservoir in January, 1910, and as it rose large quantities of loose turf, or "sudd," floated up from the bottom, and had the appearance of islands floating on the surface of the water. This material was subsequently towed to the side of the reservoir, cut up and removed. The execution of these works necessitated the employment of a large staff, for whom quarters, coolie lines, and hospital accommodation

were provided. A temporary railway, 4½ miles long, was constructed along the pipe track up to the site of the reservoir, and the bulk of the materials of construction was conveyed thereon.

FILTERS.

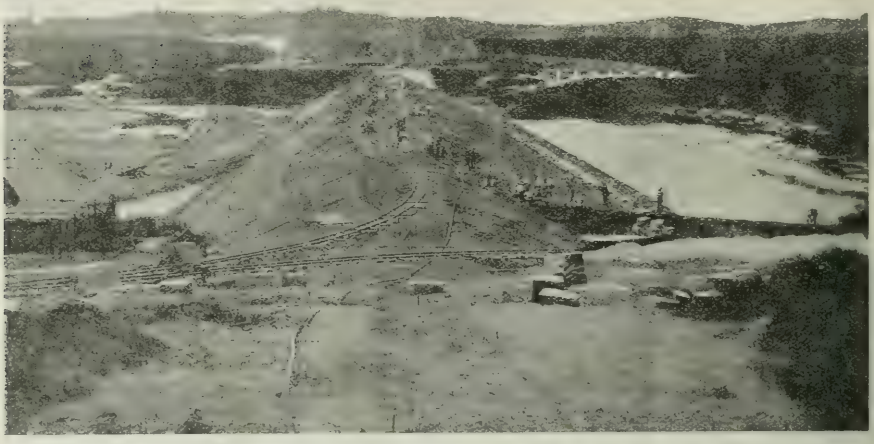
From the reservoir the water passes along 30-in. diameter cast-iron pipes to the land selected for the filters, which is an irregular-shaped hill, from which the surface drainage runs off in all directions.

The Woodleigh filters, as they have been named, are slow sand filters, nine in number, having an area of nearly 7 acres, and are capable of dealing with 1,000,000 gallons of water per day during the worst period, and a considerably larger quantity during the best period of the year.

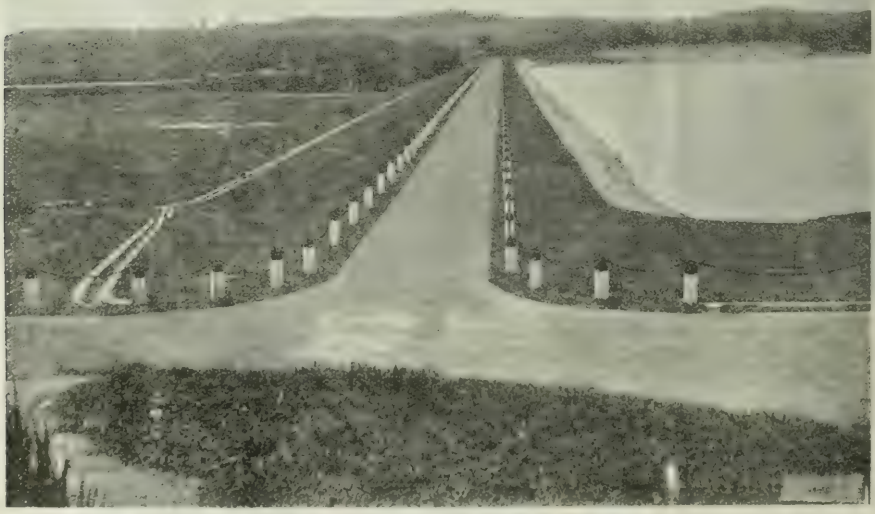
The filtering material is placed in the filters in the following manner. On the bottom of the filter a false floor is first constructed of two courses of brick. And from the top of this floor supports three layers of broken granite, coarse below, medium between, and fine stone above, upon which is placed a layer of sand, 2 ft. in thickness, as the actual filtering medium.

The quantities of material required were very large, altogether 1,720,000 bricks being used in the forming of the false floors, supporting 10,000 cub. yds. of broken granite and 28,000 cub. yds. of filtering sand. All these materials were carefully washed and cleansed before being laid. The water for washing the sand is raised by special electrically-driven pumps to a small reservoir on a hill above the filters, whence it gravitates to the Walker washing-hoppers, of which two batteries of twelve each have been installed at the site of the works.

The rate of filtration varies according to the character of the water and the time of year, the limits being 150 gallons per square yard per day as a minimum and 450 gallons per square yard per day as a maximum.



SINGAPORE WATERWORKS: THE EMBANKMENT IN COURSE OF CONSTRUCTION.



SINGAPORE WATERWORKS: THE COMPLETED EMBANKMENT.

ANALYSES.

The purification effected by filtration is shown in the following analyses:—

| | Parts per 100,000. Unfiltered. | Filtered. |
|---|---|---|
| Total solids ... ... ... | 4·08 | 2·70 |
| Organic solids ... ... ... | 2·36 | 0·96 |
| Inorganic solids .. ... ... | 1·72 | 1·74 |
| Chlorine ... .. ... ... | Practically nil | 0·05 |
| Free and saline ammonia .. | Absent | Absent |
| Albuminoid ammonia .. .. | 0·010 | 0.002 |
| Nitrites ... ... ... ... | Absent | Absent |
| Nitrates ... ... ... ... | Slightest trace | Slightest trace |
| Oxygen absorbed from permanganate in 15 minutes at 84° ... ... | 0·050 | 0·013 |
| Oxygen absorbed from permanganate in 4 hrs. at 84° | 0·110 | 0·037 |
| Poisonous metals .. | Absent | Absent |
| Iron ... ... ... ... | 0.11 | Absent |
| Colour ... ... ... .. | Slightly Brownish | None |
| Turbidity ... ... ... | Turbid | Clear |
| Reaction ... ... ... ... | Neutral | Neutral |

Percentage removal of bacteria from the unfiltered water, average, 60 per cent.

Singapore water is very soft, containing only 1 to 1½ degrees of hardness.

CLEAR WATER TANK.

After filtration the water is stored in a clear water tank, whence it is discharged to the existing pumping station in Mackenzie-road through pipes of 30 in. in diameter. The clear water tank is divided into two portions to facilitate cleansing, and has a total capacity of 4,000,000 gallons, with a depth to overflow level of 9½ ft. Special care has been taken to secure efficient ventilation.

The daily discharge from the tank will be registered by a 30-in. Venturi meter, which has been fixed on the supply main near the entrance to the works. Near the site of the works permanent coolie lines, superintendent's quarters, and offices have been built.

GRAVITATION MAINS.

The water will be conveyed from Kalang river reservoir to the filters by a main 30 in. in diameter, 3¾ miles in length, and from the filters to town by a similar main 3 miles in length. Cast-iron pipes have been used for all mains. Where laid across the swamps, the pipes have been carried on piled foundations, and protected with earth banking. Where laid beneath rivers, special foundations and concrete casing have been required.

The total weight of all cast-iron pipes used throughout the works is 7,000 tons, and of sluice and other valves, 100 tons. These gravitation mains are designed to deliver to town a quantity of 3,500,000 gallons per day when the reservoir is at its lowest working level, and are capable of delivering much more at ordinary times. The water will be delivered at the existing pumping station in Mackenzie-road, whence it will be pumped to the existing service reservoirs at Mount Emily and Pearl's Hill for distribution.

CONTRACTING FIRMS.

Among the contractors who have been engaged upon these works may be mentioned the following firms:—

Kalang river reservoir—Messrs. the Westminster Construction Company, Limited (Airds, Limited).

Woodleigh filters—Messrs. the Westminster Construction Company, Limited (Airds, Limited), and Messrs. M. A. de Silva & Co.

Gravitation mains — Messrs. Howarth Erskine, Limited, and Messrs. Riley, Hargreaves & Co., Limited.

Pipes and castings—Messrs. Robert Maclaren & Co., Limited, Messrs. Stanton Iron Works Company, and Messrs. the British Hydraulic Foundry Company, limited.

Valves—Messrs. Glenfield & Kennedy.

Meters—Messrs. Kent, Limited.

Steelwork—Messrs. P. & W. MacLellan, Limited, Messrs. Dorman, Long & Co., and Messrs. the United States Steel Piling Company.

Filtering materials—Messrs. Fraser & Cumming.

COST OF NEW WORKS AND AVAILABLE SUPPLY.

The total cost of these works, excluding the purchase of land, has been £385,000, and the total supply of water now available from both old and new works is 9,000,000 gallons per day in the driest season. An additional supply of at least 3,000,000 gallons per day will be obtained from the works in the Seletar Valley to be constructed hereafter.

Mr. Robert Peirce, M.INST.C.E., the municipal engineer, was engineer for the works, with Mr. Stephen G. Williams, ASSOC.M.INST.C.E., as chief assistant and resident engineer.

SINGAPORE WATERWORKS: KALANG RIVER RESERVOIR.

(Showing Turf or "Sudd" which has floated up from the bed of the Reservoir.)

THE OPENING CEREMONY.

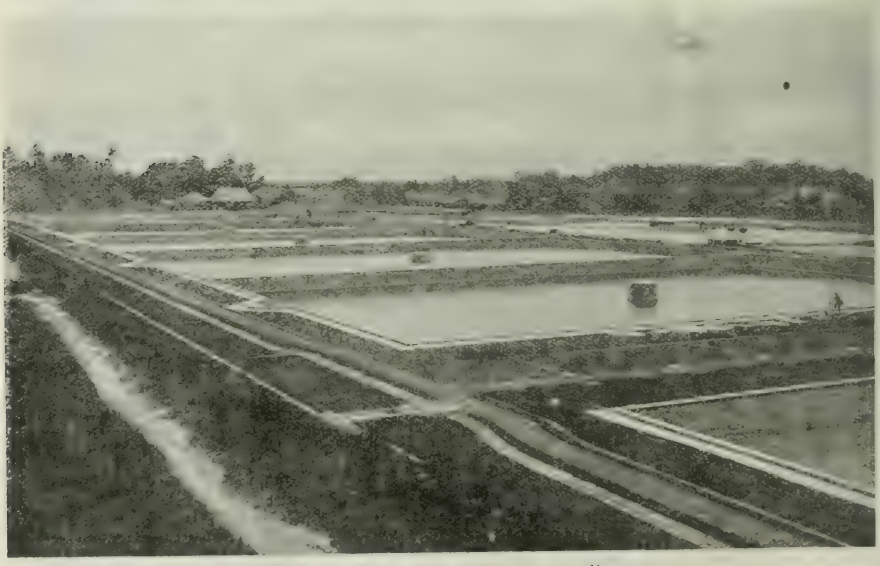
At the opening of the works described on the foregoing pages the President of the Municipality (Mr. F. J. Hallifax) remarked that there were three chief causes that led to an increased demand for water from public sources of supply. These were: (1) The natural growth of the area and population supplied; (2) the failure or stoppage of other sources of supply, such as wells; (3) the establishment in the town of new industries or processes for which pure water was necessary. In the case of Singapore all three of these causes had operated to render necessary the construction of the new reservoir. If future demands for water should require it, a still further extension was possible, by which the water from the Seletar catchment area could be added. The land had already been acquired and the extension could be made at any time. The town was therefore to be congratu-

lated that its supply of pure water was adequate for all requirements for some years to come, and that the sources of that supply were wholly under public control. The catchment areas were in all about 15 square miles in extent, and the whole of this land was now vested in the municipality. One of the difficulties of reservoir construction in Singapore lay in the fact that the country possessed no high hills and no steep valleys. Any reservoir therefore constructed as this one was by damming up the course of a river was of necessity shallow in depth and of a large superficial area. This reservoir, for instance, was only 27 ft. in depth, but had a water area of 253 acres. It was easy to understand that the exposure of so large an area of water to the rays of the tropical sun must mean a large loss by evaporation. Observations on this reservoir showed that the evaporation was about 6 in. per month, which represented a loss of no less than 400,000,000 gallons of water each year. A further disadvantage of the exposure of so large a superficial area of water was that the temperature of the water was increased and growth of microscopic forms of both animal and vegetable life was encouraged, necessitating expensive filtration works for the subsequent purification of the water.

His Excellency the Governor (Sir Arthur Henderson Young) said he considered the town of Singapore had cause to be thankful to the municipality for the wise discretion they had used in dealing with the question of the water supply. They had also to be thankful at having at the head of the municipal engineering staff Mr. Peirce, and that his recovery from a dangerous illness enabled him to be present at the opening of works with which he had been so closely associated and the initiation of which were in a great measure due to him.

The Woodleigh filters were afterwards inaugurated, an inspection of the works following. Subsequently

Singapore Waterworks: Another View of Kalang River Reservoir.



Singapore Waterworks: Woodleigh Filters.

the GOVERNOR proposed the health of Mr. R. PEIRCE, who, in acknowledging the compliment, spoke of the necessity for a still further extension of the supply. The works opened that day had taken ten years to complete, and the necessity of looking forward at once to the future was clear. He would like to mention those associated with him and his colleagues in the construction of the works. The Westminster Construction Company had the contract for the dam, and their engineer, Mr. M. B. Friedberger, had been unremitting in his attention to the work. Two local firms, Messrs. Riley, Hargreaves & Co., and Messrs. Howarth Erskine, Ltd., had laid the pipe lines, and Mr. Fisher and Mr. MacDonald were to be thanked for the work they took in hand. The works had been carried out under the supervision of his colleague, Mr. Stephen Williams, who, with unflagging energy and ability, had supervised the works from beginning to completion. His name should have been rightly coupled with the toast. They had also had great help from Mr. Charles C. Lindsay, M.INST.C.E., Glasgow, the Municipal Commissioner's agent in Great Britain, by whose suggestion of compressed air they were enabled to complete the Kalang Tunnel. Also the commissioners, and especially Mr. Broadrick, the late president, had always consistently supported the staff in their work. He had said that engineers were often toasted by the fire of criticism; it was a common taunt, "Estimates exceeded as usual." Well, in this case the estimate was $4,000,000, and the cost of the works $3,800,000, so that he hoped it would be remembered that in this case there was a saving of $200,000. He hoped therefore that the ratepayers would be as well satisfied as the commissioners, and that both would find the work thoroughly satisfactory.

## STERILISATION OF SEWAGE EFFLUENT AT PLEASANTVILLE, NEW YORK.

As an example of sewage disposal works where extreme precautions have been taken to prevent stream pollution and nuisance, the works recently completed at Pleasantville, New York, for a public institution are deserving of study. A full description is contained in the *Engineering Record*, from which the following particulars are taken:—

The works are designed to deal with a flow of 50,000 gallons a day, and provision has been made to secure an ultimate capacity of 75,000 gallons a day, the allowance of sewage per head being about 68 gallons. The sewers are laid on the separate system, all rain water being excluded.

Owing to the proximity of buildings any nuisance from smell had to be guarded against, and, owing to the fact that the effluent has to flow into the Saw Mill river, the source of the water supply to the City of Yonkers, the water intake being below Pleasantville, it was necessary to afford complete assurance to the State authorities that every possible means to render the sewage innocuous would be taken. In addition, a privately owned ice pond exists about a ¼ mile below the sewage works, from which Pleasantville obtains its ice supply, and it was therefore considered necessary to produce an effluent practically sterile so as to insure against the possibility of an action for damages for the contamination of the ice. This case is therefore specially interesting, seeing that with reference to water-supply pollution it resembles that of many of our riverside works, and in the case of the ice pollution it is analogous to works which may be thought likely to pollute oyster beds.

SINGAPORE WATERWORKS: WOODLEIGH CLEAR WATER TANK.

**Concrete Institute.**—The annual general meeting of the Concrete Institute will take place at Denison House, Westminster, S.W., on Thursday next, at 4.30 p.m.

**London County Council Tramways.**—The accounts of the London County Council tramways department show that in seven years the council have more than doubled the number of passengers carried on their lines and trebled the receipts. The increase on the year is 25,784,700 passengers and £89,730 in money, against 52,275,300 and £205,318 for the year 1911. On traffic receipts from passengers the balance-sheet stands thus: Received in fares, £2,264,000; outgoings, £2,288,456; deficiency, £24,456. Other sources of income yielded £57,000, of which more than half was produced by advertisements on the cars and tickets. Allowing for this, and estimating the extra income at £60,000, the nett surplus on the working of the tramways is £36,000, as against £49,000 last year.

THE WORKS.

The works consist of preliminary settling tanks, covered sprinkling filters, humus tanks, sand filters, sterilising tank, and mixing and dosing plant. The settling tank, which is of 75,000 gallons capacity, is divided into three compartments, one of which is twice as large as the other two. All the settling compartments are 28 ft. long, two are 6 ft. wide, and one is 12 ft. wide. All the tanks have flat bottoms, sloping towards the inlets, where there are sludge outlets controlled by 10-in. valves. Sludge is conveyed to coke-filled sludge-drying beds. The settling tanks are 6 ft. 6 in. deep at the inlet end and 5 ft. 6 in. deep at the outlet end. The outlets from the settling tanks are 8-in. pipes, protected by concrete scum boards. These outlets are in the corners of the tanks near the top, and the concrete scum boards are cast in place, and form a triangular-shaped enclosure at the outlet. The special feature of these tanks is that arrangements are made to prevent scum forming by having 1-in. water pipes under pressure fixed at an elevation of

12 in. above the liquid level. These pipes are tapped at frequent intervals, and lawn sprinkler heads are inserted in the openings, so as to spray water down upon the sewage level and break up any scum that may tend to form. These tanks are covered with a wooden building, well lighted with windows and well ventilated. Sewage flows from the settling tanks to a dosing chamber, whence it is discharged by a syphon in 1,500-gallon doses to two sprinkling filters.

There are two sprinkling filters; these are octagonal in form, and each has an area of 121 sq. yds. They are 6 ft. deep, and are formed of crushed stone, varying in size from ¼ in. to 2 in. It will thus be seen that with a daily flow of 50,000 gallons about 104 gallons per cubic yard of filtering medium is the allowance adopted. The underdrainage of the filters is effected by means of a dry brick false bottom. In each filter the drainage is toward three adjoining sides and the effluent is collected by a channel running round these three sides to a settling basin or humus tank. There is a humus tank to each filter, and the effluent is held up in these and discharged by means of syphons in doses on to the sand filters. The percolating filters are enclosed in buildings.

SAND FILTERS.

There are three intermittent sand filters, two of which are 34 ft. by 64 ft. in area and one 68 ft. by 64 ft. in area. It will be noted that the total area of the sand filters is 967 sq. yds., which gives an allowance of nearly 51 gallons per square yard per day. The sand is 3 ft. thick, and is composed of grains varying in size from 0·25 to 0·35 mm. The underdrains are of hexagonal tile, having open joints, and these are covered with a layer of crushed stone from ¼ in. to 2 in. in size. Distribution is effected by means of half-round tile pipes, supported on tarred planks lying on the surface of the sand. Sewage effluent discharged intermittently into these channels by the syphons will spill over the sides upon the sand filter.

STERILISING ARRANGEMENTS.

The effluent, having been thus settled twice and filtered twice, being in a high state of chemical purity and practically free from organic matter in suspension, can be readily sterilised by the addition of a very small quantity of hypochlorite.

The sterilising plant is housed in a small building. It is designed so as to be automatic in working, and so that it can be worked by an intelligent workman, who must attend to it at least once a day. There are two mixing tanks, made of 30-in. diameter stoneware pipe, with concrete bottoms, two storage tanks, capable of holding a day's supply of chloride of lime solution, made of 24-in. stoneware pipes, with concrete tops and bottoms, and two small dosing tanks below. The storage tanks are filled with the solution from the mixing tanks. While these storage tanks are being filled an air valve is left open at the top in each case and the outlet valve at the bottom is closed. The tanks having been filled, the air valves are closed and the outlet valves are opened. The feed-pipe inlet to each dosing tank is fixed at its top-water level. The object is to keep the dosing tanks full to this level, so that their discharge may be perfectly regular. Whenever a small quantity of sterilising agent is discharged from the dosing tank the level of the liquid in that tank is lowered very slightly until the outlet from the storage tank is unsealed. This permits a bubble of air entering the airtight storage tank to displace a small amount of the solution, and thus the dosing tank is fed till the outlet from the storage tank is again sealed by the rise of the liquid. The storage tanks are 12 in. by 12 in. by 12 in. deep, and are of enamelled cast iron. All valves are of stoneware. The sterilising agent flowing from the dosing tanks is mixed with the sewage effluent coming from the sand filters in a chamber containing baffles.

SLUDGE DISPOSAL.

The sludge drawn from the settling tanks and humus tanks is conveyed to a pair of 15-ft. square beds filled with 12 in. of coke. It is stated that the liquid is collected in underdrains and delivered to the mixing tanks for chemical treatment. This part of the description is obscure, for it cannot be supposed that the only treatment given to this foul liquid before it is discharged into the river will be sufficient if it is only mixed with chloride of lime solution. This treatment, though quite sufficient to render a sand-filter effluent harmless, could scarcely be considered sufficient for sludge-filter effluent. The most rational method would be to convey the liquid from the sludge filters to the preliminary settling tank. The dried sludge is burnt under boilers in the power-house. Further comments are made in our "Minutes."

## ROADS IMPROVEMENT ASSOCIATION.

### ANNUAL GENERAL MEETING.

The annual general meeting of the association was held at Caxton House, Westminster, London, S.W., on Thursday, April 25th. Colonel R. E. Crompton, C.B., M.INST.C.E., occupied the chair, and was supported by the Hon. Arthur Stanley, M.P., H. Howard Humphreys, M.I.MECH.E., John Kennedy, J.P., D.L., and a number of members of the council.

The CHAIRMAN, in moving the adoption of the annual report, referred to the large attendance of the council and the small attendance of members as indicating very prominently satisfaction with the association's work and the enthusiasm of its officers. After reviewing the more important features of the work during the past year, the chairman specially drew attention to the great success which had attended the association's system of local organisation. He strenuously urged the great necessity of local road users taking a much more active interest in their roads. At the present time the large majority of road users who were dissatisfied with the condition of their roads uttered complaints against them and occasionally wrote to the Press, but at this point their energy has ended. The object of this association was to take up the cause of road users and to see that their views and requirements were efficiently formulated and represented before the authorities. During the past year the association had greatly increased in influence; a much larger measure of co-operation had been received from the authorities, and the association, in carrying out its work, endeavoured to appreciate the difficulties that beset highway committees and their officers, and lent its assistance to meet and overcome them. If the association's work was continued and expanded in the well-organised and well-thought-out manner that had attended its operations in the past year, it would become a very powerful influence in road matters.

The report having been unanimously adopted, the accounts were submitted to the meeting by the chairman and unanimously approved.

The chairman appealed for additional financial aid, and specially pointed out that unless further funds were forthcoming the existing work of the association would be hindered and its development held back; he felt sure he would not appeal in vain.

At the conclusion of the annual general meeting a meeting of the council was held. The existing officers of the association were all re-elected, and heartily thanked for their services during the past year, the only alteration being the appointment of an additional vice-chairman—Mr. H. Percy Boulnois, M.INST.C.E. The officers of the association are as follows: Vice-presidents: The Hon. Arthur Stanley, M.P., W. Joynson Hicks, M.P., E. Manville, M.I.E.E.; chairman, Robert Todd; vice-chairmen, Col. R. E. Crompton, C.B., M.INST.C.E., H. Percy Boulnois, M.INST.C.E.; hon. treasurer, E. Shrapnell Smith; secretary, Wallace E. Riche.

The following committees were also appointed and their 1912 programme generally discussed: Organisation Committee; Signs Committee; Local Improvements Committee; Traffic Committee; Tramways (Traffic Congestion) Committee; Gritting Committee; Office and Finance Committtee; and Roman Roads Committee.

A discussion took place in regard to the powers of certain local authorities to make by-laws under sec. 78 of the Public Health Act, 1907, for the more efficient regulation of traffic, and it was decided to ascertain which authorities had made by-laws and what success had attended their efforts. The reports of various committees were received and adopted, and an amount of other business was transacted.

**Society of Engineers: Annual Dinner.**—The annual dinner of the Society of Engineers (Incorporated) will be held at the Criterion Restaurant, Piccadilly-circus, W., on Saturday, May 11th, at 7 p.m., when Mr. John Kennedy, the president, will take the chair. Among those who have promised to attend are Sir Wm. H. M. Christie, K.C.B., F.R.S., Sir David Gill, K.C.B., F.R.S., Sir Maurice Fitzmaurice, chief engineer to the London County Council, Mr. Alexander Siemens, past-president of the Institution of Civil Engineers, and Mr. H. Percy Boulnois, chairman of the Royal Sanitary Institute. The concert and conversazione after the dinner will be a special feature of the evening's entertainment. Tickets may be obtained from the secretary, 17 Victoria-street, Westminster.

## HIGHWAY ENGINEERING IN AMERICA.

### NOTES FROM THE ANNUAL REPORT OF THE DIRECTOR OF THE UNITED STATES OFFICE OF PUBLIC ROADS.

In his report for the year ended June 30, 1911, Mr. Logan Waller Page presents a summary of the work done by his office during the preceding twelve months. Some of the roads made by the engineers of this central department were "object-lesson" roads, and others are classed as "experimental." The office gives advice and instruction concerning specific problems which local authorities are unable to solve, and helps counties to organise efficient road systems. Laboratory and field investigations are also carried out, 685 samples of road materials having been received during the year. Research work is done independently of ordinary testing and economic and statistical studies are made to determine the effects of good and bad roads upon the welfare of rural communities. Propaganda was carried on by means of "road improvement trains," each carrying a lecture car and a car for models. Representatives of the central office travelled on these trains, and gave lectures to audiences amounting to some 65,000 persons.

#### ORGANISATION OF ROAD SYSTEMS.

Fourteen counties were studied by engineers and experts of the central office, the work involving an investigation of the whole road system of each county, its materials, and local methods of road making, road maintenance and administration. "Upon the completion of the investigation the engineer prepares a detailed report for the local authorities, giving all data of value in connection with the road system of the county, together with recommendations and detailed plans and estimates for future work covering a period of several years." As an example, the case of Mobile County, Alabama, may be cited. The county has an area about that of Wiltshire or that of Cornwall, 1,300 square miles, and about 2,000 miles of roads, about 1,200 miles being maintained as public roads. A general study of the topography, drainage and surface geology was undertaken and a road map prepared. Definite recommendations were made as to the kind of road construction to be undertaken, and the order in which the work should be carried out. The construction of some 120 miles of roads of various kinds was recommended with some detail, and careful attention was paid to future bridge building. In Wetumpka county a system of twenty-five roads (210 miles) was projected, the culverting and other details worked out, and estimates made. Robertson county, Tennessee, has an area of 475 square miles (about the area of Bedfordshire, or half that of Warwickshire). There are about 500 miles of earth roads, 145 miles of which are main public roads. Loads of tobacco weighing 32 cwt. are drawn by teams of four mules. The type of road decided upon for this county was limestone water-bound macadam.

For Bastrop county, Texas, the roads recommended were, on the hard, stiff soil, simple graded roads—that is, roads with no made crusts: on sand and loam stretches, sand-clay crusts; and for heavy traffic and where the material is available, gravel roads. In Bowie county, Texas, guidance was given as to the best use of local materials, which included "a good grade of clays and a surface formation of conglomerate suitable for bottom courses, some sand-clay hardpan mixture, and a good grade of tough limestone besides several deposits of gravel." Similar work was done in other counties.

#### OBJECT-LESSON AND EXPERIMENTAL ROADS.

In 1905 roads amounting in area to 79,203 sq. yds. were made, rather more than half of the area being "macadam," and the rest, in order of area, sand-clay, gravel, shell and burnt clay. In 1906 the area was nearly 88,000 sq. yds., considerably more than half of it macadam, and the rest, in order of area, sand-clay, earth, gravel and shell. The area constructed in 1907 was 200,711 sq. yds., about 86,000 sand-clay, nearly 76,000 macadam, 27,000 earth, and nearly 12,000 gravel. Out of a total of over 223,000 sq. yds. for 1908, nearly 86,000 were earthen roads, 73,000 macadam, 43,000 sand-clay, and the rest shell, gravel and burnt clay. There was a large increase in the area made in 1909, over 690,000 sq. yds., or, if taken as 15-ft. roads, about 79 miles. Earthen roads were most prominent (319,000 sq. yds.), and sand-clay roads next (205,000). The other figures are: Macadam, 96,000; gravel, 66,000; burnt clay, 2,000; and shell, 1,600 (approximate figures). In 1910 the total was over 1,000,000 sq. yds. (about 113 miles of 15-ft. road). Earthen roads accounted for 651,000 sq. yds., and sand-clay for 178,000; gravel for 71,000, and macadam for 50,000. A new feature of the work was the construction of nearly 46,000 sq. yds. of bituminous macadam, nearly 5,000 sq. yds. of oil gravel, while small areas were made with slag, concrete and brick. In the ensuing year (1911) the total was 485,000 sq. yds.—about 218,000 sand-clay, 141,000 earth, 60,000 gravel, 42,000 bituminous macadam, 11,000 macadam, nearly 10,000 oil-gravel, about 2,000 oil-mixed concrete, and small areas of oil-asphalt gravel and asphalt slag. The large reduction in total area is mostly accounted for by the small area of earth roads built in 1911. The area of sand-clay roads was, however, greater than in 1909 or 1910.

The methods adopted in particular cases are described in the report, a striking feature in some cases being the high cost.

#### COSTS OF OBJECT-LESSON ROADS.

*Bituminous Macadam.*—A 14-ft. bituminous crust, with grading and incidental drainage for a 20-ft. road bed, cost about 1·20 dollars per square yard, or 9,900 dollars per mile—five shillings per square yard, £2,079 per mile. The length was less than half a mile. In another case an old crust was excavated, screened and relaid to form the subgrade, the cost for a short length being well over £2,000 a mile. In a third case the old crust was scarified and shaped and coated with a 2-in. layer of limestone. Over this a carpet layer was formed with an "iron limestone." The bitumen was applied by the penetration method. The cost per square yard varied (according to the bitumen used) from 53·7 cents (2s. 3d.) to 60 cents (2s. 6d.) per square yard.

*Oiled Gravel.*—An oiled-gravel road in New Mexico cost 42 cents per square yard, a similar, but water-bound, crust costing 34 cents, both including a 4-in. foundation course of adobe clay.

*Oil-mixed Concrete.*—On a road-bed previously graded, with kerbs and gutters in place, a 5-in. course was laid, and rolled, blinded and finished as an ordinary macadam crust. A wearing surface of oil-mixed concrete, 2½ in. thick, was placed over this by various methods in different parts of the length. In one case the "concrete" was a 1½:2:4 mixture of cement, sand, and broken stone, 10 per cent by weight of oil being added (before the stone). Another was 1½:3:4, with 10 per cent of oil. In a third case the mixture was 1½:1:2:4 of cement, sand, screenings and broken stone. The cost per square yard varied from about 1.15 to 1.25 dollars (4s. 9d. to 5s. 2d).

*Macadam.*—A street in Berea, Kentucky, was built on a heavy yellow clay subsoil. A considerable amount of excavation was done, and in some places a sub-base of field stone from 6 in. to 15 in. deep was laid. Two 4-in. centre drains were laid, surrounded by broken stone. There were two courses of macadam, the lower 3-in. to 1-in. stone, and the upper 2-in. to 1-in., both 4 in. deep, in the loose, rolled to 3 in. The cost was 91.5 cents per square yard, or 16,840 dollars a mile of the 30-ft. road (3s. 10d. per square yard, or £3,508 per mile).

In another case a crust of limestone on gravel, the compacted thickness being 4½ in. to 6 in., cost 2s. 8d. per square yard, including grading.

*Gravel.*—A length of 2,800 ft., half of it new location, was graded and surfaced with gravel. The total of excavation was 1,300 cub. yds. The gravel was free at the pit, the loose depth being 8 in. The average haul was half a mile. The cost was 15 cents (7½d.) per square yard., or, for the 15-ft. road, £226 per mile. In another case a gravel road through swampy land cost 32 cents (1s. 4d.) per square yard. Many other examples are given, with costs such as from £1,000 to £2,000 per mile.

*Sand-clay.*—Under various conditions the costs of sand-clay roads with 15 ft. and 16 ft. crusts were from about £90 to £500 per mile. In some cases convict labour was used. The low cost of the actual crust and the variable amounts of other work make comparisons very vague with roads of this class; but characteristic examples showed costs of about £180 to £300 per mile.

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**Quantity Surveyors' Association.**—The annual dinner of this body is fixed to take place on Monday, the 20th inst., at the Connaught Rooms, Great Queen-street, Kingsway, W.C.

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# The Proposed Western Approach to London.

## SPEEDWAY, MAIN AVENUE, OR STREET?

At the present stage it would be idle to discuss in any detail the proposal for the making of a western approach to London on the assumption that some particular kind of road is necessarily or unanimously contemplated. The new route might be made as a part of a large and costly scheme of the main avenue type, with accommodation for swift traffic, slow traffic, and tramways; it might be merely a wide street, with or without tramways, provided with wide footways and flanked by shops; or it might, at far less cost, be made to serve only the purpose of an inlet and outlet for traffic between London and the West Country. Before discussing these three possibilities, or their possible separate application to different parts of the route, it will be well to pay careful attention to an article which appeared in a recent issue of the *Times*. This article is evidently written with knowledge of the facts, and, possibly, with some special knowledge of the forces at work in the matter.

### THE MAIN POINTS OF THE "TIMES" ARTICLE.

The writer of the *Times* article begins by pointing out that the Road Board, though proposing to contribute £825,000 towards the cost of the undertaking, would not itself make the new road which would be constructed by the county, borough and district councils whose areas would be traversed by it. He next raises the question whether it would be desirable to carry the road a little further west, and evidently favours the plan of extending it beyond the fork of the Southampton and Bath roads, in order that it may not increase the congestion of traffic at, and east of, that point. He then refers to opposition from frontagers on existing roads, which opposition, it may be assumed, will be of two kinds—the objections of those who think that their business would be diminished by the construction of a new and important main thoroughfare, competing in the matter of shopping and other facilities, and the other kind of opposition from residents in quiet streets close to the route, and, especially, the occupiers of houses in Cromwell-road, which would become itself a part of the new route. The writer then points out that, as a work of public utility, the road could be made in spite of local opposition if the advantages which it would provide were held to be sufficient to justify this course. The Road Board have no staff for such work, but an Act of Parliament could be passed and the scheme carried through "in the same manner in which a railway company is authorised to construct a road upon which rails are laid." He does not say, however, who would take the place corresponding to that of the railway company.

### WIDTH: TRAMWAYS: CAMBER.

Dealing next with the width of the proposed road, the *Times* correspondent states, somewhat didactically, that the width of 80 ft. at present contemplated must be regarded as the minimum, and that if possible 100 ft. should be secured, with an eye to future needs. He quotes, from the Board of Trade Traffic Report for 1911, figures which show that the number of vehicles passing, per twenty-four hours, along Bridge-road, Kew, is nearly 3,000; along Chiswick High-road not far short of 4,000; along Hammersmith-road nearly 6,000; and along Kensington-road, at Queen's Gate, more than 9,000. "It cannot be said," he remarks, "that the Victoria Embankment, which averages 60 ft. in width, is at all too wide for its purpose, especially since two encumbering tramlines have been laid upon it; nor can Blackfriars Bridge, recently widened to 73½ ft., be said to be any too spacious for the traffic it has to carry in 1912," and concludes that the 80 ft. width proposed for the new road is "obviously too little, especially if two lines of tramrails are to be allowed to obstruct some of the available width." He regards the proposed new road as likely to be used to connect with roads as far north as those to Liverpool and as far south as that to Chichester, and, pointing out that there would be a large amount of motor-van traffic, suggests the making of experiments to determine the best form of road surface, and the possible advantage of providing plateways of stone or metal for heavy motor vehicles. As regards tramways, the following passage is worth quoting: "Another point arises as to whether the London County Council or any other tramway authority shall be allowed to lay rails along this new road at all in consideration of contributing to the cost, and if this is allowed whether a considerable portion of the extra cost due to extra width then needed should not be demanded." This passage is somewhat weakened by what follows: "Moreover, it must be remembered that the money given by the Road Board is wholly and solely derived from the taxes on petrol and motor vehicles, while tramways and other vehicles, if they do not also contribute, will enjoy untaxed the use of the highway." In the next paragraph the suggestion is made that a concave instead of a convex camber would suit the conditions of the road.

Under the heading "Broader Aspects of the Road," reference is made to the probable effect of the new highway upon property in the neighbourhood, an improvement in the residential character and frontages in or near such a road being a matter of doubt.

The article concludes with a reference to the "desperate need" of London for such outlets, and a further hint that the work may be done independently of the local authorities if it cannot be carried out with their co-operation.

### NOTES ON THE POINTS RAISED.

By Reginald Ryves, Assoc.M.Inst.C.E.

There are two factors which dominate the situation, and compared with which almost all other considerations are insignificant. The nature of the road, its width, and the gradients that may be permitted will depend upon whether it is to be regarded as a main avenue, as an ordinary street, or as a speedway. The area of land which will have to be acquired will be very considerable if the new road is to be a street with shops, for these shops will have to be new buildings. Less land would be needed for an avenue which, though perhaps wider than the alternative street, would not have to be provided with new frontages. An area very much smaller would suffice for a speed way intended only to accommodate through traffic.

The other dominating factor is the "arc" factor. Whatever kinds of traffic the road may accommodate, some proportion of its width will be that needed for through traffic. Now, as far as through traffic is concerned, the accommodation necessary depends theoretically upon how many degrees of the whole circle around some point in London are to be permanently served by this road, and, practically, upon this consideration modified by the actual positions of main roads.

### THE ARC FACTOR.

Although there may be some who would like to regard the proposed western approach to London as a problem standing by itself, it is far more reasonable to consider the road as one of a number which will be made in the near future. It is difficult to believe that it will not be worth while to make special ways for through motor traffic, and that in the very near future. It is the purpose rather than the nature of the vehicles under consideration which makes it desirable to construct special roads. This point will be further considered presently; and for the purpose of the present argument it will be taken for granted that a considerable number of through roads will be made, radiating from London, and that each of these roads will, if not intended solely or chiefly for through traffic, at least provide special facilities for such traffic. Now, it is clear that if any considerable number of such roads is to be constructed, we must be careful to see that our estimate of the width needed for any one of them is not based upon estimates of the traffic through too large an arc of the circle. In addition to the present proposal, it is safe to say that strong demands will be made for a road to the north and one to the south, if not for one to the south-east also. Now, if we are to have a road to the south, and one to the north, the estimates made by the *Times* correspondent of the arc to be served by the western approach is excessive. It is, indeed, excessive even on the assumption that no other through route is to be made.

However good the road to Hounslow, the way to Chichester, from some parts of London, will continue to be by the Portsmouth road as far as Haslemere, and thence by Midhurst. Southampton can be reached by the same route. This route is fed by King's-road,

Fulham-road, Battersea Park-road, and Wandsworth-road, and, having regard to the possibility of minor improvements being made on one or more of these roads, and, on the other hand, the cost of making an effective link between the western approach road and the Portsmouth road, it is clear that we must not include places as far east as Chichester and Portsmouth in the sector which may be regarded as necessarily and permanently to be served by the western approach road. Again, if we look to the north-west, the directions of the roads, the considerable distance to which the closely-built area extends, and the sudden change to almost open country, all point to the probability that this sector will be served by one radial road of high capacity and a chord or arc road connecting it with the Edgware-road (Watling-street), the Finchley-road (leading to the important fork at Chipping Barnet), and, if necessary, to the Great North Road. The immediate point is that roads north of the Uxbridge-road are likely to be served in the future by a north-west or even by a northern radial road, and not by the western radial road. A north-western radial road is likely to be made before a northern one, for the following reason: There is a possibility of serving both the north and the south-east by means of a road nearly due east in the sector between the Mile End-road and Commercial-road East. Hence the north-eastern roads could be served by a relatively cheap road along the Hackney and Leyton Marshes, and the Dover and East Kentish roads by way of Blackwall and Greenwich. It may be assumed that before this, or at about the same time, there would be made a south radial road which, it may be noted, could serve places as far west as Chichester by way of Leatherhead and Guildford. Leatherhead will be a very important point in the road system, and land should be secured at Ashtead, through which place the traffic will be very great.

### THE WIDTH OF THE RADIAL ROAD.

It remains to be considered whether a width of 100ft. would be likely to be more than enough. If the road is to be on the main avenue principle, with tramways, roads for fast and slow traffic, and wide footways, and will include strips of greensward and trees, its width cannot be decided upon until the design is fully worked out; but 100 ft. would not be too much, probably not enough. If it is to be an ordinary street, however, it must not be made too wide, because a very wide street is dangerous for foot passengers who cross it, and the crossings with other streets involve either danger or delays. The Embankment, it may be pointed out, is not crossed by streets, and it is to be feared that the wide avenue idea, however valuable in itself, does not help us much, in proportion to its cost, in the matter of through traffic. There are not many places in London where a wide street with a large traffic is crossed by another street also bearing a constant stream of traffic, and the advantage of width for a given amount of traffic must not blind us to the difficulty in the case of a wide road the full width of which is used by a steady stream of vehicles.

The advantage following a moderate increase in the width of a congested street is much more than in simple proportion. The Thames Embankment, which is referred to in the *Times* article, seems to be of ample width for its traffic, in spite of the tramways, but it is a bad street to cross. The bridges hardly present a fair comparison; their traffic is very mixed, and they suffer from heavy rush-hours traffic without the help of alternative routes. For an ordinary road or street 100 ft. is an enormous width. If tramways were used on a radial through traffic street it might be necessary to have only a very few stops at fixed points, or to run the trams round corners into side streets and run them out again reversed. For motor-omnibuses this would not be necessary, as these vehicles do not, like trams, stop the road for others following them. These remarks are made on the assumption that the through road will really serve its purpose and carry a very large volume of traffic.

### THE SPEEDWAY.

It is worth while to consider what width would be necessary if the road were purely a through route for motor vehicles only, with no frontages and no cross-streets. It may be taken for granted that by general consent two speeds would be aimed at, and without difficulty maintained. Taking 20 miles an hour for motor cars and 8 miles an hour for heavy vans, and allowing 10 ft. width for each line of vehicles, and assuming that the length of road occupied is 30 ft. for each motor car and 40 ft. for each van, we get the following results: A mile length holds 176 motor cars, going each way, and 132 vans. The discharge capacity of the roads is therefore 176 cars in one-twentieth of an hour and 132 vans in one-eighth of an hour —that is, 3,520 cars and 1,056 vans per hour, each way, on a 40-ft. road. An 80-ft. road would therefore "discharge" more than 7,000 cars and 2,000 vans each way every hour, or 70,000 cars and 20,000 vans in the busy ten hours of the day. If each motor car carried three persons, five such radial roads would carry more than 1,000,000 passengers in and 1,000,000 out. If each van held two tons and made the return journey empty, the weight of goods shifted would be 200,000 tons in the ten hours.

It does not seem wise to sacrifice this prospect by muddling up these streams of men and goods with tramways, crawling cabs, the carriages of shoppers, the lives and limbs of persons crossing the road, supercilious dogs, and the various incidents of a street; nor does it seem wise to interpose such streams, in a broad avenue, between tramways and their passengers or shoppers and their shops. It is a comparatively simple matter to design and to estimate the capacity of a real thoroughfare, an outlet and inlet, but it is not possible to estimate capacity or to design correctly in the case of a road which is collecting traffic all the way and distributing traffic all the way. On the country roads there is a margin, the full capacity is seldom reached, and the width necessary for other reasons is sufficient for the traffic as regards its volume; but can we afford to allow the margin and face the uncertainty in the case of outlets cut through the densely-built area of London?

The view taken by the present writer is that specialisation of the highway is to be avoided, but that when the public value of a particular route is being destroyed by traffic of one kind, or when that traffic is being hampered very seriously indeed by the limitations of the ordinary highway, we ought to consider whether the making of a special road will be justified by the results. If a tramway is needed in the country, let it be a light railway across fields; if a stream of motor vehicles is to be provided with an outlet from London, let the road be suited to the purpose. The position taken up is that London is a special case, and that just as it is worth while to make tunnels under London for trains, so must it be worth while to make special provision for motor cars to an extent to be measured by the use made of the first of such radial roads. If broad avenues are needed let them be made; but until it is decided that they are needed it is not worth while to compare the cost of an avenue which will be used for through traffic with the cost of a road for through traffic only. As far as horsed vehicles and the slower and heavier motor vehicles are concerned, the provision of a road for motor cars and for the speedier vans will make the ordinary roads worth more, and no injustice will be done. The first radial roads to be provided should not be very wide, as any lack of capacity can afterwards be corrected by the position and width of those made later. Sixty feet may be suggested as a good width for the first. Other roads and streets would be crossed by bridges, the approaches to which could, if necessary, be as steep as 1 in 10.

### THE ROAD SURFACE.

The suggestions made by the *Times* correspondent as regards the surface with which the road should be provided are somewhat difficult to understand. Does he seriously propose that the road crust should be chosen as the results of new experiments rather than in the light of experience? It is very seldom indeed that any engineer has the boldness to propose such a course, important works being almost always carried out with materials and by methods which have stood the test of actual experience. There is no difficulty in finding suitable materials, though there may be some difficulty in deciding which is the best. If tracking is feared, there are ways of preventing this, and it does not seem desirable to resort to plateways. Clearly, however, the writer of the article is mainly interested in the administrative side of the subject, and the time for discussing engineering details is not yet at hand.

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**Dunbar Water Scheme.**—All petitions against the Provisional Order in connection with the Dunbar water scheme have been withdrawn, and the Order will proceed through the usual course. The scheme has been promoted for the purpose of augmenting the present supply of water, and is expected to entail an outlay of about £16,000. It is anticipated that the work will reach completion within a period of two years.

# Comparative Reports of General Practice.—LXXIX.

## HAULAGE BY MOTOR *v.* HORSE.

On May 12, 1911, Mr. C. H. Cooper, M.INST.C.E., borough engineer and surveyor of Wimbledon, sent out the following letter to seventeen firms:—

"I should be much obliged if you would let me have a price for the plant you would recommend in connection with road watering, haulage of goods and house refuse, or any of these labours. The plant will be required to compete with horse haulage in this district. The average distance for haulage of house refuse is barely 1½ miles, while the average for the haulage of road material, &c., will be about 1 mile. The time taken for the filling of the ordinary 450-gallon water van is from three and a-half to five and a-half minutes; the length of the roads watered is, roughly, 50 miles; the population of the district is 59,000; and the district is very compact, being, roughly, 3 miles by 2.

"The only condition, I take it, under which the council would entertain motor haulage would be on the understanding that it proved to be more economical than horse haulage, and the terms would have to be somewhat as follows—*viz.*, that the plant should be supplied on trial for not less than three months."

The result of Mr. Cooper's inquiries was reported to the Highways and Sewerage Committee on June 19, 1911, the experience of certain local authorities where mechanically propelled vehicles are used for street watering, scavenging, &c., as to the economy and efficiency of that form of haulage being also given. Mr. Cooper was subsequently directed to make enquiries on the matter from local authorities other than those mentioned by him, and report the result to the committee.

On January 23rd last Mr. Cooper received a letter from Messrs. Green & Sons, *re* a "Little Giant" tractor. He asked them for a price for haulage, and received the following quotation:—

"I . . . beg to quote you 1s. 2d. per mile, if you would allow us a man to load. We could put you two trailers on, one to load while the other is running, and could average you 6 tons per hour for 1 mile, the road conditions being fair, of course (our engine averages 5 miles per hour).

"(Signed)
"W. H. H. GREEN,
"pp. Green & Sons."

On February 14th Mr. Cooper sent circulars to fifty-eight municipal authorities having a population of from 50,000 to 100,000 persons, and in answer received replies, given in tables which will be reproduced in next week's issue, from thirty-six districts. Eight of the districts have adopted motors for haulage of goods, three for the haulage of house refuse, two for slop and scavenging, six for road watering, and four for other purposes. Ten of the districts have adopted motor haulage. "I understand," says Mr. Cooper, "it is an accepted fact that motor haulage has not proved economical for the removal of house refuse except where two shifts are worked in the twenty-four hours, as in the case of Westminster."

The replies from four districts state that motor haulage is only economical over long distances. Messrs. Kavanagh, contractors, Surbiton, have had a Foden steam wagon to carry 5 tons, with a trailer to take 2 tons, since June, 1907, and Mr. Kavanagh informed Mr. Cooper that his firm do not consider motor haulage can compete with horse haulage for distances under 10 miles.

Mr. O. Claude Robson, M.INST.C.E., engineer of Willesden, a district 3¾ miles by 3¾ miles, in his report for last year, says: "I am of opinion that motor traction only pays with heavy loads carted over long distances, but not with intermittent work such as watering, dusting and slopping."

Mr. Cooper understands that in the following districts, where motor haulage was adopted some years ago, such haulage has either not been added to, or the plant has been abandoned for the purposes for which it was obtained—*viz.*, Hampstead, Folkestone and Burnley. Mr. G. H. Pickles, M.INST.C.E., borough engineer of Burnley, says: "For long-distance journeys we found the motor wagon more economical than horses, but for shorter journeys the latter were found more economical."

BOROUGH OF WIMBLEDON.

Mr. Cooper adds: "I have set out particulars as regards this borough among the replies *re* haulage, from which it will be seen that the district has a length from west to east of 3 miles, while its width from north to south is 2 miles. The main purposes for which haulage is required are:—

"(*a*) Conveyance of refuse from houses to destructor, Durnsford-road—average distance about 1½ miles.

"(*b*) Materials for repairs of highways, the principal items being: (i.) Flints, an average of 3,000 tons per annum, carted where required by contractors; (ii.) granite, an average of 1,909 tons per annum, carted from Queen's-road depot where required, average distance ·82 miles, by council's carts.

"(*c*) Road watering.

"From the replies obtained, I see no reason to vary the advice already given the council that motors cannot yet compete with horses for haulage within the borough.

"This report has taken a considerable amount not only of my time, but the time of my staff, to prepare, and can serve no useful object, except to dispel erroneous ideas that have been propagated. I feel that the time occupied in preparing this report might have been applied to much better purposes, when such a large number of works are being carried out by the department."

*(To be concluded.)*

**Public Health Law.**—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangement well suited for easy reference.—*The Law Times.*

**Plague in Rats.** Mr. A. R. Tankard, the City analyst, reported recently that rats taken from the Alexandra and Albert Docks gave rise to suspicions of bubonic plague. The Ratin Bacteriological Laboratory suggests that a systematic attack upon rats is the only real safeguard against the destruction of life and property threatened, and that science in the form of "Ratin" is at hand to assist. "Ratin" contains the bacillus of a disease which is absolutely harmless to human beings and domesticated animals, but is fatal to rats and mice. These rodents feed eagerly upon it, and at once make for the open air to die; thus all risks of smells from dead bodies in enclosed premises is avoided. Not only is the rat mortally seized, but he communicates the disease to its fellows, and many large premises have thus been entirely cleared of the pest. The firm's laboratories are at 155 Fenchurch-street, where full particulars may be obtained.

**National Fire Brigades Union.**—The annual camp of the National Fire Brigades Union (Incorporated) will be held at the Crystal Palace from the 17th to the 24th inst. next, and will be of great public interest. Firefighters from every part of the country will be under canvas, and daily will give demonstration drills with the latest types of fire-fighting appliances with thrilling exhibitions of life-saving. Additional interest in the event is being taken in view of the fact that the union has now been incorporated, and the certificate has been issued by the Board of Trade. Furthermore, the union this year celebrates the twenty-fifth year of its foundation. Earl Londesborough, K.C.V.O., the president of the union, will hold a grand review and inspection of the assembled fire brigades after the annual camp competitions on Saturday, August 24th. No camp was held last year owing to the Coronation celebrations, and it is expected there will be a great muster at the Crystal Palace next August.

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By Sydney G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

## CORRESPONDENCE.

*"Men are never so likely to settle a question rightly as when they discuss it freely."*—MACAULAY'S *"Critical and Historical Essays."*

### THE MANUFACTURE OF ROAD DUST.

*To the Editor of* THE SURVEYOR.

SIR,—We (the housewives of Foreignbois) have, for weeks, wallowed in a sea of injustice.

We have cursed—with our earliest and latest breath—the man who is responsible for the lumps of chalk put upon our roads some weeks ago.

Instead of having large interests in carpet and such industries (as we thought he had), we now find that this man is a public benefactor, and we would be grateful if any of your readers would suggest something we could do for him in the way of reparation. Couldn't he be canonised or something?

He is a surveyor of some kind (borough, district, or county, I am not sure which). We discovered that his name is, say, Smith (his initials were not given; but when I state that his crest is a woman rampant, and his quarterings include brushes, dustpans and such domestic things, you will, no doubt, know who he is).

We formed leagues for paying small children to pick up the lumps, and were informed that this was illegal. We had ideas of asking the prayers of the Church for all those who are afflicted in mind, body, or estate, and should have carried them out if we could have spared the time. The little girls of the village were wiser than we: they used the lumps of chalk for marking out squares for the game of "ball-y hop-scotch." This game they have played in all their spare moments. It is one which calls for the exercise of everything in a girl—including her lungs.

To-day one of our members thought she would like to see her dining-table, and, hoping to come upon it eventually, went on sweeping until she was exhausted. In excavating she found a magazine, and while resting read "At no season is exercise more important than in Spring." The writer went on to say that in spring-cleaning the housewife exercised practically every muscle of her body, and thus was set up for the rest of the year.

We called a meeting at once, and our president drew a touching picture of Mr. Smith, yearning to see us glowing and blooming, with rosy cheeks, and with arms well-developed. She pointed out with what truly wonderful foresight he had planned that even the youngest among us should participate in the health-giving exercise. Assured us that we might be quite sure that he knew all about ball-y hop-scotch.

It was decided that if he means to benefit women in other parts of his district (borough or county), we, the women of Foreignbois, agree to give up the chalk now being stored in our houses. That it would be a waste of money to expend more on the purchase of chalk now that we have quite finished with that which he was kind enough to get for us.

While quite seeing Mr. Smith's point, and heartily thanking him, we cannot help regretting the state of our carpets, curtains, &c.

How would it be if we signed a sort of pledge committing us to at least six hours of "ball-y hop-scotch" daily? Ah!—I see. That would not do at all! With the present scheme our *husbands* are also benefited. To replace the carpets, &c., they have to work night and day, and so are *exercised* in mind and body.

It is truly astonishing how Mr. Smith has thought this subject out; he seems to have missed nothing.—Yours, &c.,

CHALKYGOUT.

May 1, 1912.

### ESTIMATING.

*To the Editor of* THE SURVEYOR.

SIR,—Your correspondent "Contributor," not having responded to my suggestion that he should give details showing how pitch-grouted macadam could be carried out at 2s. per yard, as he alleged it could be, with the prices of materials given in my article, and with pitch at 50s. per ton, I think I am justified in assuming that he now finds that he cannot do the work at that price.

As to the term "correct" in his letter in your issue of April 5th, in regard to tar-spraying and pitch-grouting, practical experience shows that there is no such thing as a "correct" amount of tar or pitch to be used in either case since materials, conditions and circumstances vary with time and place. Therefore, anyone not considering himself to be an infallible authority would no doubt prefer to use some qualified phrase such as "the average amount in his experience," or "the average amount to give the most satisfactory results," rather than language which would lead one to think that there was a mathematically exact standard which did not permit of any deviation.

As an example of the "correctness" of "Contributor," I may point out that if I had allowed 4½ yds. covered per gallon of tar, in tar-spraying, as he asserts I have, with tar at 36s. per ton, and cost per yard for tar of ·374d., as given in my article, this would mean tar of a specific gravity of ·876 (about 256 gallons to the ton). The specific gravity of tar as used for tar-spraying usually averages about 1·2 (about 187 gallons to the ton), as may be seen by referring to the Road Board's specification. Are "Contributor's" figures for pitch-grouted macadam based on similar "correct" data?

In conclusion, may I remind "Contributor" that the mere assertion of an anonymous writer, without any details, cannot be expected to outweigh detailed figures given by a contributor who signs his name.—Yours, &c.,

J. EASTWOOD.

April 29, 1912.

### GRANTS TO OFFICIALS.

*To the Editor of* THE SURVEYOR.

SIR,—I note the wish expressed in last Friday's issue that SURVEYOR readers should give their experiences of what some councils are good enough to grant by way of honorarium for extra work and trouble in preparing new sets of by-laws.

I have had no experience of what urban councils or boroughs are in the habit of doing in this way, but I had all the burden of preparing a set of by-laws with respect to new streets and buildings, meeting committees, making and altering drafts, visits to the Local Government Board, &c., for a large and populous rural district in the South of England in 1896; again, in 1906, the preparation of two separate sets (urban and rural series), to be applied to the several defined areas in the district, in substitution for the above-mentioned code; subsequently, the preparation of by-laws for the drainage of existing buildings; the alterations to existing buildings; regulations, forms of notice for the connecting of house drains to sewers, and various other items of similar extra work. In addition to the above, on two separate occasions, I prepared plans, computed the areas, and assessable values for the making up of a separate parish and a special expenses area proposed to be set up in one of the large parishes of the district; but, hitherto, the question of grants, such as your correspondent "Jay" refers to, has never been so much as hinted at by my council. I verily believe they would be horrified at such an idea; in fact, I do not think it has ever occurred to them that the extra service is even worthy of a small meed of commendation.

However, I hope some other surveyors will have a brighter tale to tell, so that our friend "Jay" may be encouraged to try the spirit of his council.—Yours, &c.,

"HAWK."

April 29, 1912.

**Law of Private Street Works.**—It is surely a commentary on our system of legislation relating to what may be termed domestic matters that the owner of house property (to say nothing of the occupiers of his houses) has to thread his way through a maze of statutes and decisions to ascertain his rights and his liabilities in connection with questions which may arise every day. Such, however, being the case, text-books dealing with what on the face of them might be deemed to be simple matters have become an actual necessity, although the owner of property is lucky if the text-book suffices and he is not driven to consult a specialist. The work before us* deals with one of such subjects, private street works under the Public Health Acts and the Private Street Works Act, 1882, but not with the Metropolitan Management Acts; the statements in the text are supported by decided cases, with references printed in the text; there is also a table of cases and an index, and it should prove a useful hand-book. We find the recent decisions included, and the work seems to have been carefully prepared.—*The Builder.*

* "Notes on the Law of Private Street Works under the Public Health Acts." By J. B. Reignier Conder, a Solicitor of the Supreme Court. 3s. 6d. nett. London: St. Bride's Press, Limited, 24 Bride-lane, E.C.

# Law Notes.

Edited by J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

*The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, one side only) should be addressed to "The Law Editor," at the office of* The Surveyor, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

Municipal Tramways: Power of Lessees to Grant Licences.—The decision of the Court of Appeal in *Eccles Corporation* v. *South Lancashire Tramways Company* (noted in vol. xxxvii., p. 244) has been affirmed by the House of Lords (March 29th). The point in dispute was shortly whether the Salford Corporation, as lessees from the Eccles Corporation, had power, without licence from that corporation or the Board of Trade, to license the company to run cars on a line in the borough of Eccles. That borough lies between the borough of Salford and the urban district of Worsley, in which district the company worked tramways up to the Eccles boundary, beyond which their powers did not extend. Under two agreements between the two corporations, the Salford Corporation constructed and worked tramways within the borough of Eccles. One of the agreements provided for the grant of a thirty-five years' lease of those tramways to the Salford Corporation, and that the latter should not assign, sub-let or part with the benefit of the agreement, or of the lease, without the licence of the Eccles Corporation. Notwithstanding this provision, the Salford Corporation, without applying for a licence from the Eccles Corporation, licensed the company to run cars on part of the line within the borough of Eccles. The Court of Appeal (reversing the decision of Mr. Justice Eve) held that the action of the Salford Corporation was *ultra vires*. The ground of their decision was that the Eccles Corporation had no power, either under the Tramways Act, 1870, or their special Act, without the consent of the Board of Trade, to authorise the company to use the tramways of that corporation; and that the agreements could not confer upon the Salford Corporation powers greater than those possessed by the Eccles Corporation. The House of Lords took the same view.

## QUERIES AND REPLIES.

*In order to avoid confusion querists are requested to use distinctive words as* noms de plume. *The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.*

By-laws: New Street.—"Brock" writes: Plans have been submitted for the laying out of a new street in the position shown on the accompanying plan. I would feel obliged if you would inform me whether the plan complies with the by-laws enclosed regarding

the width of the proposed street—by-laws No. 4 to No. 10. It is proposed to lay out the street in front of the houses 30 ft. wide, but the access to it through the existing back lane will be at one point only 17 ft. 7 in. Is the portion from point A to B on plan to be considered as part of the new street, or only the portion from B to C?

The proposed new street B to C (being 76 yds. only in length) is in conformity with by-law 4, which permits a new street not exceeding [illegible] yds. in length, intended for use as a carriage road, to be 30 ft. wide at least. The street also complies with by-law 10, in having an entrance of a width equal to the width of the street. In my opinion, A to B and B to C are two streets, not one. If, however, A to B is being laid out as a new street it must be laid out of such a width as to comply with the by-laws.

Water Supply: Waterworks taken on Lease.—"H. H." writes: A rural district council have agreed to rent a small water supply for a small country parish, with a population of about 200, the scheme being carried out at the cost of a private individual who will lease it to the council. The source of the supply is said to be precarious. The size of the pipes are very small, being only 1 in. It is proposed to supply standpipes in the public roads only. There are three large houses in the area, all of which suffer greatly from want of water. The council refuse to allow the water to be laid on to any of these three houses, although it is urgently required. (1) Under the Public Health Act, can the council be compelled to permit the water to be laid on to the houses? (2) If so, what would be the proper course to adopt, if by application to the Local Government Board? (3) Should not the public mains be of a suitable size to afford a sufficient supply to the house for domestic purposes? The rural district council have not laid any pipes or executed any work themselves. This is being done by a private individual, from whom the council will lease the works, or undertaking, when completed, at a yearly rental. This private individual has not obtained any powers, nor is he executing the work under any Act of Parliament; he is merely carrying out the work at his own expense, for his own profit; but, of course, he has the approval of the rural district council to open up the roads for the purpose of laying the pipes. Under the above conditions would secs. 44 to 53 of the Waterworks Clauses Act, 1847, apply, as these apparently refer to works being carried out under Parliamentary powers?

(1) and (2) Inasmuch as the council are not themselves laying the pipes, secs. 44 to 53 of the Waterworks Clauses Act, 1847, will not apply. Neither will sec. 55 of the Public Health Act, 1875. Local authorities are empowered by sec. 51 of the last-mentioned Act to take on lease or hire waterworks for the purpose of providing their district (or in the case of a rural district a contributory place or part of it) "with a supply of water proper and sufficient for public and private purposes." But there does not appear to be anything in this Act defining or explaining what is meant by a proper and sufficient supply, nor any provision for compelling an authority who have not themselves constructed or purchased waterworks to have water laid on to houses. (3) This depends upon what is meant by a "proper and sufficient" supply, which (in the absence of a statutory definition) would presumably be a question of fact, depending upon all the circumstances, in each particular instance.

Highway: Material for Road Repair. Referring to query and reply on p. 570 *ante*, "Rural" writes: I am obliged for your reply to my query *re* "Material for Road Repairs," but it does not altogether cover all I require. Will you please say if, as we have been obtaining stone from the quarry in question for many years, the owner can give us notice to stop doing so? I am not certain if a licence was obtained from the magistrates when the quarry was opened. If a new owner gets possession of the land, will it be necessary for the council to apply for another licence if they already have one?

This question cannot be answered decisively without fuller information. I assume that, although the quarries themselves are not fenced, the fields on which they are situated are inclosed, so that secs. 53 and 54 of the Highway Act, 1835 apply. It has been held that a licence under section 54 is limited to the necessities of each particular occasion. See *Earl Manvers and Browne* v. *Bartholomew* (4 Q.B.D., 5), where it was decided that a licence granted in 1866 did not authorise the taking of materials in 1877. The form of licence given in the schedule to the Act omits all mention of time; but it would appear from this decision that the justices, in granting the licence, should specify the time for which it is to last. If no time be specified presumably a fresh licence must be obtained for each occasion. It is possible, however, in the present case (as it appears to be uncertain whether a licence was obtained) that there was an agreement between the landowner and the highway authority. If so their respective rights would depend upon the terms of such agreement. In the absence of either (*a*) a recent licence or (*b*) an agreement, the landowner, or a purchaser from him, could require the council to discontinue obtaining stone forthwith. Of course in the event of his so doing it would be open to the council to apply for a licence.

### ERRATA.

On page 543 *ante*, in reply to query by "C" ("Cleansing of Ditches near Highway"), lines 2 and 3, for "sewer" read "scour."

On page 528 *ante*, in reply to query by "Justitia" ("Officer's Compensation on Abolition of Office"), line 13, for "3/60ths" read "5/60ths"; in line 14, for "1/60th" read "3/60ths," and after line 14 add "for under five years' service 1/60th additional."

The Surveyor
And Municipal and County Engineer.

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## SOME PRINCIPLES IN THE VALUATION OF LAND AND BUILDINGS.*

By G. Taylor Loban.

In their last report to the council of the Surveyors' Institution, the examiners in valuation commented upon the character of the answers submitted by candidates in that subject at the annual examination. They drew attention to the fact that, as a rule, candidates had been well grounded in the use of valuation tables, but that many showed a lack of experience in making use of their knowledge. The circumstance thus disclosed in the examiner's report furnishes me with a text for the substance of this paper.

Candidates for the examinations usually take them early in life, and before they have had opportunity to acquire much experience by practice. If the examiners' object was (as I think it must have been) to emphasise a certain want of understanding of the principles, accompanied at the same time by a comparative facility in the use of the machinery, then the comment is a grave one and points to errors in the methods of training. A close examination of the matter is unnecessary here. There are, however, circumstances which lead me to suggest that part of the trouble originates in a very prevalent misconception (not confined to young valuers) as to the part played in valuation by purely arithmetical processes. Until the learner has had opportunities by practice of correcting the impression, it happens quite frequently that to him these arithmetical processes (that is, the correct use of the tables) *are* valuation. He learns that to take a freehold or leasehold rent, and to multiply it by a figure based on the 6, or the 7, or the 8 per cent table, does in fact determine the value of the property out of which the rent arises. This is a fundamental fallacy, and so long as it has possession of the valuer's mind, so long will he have difficulty in realising the true relation of the acts that go to make the entire valuation.

It rarely happens that any two transactions are alike in every particular. Some means are needed by which they may be cast into similar form, so that common features may be distinguished and observed. Such means and such a standard of comparison the machinery of the tables is found to furnish. Any result may be reduced by aid of them to a common denominator, of 3 per cent, 5 per cent, or 8 per cent, as the case may be. And when as a matter of observation it is found that transactions in certain classes of property always reduce to the neighbourhood of, say, 5 per cent, that percentage acquires the character of a quality of that class of property. In this way an effective and approximate guide may be obtained as to the view taken at a particular time of the worth and desirability of such-and-such a class of property—that is to say, the view taken by the minds most conversant with property and most competent to form judgment of it.

There is, however, another use to which the tables may be put. By their aid a discussion on value may be carried on, in terms of rental, deductions, and years' purchase, with an ease which would be quite impossible in the absence of this part of the valuer's machinery. Causes of difference may then be detected and so be reduced to issues of fact or of opinion. In fine, the most important functions of the tables are first to reduce to terms of common comparison the specific and individual operations of the general body of dealers; and, secondly, to furnish a medium for the convenient discussion of values.

### Essence of Valuation.

Few valuers can be found who would regard valuation as an art of exact application. Many hold it is impossible to value certainly within 5 per cent. The reason is obvious. Value is a thing continually fluctuating. On the one hand it depends on long-continued and gradually operating stresses of a political, social, or commercial nature. On the other hand, it is dependent on capricious and fitful influences that vary from day to day—fashion, some fortunate accident, an idle market, and so on.

This latter variability, arising one can only guess how, cannot be estimated or allowed for in relation to any individual result. No single instance of a particular price should ever be quoted as an indication of a market. The real indication, as everyone here knows well, is obtained by multiplying the number of transactions observed. Casual variability has then the opportunity to cancel out. It is only from observations that extend over a considerable period of time and include a considerable variety of circumstances that conclusions may be drawn which will safely indicate the trend or position of the market.

The essence of valuation—and I recognise that I am uttering a commonplace—is comparison. To place a property in the company of its likes and then to regard its individual distinctions in relation to them is the practical effort of every valuer. Usually the process presents only the ordinary difficulties of selection of the genus, and the further difficulties of the estimation of the special qualities or defects in that genus. There are, however, many cases which, as they stand, fit in no category where the properties must be reduced to their component parts, with the view of finding, if possible, proper categories for the comparison of these.

* Extracts from paper read at a meeting of the Surveyors' Institution held on Monday last.

## LOWER THAMES VALLEY DISTRICT SURVEYORS' ASSOCIATION.

The following are the arrangements for to-morrow's meeting of the above-named body at Chiswick:—

2.30 p.m.—Members will assemble outside Turnham Green Station (Bedford Park).

2.45 p.m.—Leave Turnham Green Station by motor-bus for Willesden.

3.10 p.m.—Arrive at the Metropolitan Electricity Supply Company's generating station, which will then be inspected by permission of the company. The inspection will be conducted by Mr. W. H. Chapman, the district superintendent.

3.40 p.m.—Leave the generating station and proceed to the Willesden Isolation Hospital.

3.55 p.m.—Arrive at isolation hospital, which will be inspected by permission of the Willesden Urban District Council and Dr. W. J. Stuart, the medical superintendent.

4.20 p.m.—Leave isolation hospital, drive through Willesden sewerage works, by kind permission of the Willesden Urban District Council and Mr. O. Claude Robson, M.Inst.C.E., to inspect automatic sewage discharge meter.

4.30 p.m.—Leave Willesden by motor for Brentford gasworks.

5 p.m.—Arrive Brentford gasworks, where light refreshments will be kindly provided by the company, after which the members will make a tour of inspection, conducted by Mr. Alex. Johnston.

6.45 p.m.—Leave Brentford gasworks and motor back to Chiswick, reaching the town hall at 7 o'clock.

7.15.—Dinner will be served.

# Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, assoc.m.inst.c.e.

*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

## THE MONTHLY PREMIUM.

Mr. A. G. Andrews, of Colchester, to whom the premium for March was awarded, has selected "A History of Architecture," by Fletcher (Batsford), and a copy of this book has been duly sent to him.

The premium for April is awarded to

Mr. G. Smith,
Borough Engineer's Office,
Town Hall,
Luton,

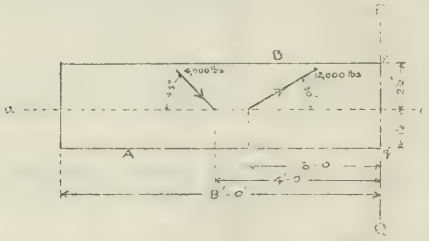
whose contributions have, in the opinion of the adjudicators, been the best received during the month.

## QUESTIONS.

This week answers are invited to the following questions:—

**238. Small Sewage Disposal Installation.**—Sketch and describe an installation consisting of a septic tank and filters for dealing with the soil sewage of about 750 persons, showing all the calculations for size of filters, &c. The filters are to be arranged so as to be capable of being enlarged if required. It is possible to have land treatment afterwards on about ¼ acre to ¾ acre of land. The effluent is to discharge into a ditch, and must be kept to a high standard. The scheme is not meant to be permanent, and is only required for a period of about six years, until sufficient assessable value is created to apply for a sewer loan to connect to a now existing sewerage system. ("Somerset.")

**239. Stresses in a Beam.**—A B is part of a beam, of which *p q* is a cross-section, cut by the plane P Q; *a a* is the axis of the beam. Forces of 4,000 lb. and




12,000 lb. act at the inclinations and distances shown. The moment of inertia of the section is 12-in. units, and its area is 4½ sq. in. Find the total compressive and tensile stresses in the section *p q*. (E. A. B., *Leicester.*)

**243. Water Supply.**—What kind of water acts upon lead? State the risk attendant upon its use and the means you would adopt for avoiding or reducing such risk. (M. C. E.)

**244. Illumination.**—The intensities of two sources of light are in the ratio 4:9. Find the ratio of the distances at which they must be placed from a screen, in order to produce on it the same intensity of illumination. ("Luminous.")

## REPLIES TO QUESTIONS.

**241. Strength of Materials.**—Show how to find the moment of inertia of a tee section. What use is made of the moment of inertia in finding the strength?

The moment of inertia of any section can be found graphically and numerically, and the following descriptions and calculations show how to find the moment of inertia both ways.

To make the descriptions clear, it may be better to give an explanation of the fundamental principles of moment of inertia.

The sum of the products of the mass of every particle of a body multiplied into the square of its distance from an assigned straight line is the moment of inertia of the body about that straight line. The straight line is usually termed the assigned axis.

If the assigned axis does not pass through the centre of gravity of the body, the moment of inertia is equal to the moment of inertia of the body about a parallel axis through the centre of gravity, together with the product of the mass of the body into the square of the distance between the axes.

Therefore the minimum value of the moment of inertia is obtained when the assigned axis passes through the centre of gravity of the body.

This axis is used for all practical purposes, and for the purpose of the following proofs:—

(1) To find the value of the moment of inertia numerically.

Let Fig. 1 represent the tee section, having the

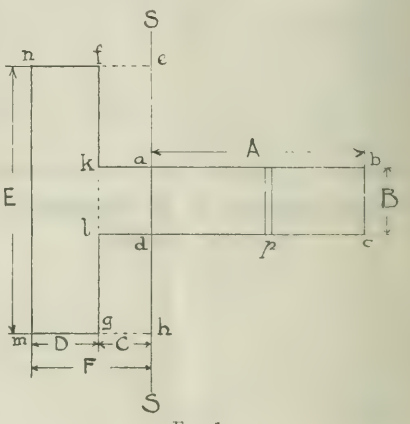



Fig. 1.

assigned axis S S passing through the centre of gravity.

Then the moment of inertia of the section is the sum of the moments of inertia of the rectangles *a b c d*, *a k l d*, and *f g m n*, about the assigned axis S S.

Then, considering rectangle *a b c d*.

Divide *a b* into *n* equal parts, and suppose straight lines drawn through the points of division parallel to S S. Thus *a b c d* will be divided into *n* equal strips, and of these let *p* be the *r*th strip from S S.

Let $M_A$ = mass of rectangle *a b c d*.

Then $\frac{M_A}{n}$ = mass of strip *p*.

Again, if *n* is very great, the distance of every point in strip *p* from axis S S may be taken to be $\frac{rA}{n}$.

Therefore, the moment of inertia of strip *p* about the assigned axis S S will be

$$\frac{M_A}{n} \times \left(\frac{rA}{n}\right)^2 = \frac{M_A \cdot A^2}{n^3} \times r^2$$

Therefore, the moment of inertia of whole rectangle *a b c d* equals the sum of such terms, and equals, when *n* is indefinitely great, the expression

$$\frac{M_A A^2}{n^3} \left(1^2 + 2^2 + 3^2 \ldots \text{to } n^2\right)$$

By algebra $1^2 + 2^2 + 3^2 \ldots \text{to } n^2 = \frac{n(n+1)(2n+1)}{6}$

∴ the expression equals

$$\frac{M_A A^2}{3}\left(1 + \frac{1}{n}\right)\left(1 + \frac{1}{2n}\right)$$

When *n* is indefinitely great $\frac{1}{n}$ = zero

∴ the expression becomes $\frac{M_A A^2}{3}$.

By the same method the moment of inertia of

rectangle $a\,k\,l\,d$ equals one-third the mass of rectangle ($M_c$) into the square of the distance ($c$) from assigned axis S S—*i.e.*, $\frac{M_c \times C^2}{3}$.

Further, let $M_h$ = mass of rectangle $e\,h\,m\,n$
and $M_m$ = mass of rectangle $e\,f\,g\,h$.

Then moment of inertia of rectangle $f\,g\,m\,n$ is equal to the moment of inertia of □ $e\,h\,m\,n$, decreased by the moment of inertia of □ $e\,f\,g\,h$—*i.e.*, equals $\frac{M_h F^2}{3} - \frac{M_m C^2}{3}$.

Thus we get moment of inertia of whole section equals the sum of the above expressions—

*i.e.* $= \frac{1}{3}\{M_A A^2 + M_c C^2 + M_h F^2 - M_m C^2\}$

Now $M_A = A \times B$, $M_c = B \times C$, $M_h = E \times F$ and $M_m = E \times C$.

Substituting we get

$$\frac{1}{3}\{A^2B + BC^2 + EF^2 - EC^2\}$$

$$= \frac{1}{3}\{A^2B + EF^2 - C^2(E + B)\}$$

This expression gives the numerical value for the moment of inertia of a tee section, and by substituting dimensions for any given section the moment of inertia can be found.

(2) To find the moment of inertia graphically.

Draw the given tee section as shown in Fig. 2, and

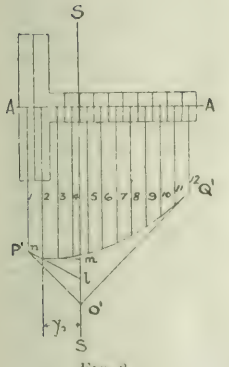



Fig. 2.

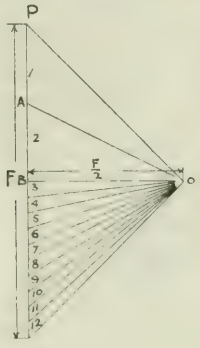



Fig. 3.

an axis A A, so that the area on each side is symmetrical.

Divide A A into a number of equal parts, the greater the number the more accurate will be the result.

Draw perpendicular lines through these parts, dividing the figure into layers of equal width.

Through the centre of gravity of each layer draw perpendicular force lines 1 to 12 in the Fig. 2. Then, on a line F parallel to these lines set out, to any convenient scale, lengths proportional to the area of each layer, making the total length F equal to the area of section. Make polar distance equal to half F, and then draw polar polygon O P Q.

Then from the perpendicular lines which pass through the centres of gravity of each layer respectively, draw lines parallel to the corresponding vector in the polar polygon forming the funicular polygon P' Q' O'. A line S S passing through the intersection of Q' O' and P' O' gives the neutral axis passing through the centre of gravity of the section.

Let I = moment of inertia.
F = area of section.
and $a$ = area of funicular polygon P' Q' O' formed as above.

Then $I = a\,F$.

This is demonstrated as follows:—

Where line 2 intersects polygon in $n$, continue the adjacent sides to cut line S S in $m$ and $l$. Let perpendicular distance from S S equal $Y_2$. Then from figures 2 and 3.

$$\frac{ml}{y_2} = \frac{AB}{OB}$$

But AB = force line 2 = $f2$,

and $OB = \frac{F}{2}$

$$\therefore \frac{ml}{y_2} = \frac{f2}{\frac{F}{2}} = \frac{2f_2}{F}$$

Dividing by 2 and multiplying by $y_2$ we get—

$$\frac{mly_2}{2} = \frac{f2\,(y_2)^2}{F}$$

That is to say, since $m\,l \times \frac{y_2}{2}$ equals area of triangle $m\,l\,n$, area of triangle $m\,l\,n = f2$ into the square of its distance from assigned axis S S, divided by the area of the section.

Again, since the funicular polygon is made up of such triangles as $m\,l\,n$, the area of the funicular polygons equals the sum of such expressions as

$$\frac{f2\,(y_2)^2}{F},$$

$$\text{or } a = \Sigma\,\frac{f2\,(y_2)^2}{F}$$

$$\therefore a\,F = \Sigma\, f2\,(y_2)^2.$$

But the moment of inertia equals $\Sigma\,(f\,y^2)$.

Therefore moment of inertia equals the area of funicular polygon into the area of the section—*i.e.*, $I = a\,F$.

This value may be readily ascertained. Practically in determining the strength of the section, the moment of inertia gives the value of the section in resisting stresses.

This is called the moment of resistance, and must equilibrate the bending moment developed.

The moment of resistance is made up of the modulus of section multiplied by the modulus of rupture, sometimes improperly termed the maximum fibre stress.

The modulus of section is equal to the moment of inertia divided by the distance from the neutral axis to the extreme fibres in tension or compression.

The modulus of rupture is a coefficient depending upon the breaking weight of the section, and usually taken as eighteen times the breaking weight of piece 12 in. long, 1 in. broad and 1 in. deep, when loaded in the centre and supported at the ends.

The modulus of section must be multiplied by the safe limiting stress to give safe moment of resistance of the section.

Let BM = bending moment,
R = modulus of rupture,
I = moment of inertia,
$f$ = safe limiting stress,
8 = distance from neutral axis to extreme fibres in tension or compression.

$$\text{Then BM} = \frac{R \times I \times f}{8}$$

(E. F. S. = B.)

## Notes.

We have received from the Warden of the Goldsmiths' College, New Cross, a prospectus of some very useful summer classes which are to be held in May and June this year. The subjects include practical carpentry, reinforced concrete, and land surveying. These classes, full particulars of which may be obtained on application to the college, should appeal to some of our readers, as the fees are low and the lectures are all given in the evening.

**Trackless Trolley Car Experiments.** — During the past few days the tramway officials of the London County Council have been experimenting with a trackless trolley car at Abbey Wood. In the course of the tests a speed of 40 miles an hour was attained.

**Southwark Bridge.**—There is to be no tramway over the new Southwark Bridge. The Bridge House Estates Committee of the City of London Corporation have informed the Highways Committee of the London County Council that neither the Parliamentary authority under which the reconstruction of the bridge was to be carried out, nor the dimensions of the altered bridge would permit of the construction of tramways.

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Aberavon T.C.** (April 30th. Mr. R. H. Bicknell).—£5,230 for works of water supply, including the laying of mains from Tyn-y-Waun reservoir to Pontrhydyfen, Cwmavon, and the council's reservoir at Ynys-y-gwas in connection with the scheme for obtaining a supply of water from the Neath Rural District Council's Ystradfellte waterworks.—Mr. M. Tennant, town clerk, said that £1,230 was for laying main extensions within the town, and £4,000 for bringing the mains from the Ystradfellte main at Tyn-y-Waun to Cwmavon reservoir. Mr. J. Roderick, surveyor, gave details of the scheme, and Mr. R. K. Green, Neath District Council assistant surveyor, supported the application.

**Barrowford (Lancs) U.D.C.** (April 17th. Mr. Edgar Dudley).—£350 for the purchase and enfranchisement of the property Nos. 151 and 153 Gisburn-road, Barrowford, for street improvements.—The clerk said the property it was proposed to acquire abutted on the main road from Nelson to Gisburn, and at the point of the proposed improvement, the width of the road, including the footpath, was at present only 28 ft. There had been previous enquiries respecting portions of the road which had been widened 260 yds. lower down and 38 yds. higher up than the point now under consideration. There was a double set of tramway rails immediately opposite the property it was desired to purchase.

**Bridge (Kent) R.D.C.** (April 23rd. Mr. H. Shelford Bidwell).—£1,000 for works of sewage at Harbledown.—The clerk, Mr. T. L. Collard, stated that the loan was to cover excessive expenditure on the last contract, which was for the extensions of the existing sewers in Harbledown parish. In October, 1908, the Local Government Board granted a loan for £2,551, but the inspector made suggestions which increased the cost. The contractors were Messrs. Adcock & Sons, who met with unexpected difficulties in the shape of water, which added materially to the cost of laying the sewer. Extra work had been carried out, and the excessive expenditure now stood at £921, to which were to be added several small items. They were not asking in this application for any money to pay legal expenses in the past actions which had been paid by the whole rural district. If the loan was not obtained the rural council would have to call upon Harbledown parish to pay the £1,000.

**Camborne U.D.C.** (April 18th. Mr. A. W. Brightmore).—£25,000 for works of sewerage, and £600 for the purchase of property at Crane for the extension of the recreation ground and the freehold of a stone depot.—Dr. R. W. Burnett, medical officer for the county, said there was urgent need for a sewerage scheme from a sanitary point of view. The district had an appalling infantile mortality, and he was certain the midden system was largely responsible for that death-rate.

**Clacton U.D.C.** (April 23rd. Major J. Stewart).—£2,210 for the paving of promenades on the cliff.—Mr. G. T. Lewin (clerk to the council) said it was proposed to pave with granolithic pavement the promenade at the top of the cliff, extending from St. Paul's-road on the east to Trafalgar-road on the west, with the exception of the intervening portion already tar-paved. The present gravelled paths were unsatisfactory, and cost a lot for upkeep. The advantages of the present scheme were: (*a*) Clean and level promenade during all weathers; (*b*) the efficient drainage of the path, avoiding the formation of puddles with their disintegrating effect on the cliff; (*c*) the cost of maintenance would be practically *nil*; (*d*) the preservation of the greensward.

**Epsom R.D.C.** (April 16th. Mr. F. O. Stanford and Dr. E. Petronelle Manby).—This was an inquiry into the application made by the council to borrow money for the purchase of land for the extension of the Cheam and Cuddington sewage disposal works.—The surveyor, Mr. W. T. Wooldridge, stated that at the present time the sewage came from four areas—*viz.*, a low-level area comprising Cheam Common and Worcester Park, from which the sewage had to be pumped when it reached the farm, a gravitation area from Cheam village, and another gravitation area from Belmont, and from twenty houses near the Nelson Inn. It was owing to the growth in the Belmont area that the scheme had been formulated. New roads had been laid out and houses built on the north and south sides of Cheam. The total population of the four areas was 7,090. The effluent had been analysed by the Port of London Authority, and no complaints had been made.

**Exeter T.C.** (April 30th. Major J. Stewart).—£9,520 for the purchase of Northernhay House, Rougemont and Castle-street buildings.—The town clerk, Mr. H. Lloyd Parry, explained that the intention was to utilise these grounds as an extension of the Northernhay pleasure grounds. The mayor said for many years it had been the wish of the citizens of Exeter that this property should belong to the city, and since the acquisition of the estate he had heard nothing but expressions of satisfaction.

**Guildford T.C.** (April 19th. Mr. F. O. Stanford).—£800 for widening and improvement of Woodbridge-road, and £3,748 for the refuse destructor and sewage works.—The town clerk (Mr. A. D. Jenkins), dealing first with the Woodbridge-road, said £612 was required for the acquisition of land and £188 for works. He asked for a sixty years' loan for the former and thirty years for the latter. The necessity for improving the road at Woodbridge had been before the council for eight or ten years, and in October, 1909, the county council undertook to widen the bridge at an estimated cost of £4,000, provided the town council agreed to provide the land required and settle any questions which might arise with tenants and owners owing to the raising of the level of the approach road. The town council agreed to the proposal, and the purchase of the necessary land was completed on March 4th. The borough surveyor, Mr. C. G. Mason, stated that quite recently the county council had altered their minds, and instead of widening the old brick bridge they were going to build a new bridge of ferro-concrete. With regard to the £3,748 loan, the town clerk explained that it was required to meet the excess expenditure on the destructor and sewage works. The excess expenditure was chiefly due to the fact that larger boilers had to be put in and a water softening plant installed. The borough surveyor explained in detail the causes of the various excesses.

**Harrogate T.C.** (April 23rd. Mr. F. H. Tulloch).—£5,000 for the laying-out of a portion of land at Stonefall, acquired by the council for cemetery purposes; £1,200 for addition at the Starbeck baths, and £2,137 in respect to the extension of the Royal baths.—The deputy town clerk, Mr. J. Wilkinson, asked for the £5,000 item to be increased to £5,500, the addition being for mineral rights acquired from the Duchy of Lancaster. The land acquired at Stonefall was 17 acres, but the present scheme only dealt with 5 acres, and the loan was required for excavating, draining, making roads, footpaths, &c. The loan for additions to Starbeck baths was next taken, and Mr. Wilkinson stated that the money was required for additional gentlemen's rooms, new dressing rooms, new entrance, ticket office, and suitable furnishing. At the present time the baths were not a financial success, and never had been. If they turned out to be a success the council would carry out similar improvements in connection with the ladies' department. The extension of the Royal baths was also dealt with.

**Leek U.D.C.** (April 26th. Mr. W. O. E. Meade-King).—£1,550 for erection of new offices, extension of coal store, pump-house, and new rotary-scrubber washer.—Evidence by the surveyor, Mr. W. E. Beacham, showed that it was intended to erect new offices on the site of the present one-storey building, consisting of general office, weighing-machine house, water-closet and lavatory on ground floor, and manager's office, laboratory and photometer-room on first floor. It is also intended to enlarge the coal store by 20,000 cub. ft., and to erect pump-house, with tank over, for the storing of ammoniacal liquor, at such a height as will allow it to gravitate from the works to the canal wharf, where it is disposed of by boats. The surveyor, Mr. W. E. Beacham, is the architect for the work. The gas manager, Mr. S. T. Smith, gave evidence as to the necessity for a new washer, and submitted plans and estimates.—There was no opposition.

**Scarborough T.C.** (April 24th. Mr. A. G. Drury).—£2,500 for the purpose of draining a portion of the undercliff of the South Cliff. £500 for works of drainage in Holbeck Gardens, and £677 for works of street improvement in St. Thomas-street.—There was no opposition.—The town clerk (Mr. Sydney Jones) in reply to the inspector, said the loans sanctioned, but not raised, were £21,850. The inspector: Has any of the work been done? The town clerk: Some work has

been done at Holbeck. The borough engineer (Mr. H. W. Smith) There has been no substantial work done. With reference to Holbeck Gardens Mr. Smith explained that there had been a very slight movement of the ground for some years past, and the extraordinary rainfall of last winter had hastened a slip which had taken place. A slip in the grounds was a common experience.

**Tunbridge Wells T.C.** (April 23rd. Mr. T. C. Ekin).—£15,000 and £90 for waterworks improvements, including the execution of works in Pembury and Speldhurst, and £6,000 in respect of the electricity works.—With respect to the loan for the electricity works, it was explained by the town clerk, Mr. W. C. Cripps, that the money was to be used for the extension of mains. As to the loan required for waterworks, the borough engineer, Mr. W. B. Maxwell, stated that 36,000 inhabitants were supplied, and the average daily supply per head was 21 gallons. Altogether, including the persons served with water outside the borough, the number of consumers was about 38,500. A portion of a bore well was produced by the borough engineer, who pointed out the corrosive effects of the water upon the iron. The inspector commented upon the extraordinary effect of the chalybeate water. In further reply to the inspector, Mr. Maxwell said there was always a large quantity of water in reserve to meet an emergency. Mr. Cripps said it was an interesting fact that the engines put in in 1868 were still working well.

### APPLICATIONS FOR LOANS.

**Birkenhead T.C.**—£1,750 for a site for a school.

**Brighouse T.C.**—£1,425 for works of road improvement.

**Forfar T.C.**—£360 for a shed at a school, and £500 for additions to the shambles.

**Smethwick T.C.**—£7,950 for laying granite setts.

**Stoke-on-Trent T.C.**—£20,000 for a central school of science and technology.

**Surrey C.C.**—£5,590 for a new school at New Malden West, and £3,695 for a school at Woking.

### LOANS SANCTIONED.

**Bromley T.C.**—£1,068 for street works.

**Carrick-on-Suir U.D.C.**—£9,000 for a water supply scheme.

**Chorley T.C.**—£1,588 for street improvement works.

**Darwen T.C.**—£1,000 for street improvement work.

**Essex C.C.**—£2,800 for a special instruction centre at Grays.

**Harrogate T.C.**—£1,572 for a tar-macadam plant and light roller.

**Hull T.C.**—£16,500 for the provision of stabling and depots.

**Luton T.C.**—£12,744 for public baths.

**Middlesbrough T.C.**—£3,587 for street works.

**West Ham T.C.**—£18,500 for buildings for the electricity undertaking, £6,100 for river service pipework, £6,000 for mains, £15,120 for generating plant and switch gear, £3,050 for steamers, condenser and boiler-houses plant, and £8,380 for street lighting, coal bunkers and coal conveyor.

### FORTHCOMING INQUIRIES.

| MAY. | £ |
|---|---|
| 6.—**Basingstoke.** For works of street improvement (Mr. W. O. E. Meade-King) ... ... | 3,300 |
| 6.—**Chelmsford.** For fire station purposes (Mr. A. A. G. Male') ... ... ... ... | 200 |
| 7.—**Auckland.** For hospital extension purposes (Mr. R. A. Farrar) ... | 6,600 |
| 7.—**Beckenham.** For street and recreation ground purposes (Mr. R. H. Bicknell) | 9,280 |
| 7.—**Blackpool.** For the construction of parade works (Mr. P. M. Crosthwaite) ... ... | 18,200 |
| 7.—**Conway.** For gasworks and water mains extensions (Mr. F. H. Tulloch) ... ... | 3,200 |
| 7.—**Hastings.** For the construction of new roads (Mr. Edgar Dudley) ... ... ... | 10,000 |
| 7.—**Hayes.** For the provision of workmen's dwellings (Mr. Edward Leonard) ... ... | 8,925 |
| 7.—**Southampton.** For works of sewerage (Mr. W. O. E. Meade-King) | 660 |
| 8.—**Billericay.** For the provision of workmen's dwellings (Mr. Edward Leonard) | 982 |
| 8.—**Bournemouth.** For sewerage and cliff improvement purposes (Mr. W. O. E. Meade-King) ... ... ... ... ... ... | 1,680 |
| 8.—**Colwyn Bay.** For street widening works (Mr. F. H. Tulloch) ... ... ... ... | 1,050 |
| 8.—**Hounslow.** For the provision of electricity plant (Mr. H. R. Hooper) ... ... ... | 5,000 |
| 8.—**Rhyl.** For sewage disposal purposes (Mr. P. M. Crosthwaite) ... ... ... ... | 6,645 |
| 9.—**Crowland.** For the erection of workmen's dwellings (Mr. Edward Leonard) ... ... | 1,800 |
| 9.—**Creetland.** For the provision of a municipal building (Mr. M. K. North) ... ... | 250 |
| 9.—**Holywell.** For the provision of a burial ground (Mr. F. H. Tulloch) ... ... | 650 |
| 9.—**Poole.** For pleasure ground, market, and sanitary purposes (Mr. W. O. E. Meade-King) ... ... ... ... ... ... | 1,600 |
| 9.—**Southampton.** For the provision of a tuberculosis dispensary (Dr. S. W. Wheaton) ... ... ... ... ... | 750 |
| 10.—**Thornton.** For street improvement works (Mr. M. K. North) ... ... ... ... | 2,228 |
| 10.—**Tyldesley.** For fire station and depot purposes (Mr. F. H. Tulloch) ... ... | 2,875 |
| 13.—**South Shields.** For works of paving (Mr. R. H. Bicknell) ... ... ... ... | 6,655 |
| 14.—**Jarrow.** For laying out playing fields (Mr. R. H. Bicknell) ... ... ... ... | 2,150 |
| 15.—**Stanley.** For the provision of a burial ground (Mr. R. H. Bicknell) ... ... | 11,500 |
| 16.—**Northampton.** For water mains extensions (Mr. M. K. North) ... ... ... | 2,000 |

## INSTITUTION OF CIVIL ENGINEERS.

### NEW PRESIDENT OF COUNCIL.

At the annual general meeting of the Institution of Civil Engineers, held on Tuesday last, the result of the ballot for the election of officers was declared as follows: president, Mr. Robert Elliott-Cooper (London); vice-presidents: Mr. Anthony George Lyster, M.ENG. (Liverpool), Mr. Benjamin Hall Blyth, M.A. (Edinburgh), Mr. John Strain (Glasgow), Mr. George Robert Jebb (Birmingham); other members of council: Mr. John A. F. Aspinall, M.ENG. (Liverpool), Mr. John A. Brodie, M.ENG. (Liverpool), Mr. William B. Bryan (London), Colonel R. E. B. Crompton, C.B. (London), Mr. J. M. Dobson (London), Sir Frederick H. Donaldson, K.C.B. (London), Mr. E. B. Ellington (London), Mr. W. H. Ellis (Sheffield), Mr. W. Ferguson, M.A., B.A.I. (Australasia), Sir Maurice Fitzmaurice, C.M.G. (London), Sir John Purser Griffith (Ireland), Mr. C. A. Harrison, D.SC (Newcastle-on-Tyne), Mr. Walter Hunter (London), Mr. Harry E. Jones (London), Mr. E. H. Keating (Canada), Sir Thomas Matthews (London), Mr. W. H. Maw, LL.D. (London), Mr. C. L. Morgan (London), Mr. Basil Mott (London), Hon. Sir Charles Parsons, K.C.B. (Wylam-on-Tyne), Mr. F. E. Robertson, C.I.E. (London), Mr. Alexander Ross (London), Hon. Sir Francis J. E. Spring, K.C.I.E. (India), Mr. A. M. Tippett (South Africa), Sir Philip Watts, K.C.B. (London), Mr. W. B. Worthington (Derby). This council will take office on the first Tuesday in November, 1912.

The council of the institution have made the following awards for papers read during the session 1911-12: Telford Gold Medals to Messrs. Ernest and Walter Mansergh (London); a George Stephenson Gold Medal to Mr. Roger T. Smith (London); a Watt Gold Medal to Mr. A. H. Roberts (Leith); Telford Premiums to Messrs. John Goodman (Leeds), A. B. McDonald (Glasgow), G. Midgley Taylor (London), D. C. Leitch (London), W. C. Easton (Glasgow), and D. H. Morton (Glasgow); and the Manby Premium to Mr. S. H. Ellis (Liverpool).

The award for papers published in the "Proceedings" without discussion and for students' papers will be announced later.

**Shorland's Manchester Crates.**—Messrs. E. H. Shorland & Brother, Limited, of Failsworth, Manchester, have just supplied their patent warm-air ventilating "Manchester" grates to the rural district council offices, Durham.

# Municipal Work in Progress and Projected.

*The Editor invites the co-operation of* Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are the more important projected works of which particulars appear below: Buildings—Glasgow £21,654, Herne Bay £5,000, Notts £5,450, Sunderland £6,000; housing and town planning—Birmingham, Northwich; roads and materials—Notts; sewerage and sewage disposal -Enfield, Halifax; water, gas and electricity—Derby £10,750, Ludlow £1,300.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

## ADMINISTRATION.

**Leeds T.C.**—The Parks Committee are proposing to make alterations in the wages and conditions of employment of workmen in the parks and cemeteries, but not to make any in regard to pay for overtime work. Minimum wages are to be as follows: For head gardeners, 28s. a week, with house and light free, as at present; for gardeners and foremen, 6½d. per hour; for gravediggers, 6½d. per hour; for horsemen, 25s. per week and 1s. extra for Sunday duty. To pay 4s. 6d. each to all men who are required to carry out rangers' duties on Saturday afternoons and Sundays, and walking time to be allowed at the discretion of the superintendent.

## BUILDINGS.

**Aberdeen T.C.**—The extension of the fish market and the covering in of a portion of Albert Quay are under consideration.

**Aberystwyth T.C.**—The borough surveyor, Mr. R. Jones, has prepared the plan of a shelter, 9 ft. long, to be erected on the Harbour breakwater, at a cost of £50.

**Cumberland C.C.**—With respect to the condition of Portinscale Bridge it has been agreed that the structure shall be kept up during this summer in a condition capable of carrying the required traffic, and that the Highways Committee should be authorised to spend whatever money is necessary for that purpose.

**Dublin T.C.**—The Improvements Committee has been asked to give attention to the dangerous condition of Annesley Bridge.

**Glasgow T.C.**—Tenders amounting to £21,654 have been accepted for works in connection with the new municipal buildings in Trongate.

**Haddingtonshire C.C.**—It has been referred to a subcommittee to adjust details of a scheme adopted by the Eastern District Committee for the erection of three new bridges over the rivers Whitadder and Bothwell. In regard to two of the bridges, the scheme is being gone into in conjunction with the Middle District of Berwickshire County Council, while Haddingtonshire district will have to bear the whole cost of the third bridge, which will span the Whitadder at Millknowe. By the provision of these bridges several fords, which in time of flood were rendered impassable, will be avoided, and a much shorter route between the two counties will be available.

**Herne Bay U.D.C.**—A scheme is being promoted for the extension of the East Cliff pavilion, at an estimated cost of £5,000.

**Hetton (Durham) U.D.C.**—Plans have been approved for alterations at the hospital, at an estimated cost of £392.

**Marylebone B.C.**—Inquiry is being made of the Regent's Canal Company as to whether arrangements can be made to provide a new convenience on the company's land beyond the wall bounding the footway in Grove-road.

**Notts C.C.**—The tender of Messrs. Bosworth & Lowe, Nottingham, has been accepted for the erection of the East Retford Secondary School for girls, and the tender of Mr. Thomas Bow, Nottingham, at £3,966, for the erection of a new school for 300 junior mixed and infant children on the Mapperley Plains-road at Gedling.—The proposed new school in Exchange-road, West Bridgford, for 420 children, is estimated to cost £5,450.

**Pembroke (Co. Dublin) U.D.C.**—The council have confirmed the resolution to purchase Merrion Pier and baths and portion of the seashore, consisting of about 16 acres, for recreation purposes.

**Sunderland R.D.C.**—The administrative block at the hospital is to be enlarged, and a new laundry erected, at a cost of £6,000.

## HOUSING AND TOWN PLANNING.

**Birmingham T.C.**—From a report presented to the council this week it appears that the town-planning scheme for the Harborne and Quinton area has taken a definite shape. The area affected is that which lies to the south of Beech-lanes between the Lordswood-road and Quinton, and extending towards Bristol-road, although not reaching so far. Its lower point is at the Harborne Mill reservoir. It is proposed to reserve the area for a residential and non-manufacturing district, with an average of twelve houses to the acre, except in certain small patches, where twenty per acre will be permitted. The chief cost of road-making will fall upon the property owners, but, inasmuch as certain main roads are required to be much wider than they would otherwise have been planned, the corporation will have to make a contribution, which, including the cost of preparing the scheme, is estimated at £109,840. About £9,725 of this is proposed to be spent at the outset, and it will enable a section of the main road 100 ft. wide to be constructed between Lordswood-road and Court Oak-road.

**Chelmsford T.C.**—Notice of approval of the Rainsford-lane housing scheme has been received from the Local Government Board.

**Northwich U.D.C.**—It has been agreed to provide twenty-four workmen's dwellings, at £170 per house, inclusive of the price of the land.

**Shrewsbury T.C.**—A report of the Housing Committee, recommending the provision of sixty-two workmen's houses, at an estimated cost of £10,700, has been adopted. The rents will vary from 3s. 9d. to 4s. 6d. per week.

## PARKS AND OPEN SPACES.

**Midsomer Norton (Somerset) U.D.C.**—The surveyor, Mr. C. H. Sunderland, has prepared a scheme for the improvement and laying out of the new recreation ground.

## REFUSE COLLECTION AND DISPOSAL.

**Helston T.C.** The scavenging is to be continued under present conditions, the borough surveyor, Mr. W. J. Winn, having reported that to let the work by tender would cost at least £75 more per annum.

**Melford R.D.C.**—The committee appointed to consider the question of the disposal of refuse at Long Melford recommended the collection of refuse twice weekly and the emptying of cesspits when necessary. They also recommended the collection of domestic and household refuse (but no trade refuse) monthly, and these proposals have been approved by the council.

**Stepney B.C.**—The council last year realised £1,068 from trade refuse and £364 from old tins, &c.

## ROADS AND MATERIALS.

**Banff C.C.**—The Keith District Committee has decided to accept the grant of £600 on the terms offered by the Road Board for road improvement purposes.

**Cardiff T.C.**—The tender of Mr. C. Davies, Grangetown, at £2,378, has been accepted for street improvement works at Roath.

**Derby T.C.**—In order to cope with the dust nuisance the corporation are again using Akonia, this being the fourth year Akonia has been used in the district.

**Easthampstead R.D.C.**—The Highways Committee are considering the question of the purchase of a steam roller.

**Hornsey T.C.**—It has been decided to make an exhaustive test of Akonia as a dust preventer, and two of the main thoroughfares are now under treatment with this preparation.

**Kingston (Surrey) T.C.** Last week there was considered a proposal to expend about £200 on the extension to the footways of the channels existing under the tramways, to avoid having to open the roads for cables required in the future. The electrical engineer, Mr. J. E. Edgcome, stated that in his experi-

ence wood pavement could not be taken up and relaid so as to look anything like as well as it did before. The surveyor, Mr. A. H. Clucas, said, however, that the laying of wood paving had now got to such a pitch that one could hardly detect where an opening had been made. The excavation for the wood paving was only about 10½ in., whereas for the ducts it would be necessary to go down 2 ft. 6 in. to 3 ft., and it was a question whether it would not be cheaper to wait until the necessity arose and then make the openings in the wood paving, instead of providing the money for the work at the present time. Finally the amendment, that the suggestion to do the work now be referred back, was defeated.

**Melton Mowbray R.D.C.**—It is proposed to make a roadway 15 ft. wide from Saxelbye to Nether Broughton at an estimated cost of £180. The surveyor, Mr. E. C. Moorhouse, reports that several unemployed men had been engaged for about three weeks in taking off the sides of roads at Asfordby, and a great improvement had been effected. The cost of the work, over £60, including the carting of the soil, was borne privately.

**Notts C.C.**—The Highways, Bridges, and County Bridges Committee estimate that their expenditure on main roads during the year will be £46,764, towards which the estimated repayments from various sources are £2,700. Mr. H. Denison, at a meeting of the council on Tuesday last, pointed out that there was a very considerable increase in the estimates for roads. There had been a feeling that the roads had been neglected, and that the committee had been too economical. Exclusive of the Fosse-road grant they had obtained £6,500 from the Road Board, but in order to get that they had to spend a certain amount themselves. Supposing they placed Tarmac on a road instead of slag, and that the difference was £100, the Road Board would give them £75. Up to now they had only been able to put down 7 miles of Tarmac road a year. So far they had done 48 miles out of 322. That was much too slow progress, but with the assistance of the Road Board they would be able to put down 19 or 20 miles this and succeeding years if similar grants were obtained. It was certainly economical in the end to put down Tarmac, because it was not cut up so soon by traction engines after frost, and it stood rapid traffic.

**Westminster B.C.**—In order to provide a new artery for the traffic in the Regent-street and Oxford-street neighbourhood, where the congestion is often acute, £125,000 is to be spent by the Westminster Council. Argyll-place, which is almost parallel to Oxford-street, is to be made as wide as Great Marlborough-street, into which it runs from near the top of Regent-street, and at the end of Great Marlborough-street the houses immediately facing in Poland-street are to be demolished, so that traffic will be able to pass directly down Noel-street into Wardour-street. This means taking a slice off the south side of Argyll-place to a depth of 25 ft. for a length of 270 ft.

**Yiewsley (Middlesex) U.D.C.**—The surveyor, Mr. John Lewis, in the course of his first annual report to the council, states that in connection with the highways the question will shortly arise as to the advisability or otherwise of procuring a water cart for use on the various roads, as gravel roads are exceedingly dusty in dry weather, no tar-spraying having yet been carried out by this council. It would, he thought, be a wise plan to consider, when a road has to be entirely recased, if it would not be more economical to substitute tarred material in lieu of the ordinary gravel. Twenty-two roads are maintained by the council, and the surveyor suggests that the Streets and Works Committee consider and recommend for such treatment certain roads each year with tarred material, or surface spraying with tar might be tried, provided the road crust is in good condition at the time of the treatment. Tar-spraying, he points out, undoubtedly improves and preserves such roads, and fulfils its principal function—that of dust abatement. The treatment itself costs about £40 per mile, so that, while the result is a better road, the total cost of maintenance is not much reduced.

## SEWERAGE AND SEWAGE DISPOSAL.

**Enfield U.D.C.**—An important question awaiting the consideration of the council is the Lee Valley drainage scheme, to which Enfield is committed in common with four local authorities. Details of this work have not become public property, except a statement to the effect that the construction of the main sewer will cost something like £245,000. This is merely a provisional figure; but it is sufficient to indicate that Enfield, Edmonton, Southgate, Leyton and Walthamstow are committed to a heavy expenditure as the price of ridding the valley of the sewage disposal works.

**Halifax T.C.**—Consideration is being given to proposals for sewage disposal schemes at Bradshaw and Mixenden.

## WATER, GAS, AND ELECTRICITY.

**Bala U.D.C.**—The necessary official authorisation has been received for the purchase of the local gasworks by the council.

**Bridlington T.C.**—The tender of Messrs. Ledward & Beckett, Limited, of Westminster, at £1,425, has been accepted for the extension of the condenser at the electricity works.

**Derby T.C.**—An expenditure of £10,750 on the electricity undertaking is recommended by the Electricity Committee.

**Halifax T.C.**—The tender of the Worthington Pump Co., Limited, at £3,054, has been accepted for a Worthington condenser and pump, and that of the British Thomson-Houston Co., Limited, at £6,633, for a turbo-alternator.

**Ludlow R.D.C.**—A water supply scheme, estimated to cost £1,300, is under consideration.

**Mansfield T.C.**—It was reported at the council meeting last week that the Gas Committee expected to be able to make a contribution of £1,500 from the profits of the gas undertaking towards the general district rate. It was also proposed to hand over £600 to the relief of the rates from the profits of the electricity undertaking, in addition to placing a substantial balance to the reserve fund.

**Newton Abbot (Devon) R.D.C.**—It has been decided to purchase an oil engine to replace the windmill used for pumping the water into the Ogwell reservoir.

**Okehampton R.D.C.**—A scheme for a water supply for Chagford has emanated from the parish council. The estimated cost is £550. The council on Saturday last adopted a resolution urging on the Local Government Board the necessity of rural authorities being invested with compulsory powers to acquire land for water supplies.

**St. Pancras B.C.**—The Lighting Committee recommend that the chief electrical engineer be authorised to prepare the necessary specifications for further extending the electricity generating and transforming plant. The estimated cost of the proposals of the chief electrical engineer is as follows: Two 1,000 k.w. transforming sets for the Tavistock-place sub-station and the King's-road generating station, £4,800; one 5,000 k.w. turbo set fixed complete with special foundations, £14,200.

**York T.C.**—The tender of Messrs. Babcock & Wilcox, at £5,200, has been accepted for extensions to the boiler-house plant at the electricity generating station.

## MISCELLANEOUS.

**Reading T.C.**—The tender of Messrs. George S. Lewis & Brother, Reading, at £225, has been accepted for works at the bathing-place adjoining Timsbury House, Tilehurst-road, and that of Messrs. Thomas Bradford & Co., of Holborn, at £123, for the supply and fixing of the heating apparatus.

# PERSONAL.

Mr. George Henry Hopkinson has been appointed borough surveyor of Chorley at a salary of £200.

Mr. J. W. Leebody, surveyor to the Tyrone County Council, has had his salary increased by £25 per annum.

Mr. William Clark, burgh surveyor of Tayport, has been appointed to the additional office of sanitary inspector.

Mr. R. A. Thomas, surveyor to the Holywell Urban District Council, has had his salary increased to £130 per annum.

Mr. G. J. Wooldridge, surveyor to the Woking Urban District Council, has been appointed engineer for the carrying out of the Hook Heath drainage scheme.

Mr. F. Wilkinson, engineer and surveyor to the Prestatyn Urban District Council, has, we regret to

state, been suffering from serious indisposition, but his condition is improving.

Mr. P. A. Watford, sanitary surveyor to the Southwell Rural District Council, has been appointed surveyor and inspector to the Claypole Rural District Council at a salary of £180.

Mr. Albert J. Rousell, surveyor to the Whitley and Monkseaton Urban District Council, has been presented by the councillors and officials with a rose bowl on the occasion of his marriage.

Mr. R. A. Webb, assistant surveyor to the East and West Molesey Urban District Council, who has taken up a position in Southern Nigeria (as announced in last week's SURVEYOR), was on Friday last presented with an illuminated address, together with a cheque subscribed by the members of the Molesey staff and several prominent tradespeople. Other presentations were made, including a silver-mounted pipe, tobacco pouch, and a cigarette case and holder, on behalf of the council staff; while he was also made the recipient of a camera by Mr. J. Stevenson, the surveyor.

Mr. C. W. Best, county surveyor of Breconshire, has had the terms of his appointment altered as follows: (1) That the county surveyor shall be a whole-time officer; (2) that the charge of all county bridges and bridge approaches shall remain under the county surveyor; (3) that the present method of paying the county surveyor partly by commission be discontinued; (4) that the salary of the county surveyor, including his assistants, shall be £500 per annum, with reasonable authorised expenses when away from home; the Finance Committee to prepare a scale of allowances for expenses and submit the same for the approval of the council.

A statement having been published that no provision has been made for the appointment of properly qualified assessors in connection with the competitive designs for the new capital of the Commonwealth of Australia, Sir George Reid, representative of the Commonwealth in this country, writes to say that the following gentlemen have been appointed in that capacity: Mr. J. M. Coane (consulting engineer and surveyor in Melbourne), chairman, Mr. J. H. Smith (president of the Victorian Institute of Civil Engineers), and Mr. John Kirkpatrick (a Sydney architect). The secretary is Mr. C. J. Clarke.

## TESTING OF BITUMINOUS ROAD MATERIALS.

### FURTHER WORK WITH THE CONSISTOMETER.

By W. W. CROSBY,

Chief Engineer to the Maryland State Roads Commission.

From a study of the differences in the readings obtained from using "Plunger No. 6" and "Plunger No. 6 Special" in the consistometer,* it occurred to the writer that unquestionably the readings were considerably affected by material adhering to the side surfaces of the plungers. This appeared to be shown in the table referred to, and it seemed would perhaps occur unevenly with materials of varying degrees of stickiness, but not perceptibly differing in consistency or other respects. Therefore the writer prepared a set of plungers or pistons identical in all respects with those described in the original paper, except that the upper faces or backs of the heads were ground down so that the circumferences of the piston or plunger heads were all "knife-edge."

Determinations were then made with both kinds of plungers on a sticky material (tar) and a relatively non-sticky or "cheesy" one (reduced petroleum). In each case two grades of the material had to be provided to allow the use of all the plungers, the separation in grades being between plungers 8 and 9.

The results obtained were as shown on the accompanying table [see opposite page].

It will be noted that the knife-edged plungers gave higher readings in every case. The writer believes their greater sensitiveness is sufficiently proved, and that the knife-edged plungers are more desirable for ordinary work.

Further, examination of the table will show that, apparently, the differences between the readings of the two kinds of plungers were proportionately greater in the determinations made on the "sticky" materials than in those on the "cheesy" or "oily" ones, and that the instrument is thus proved to be capable of differentiating between such materials to a certain extent at least.

The writer hopes to be able to offer in the near future some further results of work along this same line and in connection with the suggestion made in his earlier paper that perhaps the "time" or "time-load" for an assumed "penetration" would better be the determination to be made rather than the penetration with an assumed time or time-load.

* A description of this apparatus appeared in our issue of October 20, 1911.—Ed SURVEYOR.

FOR OTHER ADVERTISEMENTS
See End of Paper.

WARWICKSHIRE COUNTY COUNCIL.
APPOINTMENT OF INSPECTOR OF MAIN ROADS.

The Council invites applications for the appointment of a Road Surveyor to act as Inspector of Main Roads for the Eastern Division of the County, to take charge (under the superintendence of the County Surveyor) of about 108 miles of Main Roads.

Applicants must be between the ages of 25 and 40, and must have had practical experience in all the duties of a Road Surveyor, including the use of tarred macadam, surface tarring, pitch grouting and all modern methods of road repair. Applications from persons who have not had this experience cannot be considered.

The commencing salary is £175 per annum, rising by annual increments of £5 to a maximum of £210, and is to cover travelling and all other expenses except stationery and postages. A suitable office will be provided, and also a Clerk to assist the Inspector in his clerical duties. The Council will also provide a Motor Bicycle for the use of the Inspector, but all expenses connected with the running and repairs of the same are to be borne by the Inspector.

The Inspector must enter on his duties not later than 24th June next, and must reside at a place in the District to be approved by the County Surveyor.

Forms of application and particulars of duties and terms of appointment may be obtained at my Office, but will only be forwarded through the post on receipt of a stamped and addressed foolscap envelope.

Applications, accompanied by copies of not more than three recent testimonials, which will not be returned, to be made on the official Form, must reach me not later than the 16th day of May, 1912.

Canvassing in any form will be a disqualification.

JOHN WILLMOT,
County Surveyor.

6 Waterloo-street, Birmingham.

SOUTHWELL RURAL DISTRICT COUNCIL.
INSPECTOR OF NUISANCES AND SURVEYOR.

The above Council invite applications from persons between the ages of 25 and 40 for the appointment of Inspector of Nuisances and Surveyor (for all purposes except Highways) for the Southern Division of the Rural District, comprising 53,208 acres, with a population (1911) of 11,279.

Salary £120 per annum.

The person appointed will be required to perform all the duties relating to the Office of Inspector of Nuisances defined by the Sanitary Officers' (outside London) Order, 1910, make Inspections, and keep Records under the Housing (Inspection of District) Regulations, 1910, and to perform such other duties as the Local Government Board or Council may from time to time direct. He must reside in the District, and devote the whole of his time to the duties, and will be required to give security in the sum of £100 through an approved Guarantee Society.

The appointment is subject to the approval of the Local Government Board.

Applications, in candidate's own handwriting, stating age, qualifications, and present occupation, with copies of not more than three recent testimonials, must reach me by Tuesday, the 14th day of May inst.

(By order of the Council)

JOHN ELLIS,
Clerk.

Southwell.
May 1, 1912.

MUNICIPAL TECHNICAL INSTITUTE,
Romford-road, West Ham, E.

A short course of Lectures by Mr. W. T. Creswell, F.S.I., &c., will be given during May and June at the above Institute on Sanitary Science and also on Reinforced Concrete Construction.—For further particulars apply to the Principal.

## CONSISTOMETER TESTS OF BITUMINOUS ROAD MATERIALS: PENETRATION READINGS.

*Temperatures = 25 deg. Cent.*

| Loads (grammes). | Plunger No. 4. | | | | Plunger No. 5. | | | | Plunger No. 6. | | | | Plunger No. 7. | | | | Plunger No. 8. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Tar. | | Oil. | | Tar. | | Oil. | | Tar | | Oil | | Tar. | | Oil. | | Tar. | | Oil. | |
| | Knife edge. | Square edge. | Knife edge | Square edge | Knife edge. | Square edge. | Knife edge. | Square edge. | Knife edge. | Square edge. | Knife edge. | Square edge. | Knife edge. | Square edge. | Knife edge. | Square edge. | Knife edge. | Square edge. | Knife edge | Square edge. |
| 5 | 66 | 58 | 41 | 38 | 55 | 50 | 37 | 33 | 40 | 28 | 24 | 18 | 28 | 17 | 21 | 15 | 13 | 10 | 10 | 6 |
| 10 | 122 | 111 | 85 | 85 | 106 | 92 | 77 | 73 | 87 | 60 | 49 | 45 | — | — | — | — | — | — | — | — |
| 15 | 165 | 150 | 110 | 110 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 20 | — | — | — | — | 186 | 160 | 156 | 136 | 152 | 120 | 104 | 100 | 112 | 87 | 101 | 81 | — | — | — | — |
| 30 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 110 | 86 | 78 | 65 |
| 50 | — | — | — | — | — | — | — | — | — | — | — | — | 193 | 175 | 189 | 152 | — | — | — | — |
| 60 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 161 | 135 | 141 | 107 |

| Loads (grammes). | Plunger No. 9. | | | | Plunger No. 10. | | | | Plunger No. 11. | | | | Loads (grammes). | Plunger No. 12 special). | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Tar. | | Oil. | | Tar. | | Oil. | | Tar. | | Oil. | | | Tar. | | Oil. | |
| | Knife edge. | Square edge. | Knife edge. | Square edge. | Knife edge. | Square edge. | Knife edge. | Square edge. | Knife edge. | Square edge. | Knife edge. | Square edge. | | Knife edge. | Square edge. | Knife edge. | Square edge. |
| 0·3 | 78 | 47 | 17 | 10 | — | — | — | — | — | — | | | 1 | 40 | 22 | — | — |
| 0·5 | 125 | 82 | 24 | 16 | 78 | 62 | 15 | 10 | 75 | 51 | | | 3 | 121 | 81 | | |
| 0·7 | 161 | 121 | 31 | 22 | 104 | 83 | 20 | 13 | | | | | 5 | 185 | 139 | 29 | 15 |
| 0·9 | — | — | — | — | 126 | 111 | 25 | 19 | — | | — | | 6 | 198 | 166 | 32 | 18 |
| 1·0 | — | — | — | | — | | — | | 127 | 90 | 19 | 9 | — | — | | — | |
| 1·5 | — | — | | | | | | | 161 | 135 | 25 | 12 | — | — | | | |

## THE SEWERAGE OF CLEVELAND, OHIO.

### DETAILS OF CONSTRUCTION.

An article in the *Engineering News* of New York, written by Mr. J. M. Estep, describes work which is now under construction at Cleveland, Ohio, where new intercepting sewers are being built to divert the sewage from the rivers and from the lake front and to convey it to a point of discharge about 8 miles distant from the city waterworks intake. Some of the sewers are of reinforced concrete lined with brick, and part are of brick alone.

The system is designed to meet the requirements of a population of 1,000,000 inhabitants, on a basis of 54 cub. ft. of liquid per head per day, of which half is taken to be foul sewage and the rest as storm water. Water in excess of this quantity will find an outlet at the storm overflows. A density of population of twenty persons per acre was assumed for lands outside the city, and of thirty per acre within the city limits, and of 320 per acre in the congested district.

The outfall sewer is carried into Lake Erie, a distance of ½ mile from the shore. This pipe is at present only large enough to deal with 40 per cent of the estimated flow to the whole system when complete, but it is large enough for present service. Eventually other outlet pipes will have to be laid. These will have to be carried out as far or further than the present outfall sewer. The outlet sewer is made of riveted-steel boiler plate, dipped in a preservative coating. It is made up in 50-ft. lengths, with a heavy angle-iron flange riveted at each end. The joints were made by bolting the flanges together with lead gaskets between. Lengths of 150 ft. were thus jointed, and having been bulkheaded at the ends, these 63-in. diameter pipes were floated into position, allowed to fill slowly, and to settle into place in a trench made to receive them on the lake bottom. The sunk lengths were then connected by means of a special submarine joint by divers. The outlet end of the pipe is protected by a caisson surrounded by broken stone.

The main interceptor sewer has a gradient of 2 ft. per mile. It is 13 ft. 6in. diameter at its outlet, and has a capacity of about 640 cub. ft. per second. The sewage, before passing into the submerged steel outlet sewer, flows through a basin 100 ft. long by 60 ft. wide by 18 ft. deep. It is screened before it enters this basin and before it leaves it. This basin was at first open to the air, but, proving to be a nuisance, it has been roofed in.

The main interceptor sewer has a reinforced concrete arch, but the part below the arch springing is of plain concrete. A length of about 14,600 ft. run of this sewer was made in open cut, at a depth of about 40 ft. in clay and quick-sand. Apparently this method of construction proved to be difficult and costly, and it was found cheaper and simpler to tunnel. The cost of the work in open cutting was £16 13s. 11d. per foot run. The tunnelling work was first started in order to avoid damage to buildings which would have been likely to occur with an open cutting, but it was found to be so much easier and cheaper to tunnel that the earlier method was abandoned. It is difficult to understand from the information given why it should have been considered necessary to do any part of the deep work in open cutting, it being a matter of general experience that deep, open cuttings are more expensive than tunnels. The inside diameter of the tunnel was 13 ft. 6 in., and the outside diameter 16 ft. 6 in. It was lined with four rings of shale brick, laid in Portland cement mortar. A hydraulic shield was used which was operated by twelve hydraulic jacks. The jacks pressed against the outer rings of the masonry, and did no damage except at the point of application. This small amount of damaged masonry had to be relaid each day. This tunnel work was at first done at the rate paid for the open cutting but it was later paid for at the rate of £12 per lineal foot, which price still allowed the contractor a good profit. The average rate of progress was 6 ft. forward, with twenty-four hours' continuous working.

For the last 12,000 ft. of tunnel a modification was adopted. A 6-in. wood lining was substituted for the outer ring of brickwork, and against this the jacks pressed instead of the brickwork having to take the pressure. Inside the wood lining three rings of brickwork were laid in cement mortar. This method was used for sewers 12 ft. 3 in. diameter and it proved to be cheaper than the all brick section. The last 6,800 ft. of 12-ft. 3-in. diameter sewer built in this manner cost £7 5s. 10d. per foot run.

Owing to the fact that the Cleveland sewage is discharged into Lake Erie, whence the city water supply is drawn, it is probable that some method of purification will have to be adopted for the sewage. Accordingly experiments extending over a year are to be carried out. Clarification by means of screens and tanks and sludge disposal will be studied experimentally on an unusually large scale, the quantity of sewage to be dealt with in the experiment being 1,000,000 gallons per day. The results of these experiments will be awaited with considerable interest.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President*—Mr. Albert D. Greatorex, M.Inst.C.E., Borough Engineer and Surveyor of West Bromwich.

### ELECTION FOR DISTRICT OFFICES.

| | Vice-President. | District Chairman. | District Representative. | District Secretary. |
|---|---|---|---|---|
| *Scottish District*— | J. Bryce | J. Bryce | J. Young | D. Ronald |
| *Irish District*— | H. A. Cutler | W. Collen | R. H. Dorman | M. Sellars |
| *North-Eastern District*— | | F. Massie | E. B. Martin<br>E. R. Matthews | J. P. Wakeford |
| *North-Western District*— | | J. A. Brodie | J. S. Brodie<br>C. Brownridge | A. W. Bradley |
| *Eastern District* | | A. Fidler | W. H. Prescott<br>H. T. Wakelam | E. J. Elford |
| *Metropolitan District*— | | J. P. Barber | N. Scorgie<br>O. E. Winter | N. Scorgie |
| *South-Western District*— | | H. T. Chapman | T. Moulding | T. Moulding |
| *West Midland District*— | | A. T. Davis | H. E. Stilgoe | H. Richardson |
| *Southern District*— | | R. Read | L. S. McKenzie | F. R. Phipps |
| *East Midland District*— | | E. G. Mawbey | E. P. Hooley | R. A. MacBrair |
| *South-Eastern District*— | | A. Dryland | J. L. Redfern | F. Roberts |
| *North Wales District*— | | W. Jones | J. Price Evans | J. England |
| *South Wales District*— | | W. Harpur | G. A. Phillips | H. A. Clarke |

### COUNCIL MEETING.

At a council meeting held at the offices of the institution on Saturday, April 27th, there were present Messrs. A. D. Greatorex (president, in the chair), Blair, Hayward, Carter, Lancashire, Wike, Moulding, Cockrill, J. S. Brodie, Harpur, Barber, Elford, Thomas, Stilgoe, Scorgie, Newton, Thomas Cole (secretary), and H. A. Giles (assistant secretary).

Elected as Members: Messrs. R. J. W. Layland, surveyor, Billericay Rural District Council; W. A. G. Chapman, county road surveyor, Lanarkshire; D. MacBean, chief assistant road surveyor, Lanarkshire Middle Ward; J. Watson, county road surveyor, Lanarkshire First Division; H. J. Chivers, surveyor, Fleet Urban District Council; T. R. Parry, surveyor, Barmouth Urban District Council; R. Moir, county road surveyor, Ayrshire; J. Wilson, county road surveyor, East Berwickshire; E. Whitwell, surveyor, Abersychan Urban District Council; R. Spittal, county road surveyor, Lanarkshire Second Division; and F. H. McDonell, borough surveyor, Lyme Regis.

Elected as Associate Members: Messrs. J. W. Norman, engineering assistant, Torquay; J. S. McGlashan, engineering assistant, Wallasey; B. C. Bordossa, engineering assistant, Birmingham Corporation Tramways; and E. W. Turner, engineering assistant, Highways Department, Sheffield.

Elected as Students: Messrs. H. P. Bishop, H. M. Boxey, A. W. Ashby, G. J. Clarke and A. P. Piggott.

Transferred to Member: Messrs. F. W. E. Vanstone, highway surveyor, Totnes Rural District Council; W. P. Robinson, county surveyor, Devon (Northern Division); J. R. Fothergill, borough engineer's office, Bexhill; and P. A. Moss, borough engineer's office, Islington.

On the recommendation of the General Purposes

Committee, Standing Orders were approved for adoption.

On the recommendation of the Acting Examiners for the last examinations, the following were granted the testamur of the institution: Messrs. A. Clough, O. H. Cockrill, H. T. Davies, W. H. Duckworth, C. Dyke, A. W. Edmett, H. Elliott, R. L. Fairclough, H. L. Hall, B. C. Hammond, S. F. Hopley, A. C. Hughes, S. J. Kirby, S. C. Lloyd, W. T. Lynam, H. J. Osborne, A. Palmer, S. Palmer, E. Potts, A. D. Scott, B. N. Sharma, H. V. Snook, C. H. Walmisley and C. D. Wright.

On the recommendation of the Paris Committee, the final programme was approved and ordered to be issued to those attending.

On the recommendation of the Constitution Committee the petition to the Courts for the desired alterations to the Memorandum of Association was approved and ordered to proceed.

On the recommendation of the Roads Committee, the council adhered to their previous resolution in regard to the defining of routes for motor traffic, and also as to the size of material used for gritting.

Mr. R. A. MacBrair was elected chairman of the Paper Committee, and awards of premiums for papers read were considered.

The New Offices Committee brought up a scheme which was referred to a special council meeting for consideration.

On the recommendation of the Tramways Committee a hearty vote of thanks was accorded to Mr. H. T. Wakelam for his services in the tabulation of replies as to tramway-rail corrugation, and his report thereon. The question of printing the tables and report was referred to the secretary for enquiry. It was resolved to ask for further representation upon the Sub-Committee on Tramway Rails (Engineering Standards Committee).

The report of the scrutineers as to district elections was received.

An arbitration clause was approved and recommended for adoption to the Master Builders' Federation.

The report of the death of Mr. Lewis Angell, the first president of the institution, was received with the deepest regret.

(By order of the Council)

THOMAS COLE,
*Secretary*

The official programmes of the meetings of the Institution of Municipal and County Engineers to be held at Exmouth, Nuneaton, and Stirling are appended:—

## SOUTH-WESTERN DISTRICT MEETING AT EXMOUTH.

(May 4th.)

PROGRAMME.

10.30 a.m.—Reception at the public hall by the chairman of the district council, Mr. Henry Blackmore, J.P.

11 a.m.—Discussion on paper (which will be taken as read) entitled, "A Decade of Progress in a Residential Seaside Town," by Samuel Hutton, surveyor and water engineer to the council.

12 noon—Visit Beach Garden extension, pile driving in progress.

1 p.m.—Lunch at Thorn's Hotel by kind invitation.

2 p.m. (sharp).—Drive (tickets 2s. 3d. each) to Dotton pumping station (8 miles), calling at filter-beds and reservoirs, and passing through Knowle, East Budleigh, and Colaton Raleigh.

4.15 p.m.—Leave Dotton and return to Exmouth *viâ* Newton Poppleford, Aylesbeare Common, Woodbury Castle, arriving back 6 to 6.30 p.m.

THOMAS MOULDING, M.INST.C.E.,
*Hon. District Secretary.*

City Surveyor, Exeter.

## MIDLAND DISTRICT MEETING AT NUNEATON.

(May 11th.)

PROGRAMME.

11.30 a.m.—Assemble at the Law Courts, where members will be received by his Worship the Mayor (Councillor Thomas Horton, J.P.), district business, minutes, &c. Paper by the borough surveyor, Mr. F. C. Cook, ASSOC.M. INST.C.E., "Ten Years of Municipal Work in Nuneaton."

1 p.m.—Lunch at the Newdigate Arms Hotel, by invitation of the mayor and members of the corporation.

2 p.m.—Leave by brakes (tickets, 2s. each) for inspection of sewage pumping station, refuse destructor, open-air swimming baths and public slaughter-houses.

3 p.m.—Leave for the sewage outfall works at Hartshill to inspect silt and humus tanks, contact beds, percolating filters, &c.

5 p.m.—Tea at the farm buildings by invitation of Mr. Cook.

5.30 p.m.—Leave for Nuneaton.

6 p.m.—Arrive at Nuneaton.

Should any members desire to return earlier from Hartshill, arrangements can be made for them to do so.

Members must give notice of their intention to be present not later than May 4th.

H. RICHARDSON,
*Hon. District Secretary.*

Council House,
Birmingham.

## SCOTTISH DISTRICT MEETING AT STIRLING.

(June 7th and 8th.)

PROGRAMME.

*Friday, June 7th.*

11 a.m.—Reception in the Albert Hall, Stirling, by Provost Bayne and the magistrates of Stirling.

11.10 a.m.—District business.

11.30 a.m.—Discussion on paper (which will be taken as read) entitled, "The Municipal Works of Stirling," by Mr. A. H. Goudie, burgh surveyor, Stirling.

12.15 p.m.—Discussion on paper (which will be taken as read) entitled, "Work Carried Out in Central Stirlingshire under the Road Development Grant," by Mr. D. R. Cox, county road surveyor.

1 p.m.—Luncheon, provided by Stirling Town Council.

2 p.m.—Inspection of burgh works, &c., and county improved roads and quarry.

Mr. Morris, town clerk, Stirling, has kindly consented (should a sufficient number so desire) to conduct members and their lady friends through the Castle and upper part of the town, and point out and describe the buildings of historical and antiquarian interest.

6.30 p.m.—Annual dinner, Golden Lion Hotel, tickets 5s. each.

*Saturday, June 8th.*

Circular tour by motor char-a-banc from Stirling to Lochearnhead, *viâ* Callander and Strathyre, and returning by St. Fillans, Comrie and Crieff.

The following is the probable time table of the tour:

9.30 a.m.—Leave Stirling, Golden Lion Hotel.
12.30 p.m.—Lunch at Lochearnhead Hotel.
1.30 p.m.—Leave Lochearnhead Hotel.
3.15 p.m.—Afternoon tea, Drummond Arms Hotel, Crieff.
3.45 p.m.—Leave Crieff.
5.45 p.m.—Arrive Stirling.

Tickets for the tour, including lunch, 8s. 6d. each (exclusive of tea at Crieff, which can be arranged personally), can be obtained from the honorary district secretary. Those intending to make the tour should intimate their intention at least a week before the date.

DAVID RONALD,
*Hon. District Secretary.*

Falkirk, N.B.

The following meetings have also been arranged:—

May 24th—29th.—Paris.
June 1st.—Council meeting.
June 15th.—East Ham.
June 22nd.—Lowestoft.
June 29th.—Bridlington.
July 6th.—Stourbridge.
July 11th—13th.—Annual meeting, London.

Provincial members who propose to take part in the visit to Paris will, in cases where the journey exceeds a distance of 30 miles, be able to obtain return tickets to London at a single fare and a quarter.

THOMAS COLE,
11 Victoria-street, S.W. *Secretary*

## INSTITUTION OF MUNICIPAL ENGINEERS.

*President*—Mr. E. A. Stickland, assoc.m.inst.c.e., Borough Surveyor, Windsor.

### SOUTHERN DISTRICT MEETINGS IN LONDON.

A meeting of the Southern District will be held at the institution offices on Wednesday, May 8th, at 7 o'clock, when a paper, "The Design and Planning of Working-Class Dwellings," will be presented by Mr. Sidney Palmer (member) for discussion.

Members of the South-Eastern District are particularly requested to attend and join in the discussion.

A further meeting of the district will be held on Wednesday, June 5th, at 7 o'clock, at which will be discussed the advisability of the Southern District forming a local association for the purpose of becoming federated with the N.A.L.G.O.

E. W. Veale,
*Hon. District Secretary.*

Frensham,
Surrey.

### COUNCIL MEETING.

At a meeting of the council held on April 27th, the following applicants were recommended for admission:—

(*a*) To Membership: Messrs. A. E. Gayer, Town Engineer's Office, Krugersdorp; H. Bell-John, district engineer, P.W.D., Pretoria; and R. F. Trotter, Office of Chief Engineer, Kashmir Government, Srinagar, Kashmir.

(*b*) To Associate Membership: Messrs. C. W. Randall, assistant surveyor, Weybridge Urban District Council; Isaac Dixon, Borough Engineer's Office, Wallasey; and A. J. Redfern, sanitary surveyor, Honiton Rural District Council.

(*c*) Transfer to Membership: Mr. J. S. Walker, Borough Engineer's Office, Wallasey.

(*d*) Transfer to Associate Membership: Mr. H. S. Ganderton, Borough Engineer's Office, Torquay.

The council also recommended that the secretary, Mr. B. Wyand, be appointed to membership of the institution.

(Under the new by-laws these elections will be ratified at the next council meeting if no written objections are lodged within fourteen days.)

New Members, &c.—From the applicants recommended for admission at the last meeting two members and four associate members were elected.

List of Members.—With regard to the forthcoming publication of a new "List of Members," members are requested to notify the secretary of any changes which they desire to be made.

Meetings.—The attention of members is specially directed to the forthcoming visit to the works of Messrs. Doulton, Limited.

Council Meeting.—The next meeting will be held on Wednesday, May 22nd, at 5.30 o'clock.

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A visit will be paid to the show rooms and works of Messrs. Doulton & Co., Limited, Albert Embankment, London, on Wednesday, June 5th, at 2.30 o'clock.

Members will assemble in the show rooms at 2.30, and the processes to be seen during the round of visits will include the manufacture of drain pipes and other sanitary stoneware, fireclay stoves, architectural terra-cotta, and Doulton and other art ware.

B. Wyand,
*Secretary.*

39 Victoria-street, S.W.
May 1, 1912.

## ROYAL SANITARY INSTITUTE.

### MEETING AT BLACKPOOL.

On the 24th inst., at Blackpool Town Hall, discussions will take place on "The Card Index System as applied to Public Health Work," to be opened by E. W. Rees-Jones, m.d., d.p.h., m.o.h., and on "A Description of the Joint Scheme of Sewerage for Thornton-le-Fylde, Bispham-with-Norbreck, and Carleton," by Arthur Hindle, assoc.m.inst.c.e. On Saturday, May 25th, visits will be arranged to the new promenades, the new main sewerage works for Thornton-le-Fylde, Bispham-with-Norbreck, and Carleton, and the new main drainage works of the Fleetwood Urban District Council.

## BLACKPOOL PROMENADE EXTENSION.

Princess Louise, who was accompanied by the Duke of Argyll, on Wednesday last formally opened the new extension of Blackpool's great promenade. A feature of the undertaking is the remarkable rapidity with which the work, carried on in the face of high tides and high winds, has been accomplished. The widening north extends from the North Pier to Cocker-street, a distance of a ¼ mile. By means of a new sea-wall and apron, constructed 150 lin. ft. seawards of the old 15-ft. footpath, erected forty years ago, the promenade has been lengthened and widened in unison with the rest of the 3 miles of frontal carriage drives, tramroad and footpath. The area of the land reclaimed from the sea amounts to 4½ acres, and the sea-wall ranges in height from 27 ft. to 37 ft. The main promenade has a width of 85 ft. in the centre, with sunken gardens north and south. A terrace leads to the Lower Promenade, and incidentally affords seating for 6,000 people. There is also an inclined carriageway leading down to the foreshore.

In the recent widening, the plant used on the works included five steam locomotives, ninety side-tip wagons, four steam locomotive cranes, two steam pile drivers, and four steam pumps, while the men employed varied from 250 to 350. Only eleven months were occupied in the operations.

## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

CLERK OF WORKS. May 4th.—Surrey Education Committee. £160 per annum.—Mr. W. W. Finey, secretary, Kingston-upon-Thames.

SUB-FOREMAN OF WORKS.—May 4th.—Corporation of Swindon. £2 per week.—Mr. R. Hilton, town clerk.

ARCHITECTURAL AND ENGINEERING ASSISTANTS.—May 6th.—Corporation of Walsall. Architectural assistant, £150 per annum, and engineering assistant, £117 per annum.—Mr. John R. Cooper, town clerk.

TEMPORARY ASSISTANTS (2).—May 6th.—Corporation of York. £100 per annum.—Mr. F. W. Spurr, city engineer.

SURVEYOR'S ASSISTANT.—May 6th.—Bedwellty Urban District Council. £2 per week.—Mr. T. J. Thomas, clerk, High-street, Bargoed.

ARCHITECT.—May 6th.—Hackney Borough Council.—Mr. W. A. Williams, town clerk.

ASSISTANT SURVEYOR.—May 8th.—Kerry County Council. £150 per annum.—Mr. P. M. Quinlan, county secretary, County Hall, Tralee.

INSPECTOR OF NUISANCES.—May 9th.—Kettering Urban District Council. £78 per annum.—Mr. J. Bond, clerk.

CLERK OF WORKS.—May 9th.—Standing Joint Committee of Berkshire. £2 10s. per week.—County Surveyor, Shire Hall, Reading.

ASSISTANT INSPECTOR OF NUISANCES.—May 11th.—Corporation of Warrington. £78—£125.—Mr. J. Coote Hibbert, medical officer of health, 78 Sankey-street.

ENGINEER AND SURVEYOR.—May 13th.—Horbury Urban District Council. £150 per annum.—Mr. T. Barker, clerk.

DISTRICT MAIN ROAD SURVEYOR.—May 13th.—Derbyshire County Council. £200—£250.—Mr. N. J. Hughes-Hallett, clerk.

INSPECTOR OF NUISANCES.—May 15th.—Blaby Rural District Council. £110—£120.—Mr. B. A. Shires, clerk, 1 Friar-lane, Leicester.

INSPECTOR OF NUISANCES.—May 15th.—Chelmsford Town Council. £130—£150.—Mr. W. Smith, town clerk.

SUPERINTENDENT.—May 15th.—Ely Drainage and Navigation Commissioners. £150 per annum.—Messrs. Harold Archer and Goodwyn L. Archer, clerks to the Commissioners, Ely.

INSPECTOR OF NUISANCES.—May 15th.—Wanstead Urban District Council. £120—£150.—Mr. B. Blewitt, clerk.

SURVEYOR.—May 29th.—Carmarthenshire County Council. £200 per annum.—Mr. J. W. Nicholas, clerk, county offices, Carmarthen.

ASSISTANT ENGINEER FOR BUILDINGS AND ARCHITECTURE.—May 31st.—Municipality of Bombay. 600 rupees—800 rupees per month.—Mr. P. R. Cadell, municipal commissioner.

DRAUGHTSMAN.—Public Works Department of the Government of Sierra Leone. £300—£350 per annum, with extras.—Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W. Quote M/5,325 on left-hand top corner of application.

## MUNICIPAL COMPETITIONS OPEN.

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HALE.—June 28th.—Designs for a town planning scheme for the urban district council. Premiums of £50 and £25 are offered.—The Clerk.

DUSSELDORF.—July 1st.—Plan for the extension of the city. Premiums of £1,000 and £375 are offered.—The Chief Burgomaster.

## MUNICIPAL CONTRACTS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

### Buildings.

LLANELLY.—May 6th.—For the erection of twenty-four houses, for the urban district council.—Mr. H. V. Spowart, clerk.

MANCHESTER.—May 6th.—For the construction of a subway, for the corporation.—Mr. Thomas Hudson, town clerk.

GLASGOW.—May 6th.—For alterations to public baths and washhouses, for the corporation.—Mr. J. Lindsay, town clerk.

CHESTER.—May 6th.—For the erection of laundry work centre, for the corporation.—Mr. J. H. Dickson, town clerk.

SKIPTON.—May 6th.—For the erection of stabling and cartsheds, also abutments and approaches to a bridge, for the urban district council.—Mr. Richard Wilson, clerk.

NUNEATON.—May 7th.—For additions to the engine-house at electricity works, for the corporation.—Mr. F. C. Cook, borough surveyor.

MARGATE.—May 7th.—For the erection of a sheltered seat and ten bungalows, for the corporation.—Mr. Edward Brooke, town clerk.

BUCKLOW.—May 7th.—For the execution of earthwork and the erection of a retaining wall, for the rural district council.—Mr. George Leigh, clerk.

SOUTHEND.—May 9th.—For erecting a chimney, for the corporation.—Mr. E. J. Elford, borough engineer.

WEST RIDING.—May 10th.—For alterations and additions to a council school, for the Education Committee.—Mr. Francis Alvey Darwin, clerk, County Hall, Wakefield.

HARWICH.—May 11th.—For the construction of a public convenience, for the corporation.—Town Clerk.

CORNWALL.—May 11th.—For alterations at Connor Downs school, for the Education Committee.—Mr. R. Pascoe, secretary, Education Office, Truro.

BANDON.—May 11th.—For building seventeen cottages, for the rural district council.—Mr. A. Haynes, clerk.

RYDE.—May 13th.—For building a pumping station at waterworks, for the corporation.—Mr. Charles G. Vincent, town clerk.

DARTFORD.—May 13th.—For the construction of engine-house, cottage, and formation of roads, for the Metropolitan Water Board.—The Clerk, Savoy-court, Strand, W.C.

HERTS.—May 13th.—For rebuilding a bridge near Rickmansworth, for the county council.—Mr. Urban A. Smith, county surveyor.

PONTYPRIDD.—May 13th.—For the extension of refuse destructor, for the urban district council.—Mr. J. Colenso Jones, clerk.

WEST HAM.—May 14th.—For painting, cleansing, and repairing of public buildings, for the corporation. Mr. Fred. E. Hilleary, town clerk.

LANCASHIRE.—May 14th.—For the erection of an elementary school, for the Education Committee.—Mr. H. Littler, county architect, 16 Ribblesdale-place, Preston.

WEST SUFFOLK.—May 14th.—For the erection of new infants' school, and alterations to existing buildings, for the Education Committee.—Mr. Fred. R. Hughes, secretary.

ENFIELD LOCK.—May 14th.—For the construction of a pump-house, gas-producer house, coal bays, two cottages, formation of roads, and drainage, for the Metropolitan Water Board.—Mr. A. B. Pilling, clerk, Savoy-court, Strand, W.C.

ESSEX.—May 14th.—For the erection of a school at Leigh-on-Sea, for the Education Committee.—Mr. Herbert Bell, clerk.

ASHBOURNE.—May 15th.—For the erection of six cottages, for the rural district council.—Mr. W. R. Holland, clerk.

WALLINGFORD.—May 21st.—For alterations to isolation hospital, for the Joint Hospital Board.—Mr. P. C. A. Slade, clerk, 7 St. Martin's-street, Wallingford.

LUTON.—May 21st.—For the erection of a cookery centre, for the corporation.—Borough Engineer.

SOUTHEND-ON-SEA.—May 22nd.—For the erection of a council school at Hamstel, for the Education Committee.—Mr. J. W. Barrow, clerk.

PEMBROKE.—May 23rd.—For the erection of a school, for the Education Authority.—Mr. O. T. Thomas, education architect, 8 Victoria-place, Haverfordwest.

BRADFORD-ON-AVON.—May 31st.—For the construction of a retaining wall, for the urban district council.—Mr. James Compton, clerk.

WEST HAM.—June 5th.—For the erection of refuse destructor and steam-raising plant, for the corporation.—Mr. Fred. E. Hilleary, town clerk.

### Iron and Steel.

PORTRUSH.—May 4th.—For laying 6-in. water main, for the urban district council.—Mr. W. J. Cunningham, clerk.

DOVER.—May 6th.—For laying 1,060 yds. of water main, for the corporation.—Mr. R. E. Knocker, town clerk.

MARGATE.—May 6th.—For laying 320 yds. of 6-in. water main, for the corporation.—Mr. Edward Brooke, town clerk.

RICHMOND (Surrey).—May 7th.—For the supply of spigot and socket pipes and irregular castings, for the corporation.—Town Clerk.

CLUN (Salop).—May 8th.—For laying cast-iron water pipes and fittings, for the rural district council.—Mr. Percy H. Newill, clerk.

ECCLES.—May 8th.—For fixing heating apparatus in school, for the corporation.—Mr. Edwin Parkes, town clerk.

CARRICK-ON-SUIR.—May 11th.—For laying iron pipes and fittings and constructing service reservoir, also supplying cast-iron pipes and valves, for the urban district council.—Mr. James Verrington, clerk.

WINSFORD.—May 14th.—For the supply of cast-iron pipes, spigot and socket joints, bends, and syphon boxes, for the urban district council.—Mr. J. H. Cooke, clerk.

BELLINGHAM.—May 17th.—For laying cast-iron water mains and incidental works, for the rural district council.—Mr. R. Riddle, clerk, Conheath, Bellingham, Northumberland.

BISHOP'S STORTFORD.—May 21st.—For the supply of 145 tons of cast-iron pipes and special castings, for the urban district council.—Mr. Cecil J. Hancox, clerk.

HEREFORD.—For the supply of unclimbable iron fencing, for the County and City Asylum.—Mr. F. S. Goldingay, clerk to the visitors.

### Roads.

HARROGATE.—May 3rd.—For widening East-parade, for the town council.—Mr. C. E. Rivers, borough engineer and surveyor.

RICHMOND (Surrey).—May 3rd.—For making a new street, for the corporation.—Mr. J. H. Brierley, borough surveyor.

JARROW.—May 4th.—For cementing certain footpaths, for the corporation.—Mr. J. S. Weir, borough engineer.

HAMPTON WICK.—May 4th.—For the supply of Kentish crown pit flints, for the urban district council.—Mr. H. Fawsett, clerk.

CRAMLINGTON.—May 4th.—For the supply of broken whinstone chippings and slag chippings, for the urban district council.—Mr. R. Nicholson, clerk, Morpeth.

INVERNESS.—May 4th.—For the repair of Porterfield-road, for the corporation.—Mr. Kenneth Macdonald, town clerk.

PATRINGTON.—May 4th.—For the supply of stone, for the rural district council.—Mr. W. H. Snaith, surveyor.

PERTH.—May 4th.—For the supply of road materials, for the corporation.—Burgh Surveyor.

PLOMESGATE (Suffolk).—May 6th.—For the supply of broken granite and flint, for the rural district council.—Mr. D. R. Read, clerk, Wickham Market.

FALMOUTH.—May 6th.—For making good certain roads, for the corporation.—Mr. J. S. Walton, borough engineer and surveyor.

MANCHESTER.—May 6th.—For making up Charlton-street, for the corporation.—Mr. Thomas Hudson, town clerk.

RUNCORN.—May 6th.—For the supply of granite-macadam, setts, kerbstones, limestone, cinders, and sanitary pipes, for the rural district council.—Mr. G. F. Ashton, clerk.

HORNCASTLE.—May 6th.—For the supply of roadstone, slag, and chips, for the urban district council.—Mr. R. W. Clitherow, clerk.

POOLE.—May 6th.—For quarrying, sifting, breaking, and yarding gravel, and teamwork, for the rural district council.—Mr. R. T. S. Seymour, district surveyor, Wimborne, Minster.

HORSHAM.—May 6th.—For making up Victoria-road, Albany-road, and Princess-road, Crawley, for the rural district council.—Mr. W. Dengate, 58 Park-street, Horsham, surveyor.

SALCOMBE.—May 7th.—For the supply of road materials, for the urban district council.—Mr. G. G. Holmes, surveyor.

RICHMOND.—May 7th.—For making good certain streets, for the Paving Committee.—Mr. J. H. Brierley, borough surveyor.

LARNE.—May 7th.—For hill cuttings, bridge repairs, and fencing, for the rural district council.—Mr. S. M. Wallace, clerk.

REIGATE.—May 7th.—For the supply of granite-macadam, basalt and flints, granite kerb and setts, Kent ragstone, tar paving, artificial stone paving, gravel, concrete beach, pea beach, compo. grit, Portland cement, and Beddington grit.—Mr. Alfred Smith, town clerk.

WATFORD.—May 7th.—For repairs to a portion of Shire-lane, for the rural district council.—Mr. H. Morten Turner, clerk.

BROMLEY (Kent).—May 7th.—For making-up Shawfield Park, for the corporation.—Mr. F. H. Norman, town clerk.

FRINTON-ON-SEA.—May 7th.—For making up Crescent-road, for the urban district council.—Mr. E. M. Bate, surveyor.

DEWSBURY.—May 8th.—For paving and flagging works, for the corporation.—Borough Surveyor.

ENFIELD.—May 8th.—For making up Rosemary-avenue, for the urban district council.—Mr. T. W. Scott, clerk.

WOOLWICH.—May 8th.—For the supply of one 400-gallon water van (cylindrical tank), for the borough council.—Mr. Arthur B. Bryceson, town clerk.

BENTLEY-WITH-ARKSEY.—May 8th.—For the supply of whinstone, dross, dross rejections, cob dross, and whinstone chippings, for the urban district council.—Mr. R. G. Whitley, surveyor.

BARNSLEY.—May 8th.—For work of making-up, for the corporation.—Mr. J. H. Taylor, borough surveyor.

WEST RIDING.—May 8th.—For asphalting work at Darfield school, for the District Sub-Committee.—Mr. T. Graham, Education Offices, Obelisk Chambers, Barnsley.

PAIGNTON.—May 9th.—For constructing a roadway, for the urban district council.—The Surveyor.

PEMBROKE (Co. Dublin).—May 9th.—For widening and improving approach to Pembroke cottages, near Donnybrook, for the urban district council.—Mr. J. C. Manly, clerk.

PORTSMOUTH.—May 9th.—For laying block asphalt pavement, for the corporation.—Mr. G. H. Etherton, town clerk.

THAMES DITTON.—May 9th.—For making up a certain road, for the urban district council.—Council Offices, Brabant Villa.

NEWHAVEN.—May 9th.—For the supply of hand-picked surface flints, for the rural district council.—Mr. Herbert W. Coupe, clerk.

BAILDON.—May 10th.—For the supply of broken granite and broken limestone, for the urban district council.—Mr. J. Bentley, clerk.

KINGSBURY.—May 10th.—For laying tar-macadam, for the urban district council.—Mr. R. C. N. Newport, surveyor.

WIGAN.—May 10th.—For the supply of road materials, for the rural district council.—Mr. H. G. Ackerley, clerk, 6 Victoria Buildings.

WORCESTER.—May 11th.—For the construction of granolithic pavements, for the corporation.—Mr. Thomas Caink, city engineer.

BIRSTALL.—May 11th.—For the making-up of Blackburn-road, for the urban district council.—Mr. G. H. Hailstone, surveyor.

HASTINGS.—May 11th.—For the rolling of certain roads, for the rural district council.—Mr. A. R. Inskipp, clerk.

WORSBOROUGH.—May 11th.—For the supply of broken granite, tarred dross macadam, limestone asphalt and dross screenings, for the urban district council.—Mr. Alfred Clegg, clerk.

PETWORTH.—May 11th.—For the supply of materials and cartage, for the rural district council.—Mr. E. H. Staffurth, clerk.

BRIGG.—May 13th.—For the supply of broken granite, for the urban district council.—Mr. G. S. Sowter, clerk.

GUILDFORD.—May 13th.—For the supply of granite, Bargate stone, flints, and cartage, for the rural district council.—Mr. J. Anstee, surveyor.

SAMFORD.—May 13th.—For the supply of broken granite, for the rural district council.—Mr. Arnold J. Haward, clerk.

WANDSWORTH.—May 13th.—For making up and paving part of Cowick-road, for the borough council.—Mr. D. A. Nicholl, town clerk.

WANDSWORTH.—May 13th.—For the execution of repairs upon part of Crowbridge-road, for the borough council.—Mr. D. A. Nicholl, town clerk.

ILFORD.—May 13th.—For laying granite channelling, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

NEWARK.—May 13th.—For work of road improvement, for the corporation.—Borough Surveyor.

WESTMINSTER.—May 13th.—For carrying out paving work, for the borough council.—Town Clerk.

SOUTHAMPTON.—May 14th.—For the execution of street improvements, for the corporation.—Mr. R. R. Linthorne, town clerk.

MOUNTAIN ASH.—May 14th.—For carrying out street works, for the urban district council.—Mr. H. P. Linton, clerk.

LONG CRENDON.—May 14th.—For the supply of broken granite and chippings, for the rural district council.—Mr. Edward N. Purcell, clerk.

ISLEWORTH.—May 15th.—For making up portion of a road, for the urban district council.—Mr. H. J. Baker, clerk.

HALIFAX.—May 18th.—For carrying out private street works, for the corporation.—Mr. J. Lord, borough engineer.

EPSOM.—May 20th.—For the making-up of Norman-road, for the rural district council.—Mr. T. E. Ware, surveyor of highways.

ACTON.—May 21st.—For tar-spraying certain roads, for the urban district council.—Mr. W. Hodson, clerk.

LLANTRISANT AND LLANTWIT.—May 29th.—For the completion of the new Ely Valley-road and branch roads, for the rural district council.—Mr. Gomer S. Morgan and Mr. Thomas Saunders, engineers, School-street, Pontyclun, Glam.

## Sanitary.

NEWRY.—May 3rd.—For the construction of a new sewer, for the urban district council.—Mr. William M. Cronin, town clerk.

STEWARTON.—May 3rd.—For the construction of sewage disposal works, for the corporation.—Mr. W. Macrae, town clerk, Royal Bank, Stewarton, Ayrshire.

SWANSEA.—May 4th.—For the construction of sewer and manholes, for the rural district council.—Mr. Edward Harris, clerk.

PAUL (Cornwall).—May 4th.—For scavenging work, for the urban district council.—Mr. W. Curnow, clerk.

SAWBRIDGEWORTH. — May 6th. — For house scavenging work, for the urban district council.—Mr. W. Morris, clerk.

MARKET HARBOROUGH.—May 6th.—For the construction of works of sewerage for the urban district council.—Mr. H. G. Coales, engineer, Northampton-road.

WATFORD.—May 6th.—For the construction of stoneware pipe sewer, storm-water sewer, and manholes, for the urban district council.—Mr. W. W. Newman, engineer pro tem.

HOLLINGBOURN.—May 7th.—For the construction of main sewerage and sewage disposal works, for the rural district council.—Mr. H. J. Bracher, clerk, 33 Earl-street, Maidstone.

DUNFERMLINE.—May 7th.—For the construction of three miles of outfall sewer, for the corporation.—Messrs. Crouch, Hogg & Easton, 14 Blythswood-square, Glasgow.

PAIGNTON.—May 9th.—For laying sewers and drains, and constructing roadway, for the urban district council.—Mr. James R. Mill, clerk.

FOLKESTONE.—May 10th.—For the construction of sewage outfall works, for the corporation.—Mr. A. E. Nichols, borough engineer.

MILFORD HAVEN.—May 10th.—For the supply of drain pipes and bricks, for the urban district council.—Mr. Thomas H. Lewis, clerk.

BRADFIELD.—May 13th.—For the construction of main sewerage and sewage disposal works at Pangbourne, for the rural district council.—Mr. R. E. Rawstone, clerk, 4 Bridge-street, Caversham, Reading.

GLASTONBURY.—May 13th.—For alterations and additions to sewerage system, with manholes, lamp-holes, flushing tanks, storage tanks, erection of two pumping stations, and storm-water lagoons, for the corporation.—Mr. Reginald T. Gould, town clerk.

ASHTON-IN-MAKERFIELD.—May 14th.—For the construction of sewers and sewage disposal works, for the urban district council.—Mr. Albert Sykes, clerk.

STIRLING.—May 14th.—For laying cast-iron sewers, manholes, and flushing chambers, for the Eastern Committee.—Mr. J. H. Burns, district clerk, District Offices, Falkirk.

EAST GRINSTEAD.—May 15th.—For the construction of sewage disposal works, for the rural district council.—Mr. Francis S. White, clerk.

TEDDINGTON.—May 15th.—For the erection of sewage disposal and refuse destructor works, for the urban district council.—Mr. G. H. Salmons, clerk.

BOURNEMOUTH.—May 17th.—For the execution of drainage, for the corporation. Mr. F. W. Lacey, borough engineer.

WINCANTON.—May 22nd.—For the reconstruction of sewerage, for the rural district council.—Mr. E. N. Martin, clerk.

BALBY WITH HEXTHORPE.—For laying sewers and surface-water drains, for the urban district council. Mr. Frank Allen, clerk.

## Stores.

WALLASEY.—May 6th.—For the supply of stores required for steamers and ferries, for the corporation. Mr. H. W. Cook, town clerk.

RICHMOND.—May 7th.—For the supply of Welsh steam coal, house coal, Buxton lime, grey lime, sulphate of ammonia and green copperas, and filter cloth, for the Main Drainage Board.—Mr. J. Leslie G. Powell, clerk, Richmond, Surrey.

## Miscellaneous.

LONDON.—May 6th.—For the supply of sand, for the Metropolitan Water Board.—The Clerk, Savoy-court, Strand, W.C.

SWANSEA.—May 7th.—For the supply of Portland cement, for the corporation.—Mr. H. Lang Coath, town clerk.

WEST RIDING.—May 8th.—For asphalting playground, for the county council.—Mr. T. Graham, Education Offices, Obelisk Chambers, Barnsley.

HALIFAX.—May 18th.—For the supply of filtering medium, for the Highways Committee.—Mr. J. Lord, borough engineer.

DEVON.—May 23rd.—For general repairs and painting, for the county council.—Mr. F. Bailey, clerk, The Castle, Exeter.

# TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BATH.—For the Midford sewerage tank, for the rural district council:

| | |
|---|---|
| Rawlings, Bath | £98 |
| F. Cockburn, Charterhouse | 97 |
| Hiscott & Barrett, Shakespeare avenue* | 96 |

BRIXTON.—For the provision of two science rooms and an art room at the Reay Central School, Brixton, for the London County Council:—

| | |
|---|---|
| J. Smith & Son (Norwood), Limited, South Norwood | £2,306 |
| J. Garrett & Son, Balham-hill | 2,136 |
| J. Marsland & Sons, Walworth | 2,058 |
| Triggs & Co., Clapham | 2,024 |
| J. & C. Bowyer, Limited, Upper Norwood | 1,997 |
| F. W. Fletcher, Tooting | 1,924 |
| Holliday & Greenwood, Limited, Brixton | 1,899 |
| W. Johnson & Co., Limited, Wandsworth-common | 1,869 |
| J. Chessum & Sons, South-place† | 1,860 |

Architect's estimate, £1,950.

CARDIFF. For making-up eight streets, for the corporation.—Mr. W. Harpur, city engineer:—

| | T. Dunn, Cardiff. | H. T. Hames, Pontypridd. | R. Pomeroy & Co., Cardiff. | C. Davies, Cardiff.* |
|---|---|---|---|---|
| Albany-lane South | £151 | £148 | £134 | £133 |
| Arran-lane | 81 | 78 | 72 | 71 |
| Arran-place | 508 | 476 | 462 | 435 |
| Connaught-lane East | 225 | 220 | 201 | 195 |
| Roath Court-lane East | 237 | 243 | 215 | 212 |
| Roath Court-lane West | 53 | 51 | 48 | 46 |
| Roath Court-place | 640 | 601 | 577 | 548 |
| Roath Court-road | 869 | 837 | 758 | 735 |

CHERITON.—The tender of Mr. C. J. Nicholls, at £225, has been accepted by the urban district council for the work of domestic scavenging during the ensuing year.

CROYDON.—Accepted for the erection of a handicraft centre, for the corporation:—

G. E. Everett & Sons, Limited, Croydon, £920.

DOVER.—Two tenders were submitted to the town council for scavenging. No. 1 for scavenging, £3,398; cartage, £2,086; total £5,484. No. 2, scavenging, £3,600; cartage, £2,091; total £5,691. The lowest tender, that of Mr. Curling, was accepted.

EAST RIDING.—Accepted for the erection of two schools, and work of alterations and additions, for the county council.—Mr. B. B. Stamford, building surveyor

New School for Boys at Cottingham.—S. Laurence, Thorne, £3,351.
New School, Howden.—Hammerton, Schrah & Co., Shafton, £2,490.
Alterations and additions to Norton (Malton) Council school for Boys.—C. Martin, York, £1,840.

KETTERING.—For the supply of 800 yds. super. of concrete paving slabs, for the urban district council.—Mr. R. Smith, surveyor:—

| | |
|---|---|
| Thames Stone Company, Limited, Barking | £159 |
| Brookes, Limited, Halifax | 156 |
| Tytherington Stone Company, Limited, Tytherington | 152 |
| Cliffe Hill Granite Company, Limited, Markfield | 149 |
| Patent Victoria Stone Company, Limited, London | 145 |
| Atlas Stone Company, Limited, Cambridge | 142 |
| Croft Granite Brick and Concrete Company, Limited, Croft | 142 |
| Empire Stone Company, Limited, London | 138 |
| J. Ellis & Sons, Limited, Leicester | 135 |
| Excelsior Patent Stone Company, Limited, Finedon Sidings* | 135 |

MANSFIELD. For laying 2,450 yards of stoneware pipe sewers and manholes, for the corporation:—

Ward & Tetley, Bradford, £4,983.

MIDSOMER NORTON (Somerset). The urban district council have accepted the tender of S. G. Gilson & Sons, of Holcombe, for the supply of quartzite; that of the Emborough Stone Company, Limited, for the supply of limestone and asphalte, and that of J. Stevens, of Welton, for horse hire.

NORTON.—Accepted for emptying ashpits, for the rural district council:—

| | |
|---|---|
| J. W. Farnsworth, Sheffield | £110 |
| S. Fisher, Sheffield | 69 |

UXBRIDGE.—For laying down kerb, for the rural district council—Mr. J. W. Harrison, engineer and surveyor:—

| | |
|---|---|
| W. Buttrum, Hillingdon East | £38 |
| Gamble Wood, Dover | 34 |
| W. J. Wilkinson, West Drayton | 32 |
| T. Hancock, Yiewsley* | 31 |

WANDSWORTH.—For flagging the footway of part of Upper Richmond-road, for the borough council.—P. Dodd, borough engineer:—

J. Mowlem & Co., Limited, £567, and schedule prices for extras or omissions.

## MEETINGS.

*Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.*

MAY.

4.—Institution of Municipal and County Engineers: Meeting at Exmouth.
4.—Lower Thames Valley District Surveyors' Association: Annual Meeting and Dinner.
4.—National Association of Local Government Officers: Meeting of National Council, Leamington Town Hall, 10 a.m.
9.—Concrete Institute: Annual General Meeting, Denison House, Westminster. 4.30 p.m.
11.—Institution of Municipal and County Engineers: Meeting at Nuneaton.
11.—Society of Engineers: Annual Dinner, Criterion Restaurant, 7 p.m.
17.—Junior Institution of Engineers: Mr. G. C. Allingham on "Storage Battery Engineering." 8 p.m.
20.—Quantity Surveyors' Institution: Annual Dinner, Connaught Rooms, Kingsway. 7 p.m.
24-29.—Institution of Municipal and County Engineers: Visit to Paris.
24.—Royal Sanitary Institute: Meeting at Blackpool; Mr. A. Hindle, Assoc.M.Inst.C.E., on "The Joint Scheme of Sewerage for Thornton-le-Fylde, Bispham-with-Norbreck and Carleton;" Mr. E. W. Rees Jones on "The Card Index System as Applied to Public Health Work," Town Hall. 7.30 p.m.
30-31.—Surveyors' Institution: Country Meeting at Nottingham.

JUNE.

1.—Institution of Municipal and County Engineers: Council Meeting.
6-8.—Institution of Water Engineers: Summer Meeting at Cheltenham.
7-8.—Institution of Municipal and County Engineers: Meeting at Stirling.
15.—Institution of Municipal and County Engineers: Meeting at East Ham.
22.—Association of Managers of Sewage Disposal Works: Metropolitan District Meeting, Southall-Norwood and Hanwell.
22.—Institution of Municipal and County Engineers: Meeting at Lowestoft.
29.—Institution of Municipal and County Engineers: Meeting at Bridlington.

JULY.

6.—Institution of Municipal and County Engineers: Meeting at Stourbridge.
11-13.—Institution of Municipal and County Engineers: Annual Meeting, London.

## APPOINTMENTS OPEN.

### DERBYSHIRE COUNTY COUNCIL.
APPOINTMENT OF DISTRICT MAIN ROAD SURVEYOR.

Applications are invited for the post of District Surveyor for the Bakewell Main Road District. Candidates must be between 25 and 45 years of age, and must have had experience in the direct maintenance of a considerable mileage of macadamised roads.

Salary (which is inclusive of travelling expenses) at the rate of £200 per annum, rising by increments of £10 per annum (subject to the recommendation of the County Surveyor) to £250 per annum. A further allowance of £10 per annum will be made in respect of office. Stationery, books, postages, &c., will be provided by the County Council.

Forms of application, and particulars of duties and terms of engagement, may be obtained from the County Surveyor, at the County Offices, and will be forwarded through the post on receipt of a stamped addressed foolscap envelope.

Applications, endorsed "District Surveyor," must be upon the form provided, and must reach me not later than 10 a.m. on Monday, the 13th day of May next.

Canvassing in any form will be a disqualification.

Dated this 22nd day of April, 1912.

N. H. HUGHES-HALLETT,
Clerk to the Derbyshire County Council.

County Offices, Derby.

### HORBURY URBAN DISTRICT COUNCIL.
APPOINTMENT OF ENGINEER AND SURVEYOR.

The above Council require the Services of a Competent Engineer and Surveyor, at a commencing salary of £150 per annum.

Candidates must be competent to carry out the duties under the Public Health Acts and the By-laws of the Council, and to prepare Estimates, Specifications and Plans and Reports of Committees; they must also have a practical knowledge of the Construction of Buildings, Sewerage and Sewage Disposal Works, Road Making, Street Improvements, the Making-up of Streets under the Private Street Works Act, 1892, and the general duties of an Urban Council's Engineer.

The person appointed will be required to reside in the district, to devote the whole of his time to the duties of the office, and to give satisfactory security in the sum of £200.

Applications to be made on Forms to be obtained from me (on receipt of stamped addressed foolscap envelope), which must be returned to me filled up (endorsed "Surveyor") not later than 12 noon on the 13th May, 1912.

Canvassing (either directly or indirectly) will be deemed a disqualification.

(By order)
T. BARKER,
Clerk to the Council.

Town Hall, Horbury, Yorks.
May 2, 1912.

### COUNTY BOROUGH OF WALSALL.
BOROUGH SURVEYOR'S DEPARTMENT.
APPOINTMENT OF ARCHITECTURAL AND ENGINEERING ASSISTANTS.

The Corporation invite applications for the appointment in the Borough Engineer and Surveyor's Department of an Architectural Assistant, at a salary of £150 per annum, and an Engineering Assistant, at a salary of £117 per annum.

Applicants must be good and rapid draughtsmen, and in case of the Architectural Assistant must have a thorough knowledge of architecture, construction, and the preparation of details, specifications and quantities.

Applications, in Candidate's own handwriting, accompanied by copies of not more than three recent testimonials, must be made on forms to be obtained on application to Mr. J. Taylor, Borough Engineer and Surveyor, Council House, Walsall, and delivered to the undersigned not later than Monday, the 6th May, endorsed "Architectural Assistant" or "Engineering Assistant."

Canvassing will be deemed a disqualification.

(By order)
JOHN R. COOPER,
Town Clerk.

Council House,
Walsall.
April 24, 1912.

BOROUGH ENGINEER AND SURVEYOR (A.M.Inst.C.E.) of large town in the Midlands (40,000) has vacancy for Pupil. Address Box 1,144, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

SURVEYOR AND SANITARY INSPECTOR to Urban District near London is open to take Pupil for 2 or 3 years; moderate premium required.—Apply F. H., office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

## TENDERS WANTED.

### EAST GRINSTEAD RURAL DISTRICT COUNCIL.
GROOMBRIDGE SEWERAGE AND SEWAGE DISPOSAL WORKS.

The above Council invite Tenders from Builders and Contractors for the Construction of Sewage Disposal Works, comprising Detritus Tanks, Settling Tanks, Storm-Water Stand-by Tanks, Filter-Beds and Humus Tanks, together with the Laying of about 450 lin. yards of 12-in. and 9-in. Sewers, and the Construction of Manholes and other appurtenant works.

On and after April 29th, 1912, Plans may be seen and Specifications, Quantities and Form of Tender obtained, at the office of the Engineer to the Council, Mr. Charles Turton, 6 High-street, East Grinstead, on deposit of Three Guineas in cash, which sum will be returned only on the receipt of a *bona-fide* Tender, which is not withdrawn before June 30th, 1912, and the return to the Engineer of all documents received.

The Council will not necessarily accept the lowest or any Tender, and persons tendering do so at their own risk and cost.

Tenders, endorsed "Groombridge Sewerage," must reach the Clerk to the Council, Mr. Francis S. White, 6 High-street, East Grinstead, on or before the 15th May, 1912, before 5 p.m.

FRANCIS S. WHITE.
Clerk to the Council.

6 High-street, East Grinstead.
April 23, 1912.

# The Surveyor

And Municipal and County Engineer.

Vol. XLI. MAY 10, 1912. No. 1,060.

## Minutes of Proceedings.

**Mutual Obligations of Adjoining Owners.**

Various questions have arisen from time to time as to the mutual rights and obligations of the respective owners of neighbouring land or houses. It is obvious that there are a thousand ways in which such an owner might (were he absolutely free to "do what he liked with his own"), by acts done on his own land, cause annoyance, inconvenience, or even danger to his neighbour's property or person. Accordingly we find that the law recognises certain self-denying obligations on the part of a landowner. So long as he uses his land for ordinary purposes, he will not, in the absence of negligence, be liable for damage resulting to his neighbour. But if he uses the land in a non-natural and extraordinary way (even though not necessarily noxious) he is as a rule liable for any substantial damage or inconvenience to the adjoining owner. To this rule, however, there are exceptions. A public body acting in the discharge of a public duty and without negligence is not liable for the inevitable outcome of its acts. And if a private owner is careful to provide against all results reasonably to be anticipated from his action, he will not be answerable for damage arising from causes beyond his control. If, however, what he does is necessarily noxious—such as the emission of a poisonous gas—then his liability is, *primâ facie*, unlimited. To quote from Mr. Justice Blackburn, in the leading case on this last phase of the subject: "The person who for his own purposes brings on his land and collects and keeps there anything likely to do mischief if it escapes, must keep it at his peril, and if he does not do so is, *primâ facie*, answerable for all the damage which is the natural consequence of its escape" (*Fletcher* v. *Rylands*, L.R., 3 H.L.C.C., 330).

The foregoing principles seem clear and simple enough, but difficulties sometimes occur in their application. For instance, where land is subject to flooding, and the owner by taking measures to protect it diverts the flood on to his neighbour's land, must he compensate the latter? This was the question in *Nield* v. *London and North Western Railway Company* (L.R. 10, Ex. 4), and it was answered in the negative, on the ground that every landowner has the right to protect his land against a common danger, leaving it to others to take similar precautions. A like decision was arrived at in the recent case of *Massey Drainage Board* v. *Great Northern Railway Company* (noted at p. 10 *ante*), where the company erected an embankment to protect low-lying land adjoining their line from periodical flooding. The result was that the diverted water flowed into a drain, burst the embankment and did injury to land belonging to the board; but it was held that the company were within their rights, and that no liability attached to them in respect of the damage, they having acted in a reasonably careful and prudent manner and used proper care and skill. This class of case, however, must be carefully distinguished from those in which land has already become flooded before any measures have been taken for its protection. When water has once come upon his land an owner cannot with impunity, by any act of his, divert it on to that of his neighbour. He may transfer an anticipated but not a realised misfortune. Thus, where owing to an abnormal rainfall water had accumulated against a railway embankment, and the company by trenches diverted it on to land of an adjoining owner, they were held liable. But their liability was limited to the extent by which the damage was increased, by the cutting of the trenches, beyond what it would have been had the water been left to percolate (*Whalley* v. *Lancashire and Yorkshire Railway Company*, 13 Q.B.D., 131).

* * *

**Extraordinary Traffic.**

An extraordinary traffic case of very great importance has just been concluded before Mr. Justice Channell. The plaintiffs, the Colchester Corporation, were suing the Essex Asylums Committee to recover the sum of £3,724, the amount of the extraordinary expenses incurred by the corporation in the repair of certain roads alleged to have been damaged by traction engines used in connection with certain building work at the County Asylum. The case was heard at considerable length and a great deal of professional evidence was given. The experts retained for the plaintiffs were Mr. H. Goodyear, ASSOC.M.INST.C.E., the borough surveyor of Colchester, Mr. E. Buckham, M.INST.C.E., the borough surveyor of Ipswich, Mr. H. Percy Boulnois, M.INST.C.E., and Mr. S. Stallard, ASSOC.M.INST.C.E., the county surveyor of Oxford; while Mr. H. P. Maybury, M.INST.C.E., the county surveyor of Kent, and Mr. H. Howard Humphreys, ASSOC.M.INST.C.E., gave evidence for the defendant committee. Mr. Justice Channell delivered a very full judgment, in which he found in the first place that the traffic in question was undoubtedly "extraordinary," being very great in weight. He further found that the roads which had been damaged were reasonably fit for the traffic that might have been expected upon them. The next question was as to whether the certificate of the surveyor, which is by the statute a condition precedent to an action to recover extraordinary expenses, was invalid. The learned judge found that the certificate was in order, in spite of the fact that the amount of the expenses mentioned in it was excessive. A more difficult question which had to be decided was whether the extraordinary traffic had arisen "in consequence of the

order" of the defendants. The position was that the contractor had by the terms of his contract indemnified the committee against any such claim. Nevertheless, the learned judge held that the defendants were liable inasmuch as the extraordinary traffic was a natural consequence of their action in erecting the building. In the result the corporation recovered £1,690.

The two points in the case which are of greatest interest to municipal engineers are those relating to the surveyor's certificate and the contractor's indemnity, and in regard to both we respectfully agree with the decision given by the Court. It is evidently practically impossible for a surveyor to mention the exact amount of the expenses attributable to the alleged extraordinary traffic in making his certificate. This being so, he is bound in the interests of his authority to mention a figure which will be sufficient to cover every possible contingency. In regard to the second point mentioned it would appear that the only effect of the indemnity clause in the contract is to give to the Asylums Committee a remedy over against the contractor. The highway authority cannot be expected to recognise any such arrangement, which would have the effect of depriving them of their right to sue the party responsible—*i.e.*, the party by or in consequence of whose order the injury to the road was caused.

* * *

**Quality of the London Water.**

It is a mistake to apply the teachings of a purely scientific investigation too practically. Our greatest scientists are the first to emphasise the limitations of laboratory experiments, and Dr. Houston is no exception to the rule; yet, making due allowance for these facts, it is impossible to escape a feeling of uneasiness on reading Dr. Houston's recent reports. We give elsewhere a review of his eighth report on research work for the Metropolitan Water Board, dealing with the softening, purification and sterilisation of water supplies in which an entirely novel method of purification is suggested, and to some extent advocated, for the London water. In reading this report and those which have preceded it one receives the distinct impression that Dr. Houston is becoming more and more uneasy about the quality of the London water, and that he is faced with a problem so grave that he hesitates definitely to advise the adoption of any particular process without first taking the Metropolitan Water Board, and incidentally the general public, into his confidence as to the gravity and difficulty of the task which has to be faced and the chances of a new method giving a satisfactory result. In these reports attention has been drawn to the fact that water of very inferior quality has to be passed through the reservoirs and on to the filters without receiving the storage necessary for purification. Pre-settlement of such waters was advised and coagulation was suggested in the seventh report. In the eighth report sterilisation by means of quicklime is considered for a considerable proportion of the water which is of bad quality.

It should be noted that the position of the Board is not satisfactory with regard to the future. They have not been granted powers to build their necessary reservoirs; their unrestricted right to draw water when its quality is at its best has been withdrawn; they have not obtained their new intake. Flood waters of inferior quality therefore have to be used, and Dr. Houston is "unable to support the view that the safety conferred by storage affords a sufficient pretext for the ill-considered abstraction of river water of most undesirable quality." This water under present conditions cannot be excluded, and Dr. Houston gives us a very distinct warning when he says: "I have urged again and again that this *specially impure* water should either be excluded from the storage reservoirs or *purified antecedently*." Obviously it is of pressing importance that something should be done. Dr. Houston's reports contain valuable suggestions rather than direct recommendations; in giving definite practical advice the engineering and financial details have first to be considered; but, without doubt, if the reports are to be taken at all seriously, it is clear that our present methods of water purification are incomplete and may become dangerously inadequate.

* * *

**Engineers' Prospects in Canada.**

Mr. R. O. Wynne-Roberts writes us from Canada an extremely interesting letter which may be accepted as a reliable indication of the possibilities for engineers who may be able to venture out to that country. Mr. Wynne-Roberts informs us that he has received a number of letters from engineers and others at home regarding appointments on the Regina water scheme—for which, as our readers are aware, Mr. Wynne-Roberts is the engineer. To all he has answered that under Canadian conditions it is quite impossible to offer anyone any appointment worth securing, because it cannot be assured that the engineer will adapt himself to the new conditions or be satisfied with the prospects. When Mr. Wynne-Roberts was at Capetown, he was sometimes disappointed that the imported men did not come up to his anticipations, and the men themselves were sometimes displeased, as the prospects were not what they expected them to be. Nevertheless, most of the men brought out proved themselves worthy of the confidence placed in them. Canadian authorities are "quite willing to pay for goods if they can be delivered," so if engineers are willing to risk crossing the Atlantic, and to take the rough and the smooth of life, their merits or demerits will be rewarded accordingly. There are plenty of works to be carried out this summer. Quebec Government has before Parliament a great scheme of roads construction involving an expenditure of £2,000,000. The Dominion Government has power to subsidise the provincial governments for roads construction. The Saskatchewan Government has just appointed a Highway Commission with authority to spend £1,000,000. The railway companies are laying hundreds of miles of new railways, more especially in the west. Every city is carrying out works of various kinds. Buildings are being erected in every direction; in short the amount of work that will in the near future be carried out between the Atlantic and the Pacific will be immense. The growth, due mainly to immigration, exceeds the capacity of every organised authority in Canada, more particularly in the west. All these works require draughtsmen, surveyors, engineers and workmen. But to any aspirant who proposes to visit Canada it should be made plain that the only royal road to success is to be energetic and persevering and to mind his own business. The tendency of newcomers into any new country is to criticise. Let them take Punch's advice—"Don't." It irritates, it is useless and inane. Hard work is a vastly superior emollient. "Take on," Mr. Wynne-Roberts concludes, "the first offer that fits with your engineering experience. Never mind the pay at the commencement; that will adjust itself as soon as the newcomer proves himself to be capable, reliable and resourceful, for opportunities are plentiful to such men."

* * *

**Engineers as Councillors.**

The wide difference which exists between American and British municipal administration is well illustrated by the recent appointment as mayor of Seattle, Wash., of a gentleman who for the past eight years has been an official in the City Engineer's Department. This appointment has inspired an article in a recent issue of our American contemporary *Engineering and Contracting* in which the writer points out the peculiar fitness of the experienced municipal engineer to occupy the position of head of a municipality. The article goes on to contrast the qualifications of the engineer for such an office with those of the "lawyer, business man, or politician," from one of which classes the

mayor of an American city is usually chosen. The presence of the politician becomes less desirable in view of the gratifying tendency to minimise the importance of party and faction in what is after all purely administrative as opposed to legislative work. Moreover, as the writer of the above-mentioned article points out, "city engineers are often unable to design and build public works according to their best judgment on account of interference with their plans by officious mayors and aldermen. This condition is responsible for much of the so-called poor municipal engineering in this and other countries. The remedy, in some cases at least, is the election of an engineer to the office of mayor."

The condition of affairs just referred to is not unknown in England; and the presence of one or two engineers as members of a council would in our view in many cases obviate the waste of public money on amateur schemes forced upon unwilling municipal engineers, and would also prevent a great deal of the friction and unpleasantness which is apt to arise from non-technical criticism of a department whose work is of a highly technical character.

* * *

**Rural Housing Conditions.**

The medical officer of health to the West Ward (Westmorland) Rural District Council in his last annual report points out the very serious insanitary conditions which exist in many rural cottages, and urges that in addition to requiring efficient ventilation and lighting, a minimum height of ceilings in old houses should be fixed. There can be no two opinions as to the deleterious effect on the inmates of a cottage who occupy a living or bedroom with a low ceiling. They are compelled, particularly in winter time when windows are kept shut, to breathe over and over again the foul air which has been expired from their own lungs. This important matter is one to which every local authority should have regard in discharging their duty of inspection under sec. 17 (1) of the Housing, Town Planning, &c., Act, 1909. It is perhaps unfortunate that the regulations of the Local Government Board under sec. 17 do not specifically mention low ceilings as one of the matters in relation to which the medical officer must examine the state of a dwelling house. It should be remembered, however, that the regulations do specify generally "any defect which may tend to render the dwelling house dangerous or injurious to the health of an inhabitant"—language which clearly includes inadequate height of rooms. We agree with Dr. Craven, the medical officer of health whose report is mentioned above, that the question of low ceilings is one in regard to which local authorities should exercise every power of prevention which they possess.

* * *

**The Exmouth Meeting.**

The South Western District Meeting of the Institution of Municipal and County Engineers held at Exmouth last Saturday was a gratifying success. The pleasure of those who were able to attend the meeting was considerably enhanced by the natural beauties of this charming South Devon resort, while the reception accorded to the members by the local authority left nothing to be desired. Mr. Samuel Hutton, the surveyor and water engineer to the council, read a most interesting paper entitled "Exmouth: a Decade of Progress in a Residential Seaside Town," in which he dealt more particularly with the work that has been accomplished in connection with the construction and maintenance of roads, sewerage, refuse disposal, pleasure grounds, and waterworks. The reading of this paper was followed by a discussion, in which many of the members took part, and after luncheon the party visited the waterworks, which are most picturesquely situated some eight miles from the town. A pleasing feature of the meeting was the interest shown by the members of the council in the whole of the proceedings, the chairman in particular not only remaining to listen to the comments of the members on Mr. Hutton's paper, but also presiding over the luncheon and accompanying the party to the waterworks in the afternoon. A unanimous vote of thanks was accorded to Mr. Hutton, to whom—apart from his excellent paper—much of the success of the meeting was due.

* * *

**Mr. Chambers-Smith and Sutton.**

We congratulate Mr. C. Chambers-Smith, formerly surveyor to the Sutton (Surrey) Urban District Council, upon the convincing testimony which has been paid to his personal and professional character at the complimentary dinner to which we refer elsewhere. Sutton has not been above reproach previously in its treatment of officials, and in this latest instance it has furnished an illustration, which will not be forgotten, of the burning necessity for some provision for security of tenure of office for those who are necessarily, on occasions, brought into conflict, if they conscientiously carry out their duties, with an individual employer. In such case the right and fearless exercise of duty inevitably makes an enemy who, if only pertinacious enough, can at least make an official's life so unbearable as to leave open no course but resignation, as in Mr. Chambers-Smith's case. The complimentary function referred to must be particularly gratifying to its central figure, especially as it was accompanied by an enduring presentation and by most laudatory speeches made by local representatives of standing with full knowledge of the details of the rights and wrongs of Mr. Chambers-Smith's long service, and the circumstances which led to its cessation.

* * *

**Mass and Bulk in Road Crusts.**

In our issue of March 29th, page 492, there occurs the following remark: "Mass in itself has a value in absorbing shocks, both *quâ* mass and *quâ* size . . . ." We have been asked by one of our readers to explain what we mean by this statement. It is worth some amplification, for it is not a mere piece of phrasing on our own part, but a reference to two basic and important facts which have an influence on design in almost every branch of engineering work. We have therefore prepared an article, which will be found on another page, in which attention is directed to the importance of mass in itself, using the word "mass" as it is used in the language of physics, and to the influence of bulk upon the degree of resistance which a suitably disposed material offers to the forces which it is intended to resist. Both principles are often, in their practical application, closely bound up with the matter of cost. If, for instance, we have a material with all the qualities desired in the wearing layer of a road crust, its actual value in a given case may depend upon whether we can afford to buy enough of it to make a crust of reasonable thickness, or to buy in addition enough of other suitable material to give it adequate support.

* * *

**The Late Mr. J. T. Eayrs.**

With profound regret we learn of the death on Wednesday evening of Mr. J. T. Eayrs, M.INST.C.E., F.S.I., formerly borough engineer of West Bromwich, a past-president of the Institution of Municipal and County Engineers, and since his relinquishment of official work a consulting engineer at Birmingham with an extensive practice. His demise will be a permanent loss to more than the immediate circle of family and friends, for he was known professionally to a very wide circle of engineers by reason of the active and influential part he always played in all questions affecting their interests. He was a shrewd and original thinker, a man of great personal charm and geniality of disposition, and—as we and many others whom he has assisted can testify—an unselfish and devoted friend. It may truly be said of him that "The light he leaves behind him lies upon the paths of men."

# Institution of Municipal and County Engineers.

## SOUTH-WESTERN DISTRICT MEETING AT EXMOUTH.

Although in the matter of attendance somewhat disappointing, the meeting of the Institution of Municipal and County Engineers held at Exmouth on Saturday last may fairly be said to rank as one of the most successful of the West of England gatherings of recent years. On assembling at the public hall, where the business proceedings took place, the members received a hearty welcome from the chairman of the district council, who afterwards presided at the excellent luncheon provided by the local authority, and in the afternoon accompanied the visitors on an inspection of the town's waterworks. Following the official welcome, the chair was occupied by Mr. A. D. Greatorex, the president, there being also present Messrs. C. O. Baines (Paignton), E. Carter, J. Carter H. T. Chapman (Somerset), D. Edwards (Taunton), H. A. Garrett (Torquay), W. Gorfin, S. Hutton (Exmouth), C. Matthews, J. C. Matthews, T. Moulding (Exeter), hon. district secretary, J. Paton (Plymouth), G. A. Phear, G. Pownford, E. Y. Saunders (Barnstaple), S. J. Shapley, J. Siddalls (Tiverton). R. Stephens (Chard), E. L. Sturdee, C. D. H. Vanstone (Paignton), F. W. E. Vanstone (Totnes), C. D. White (Newton Abbot), and J. Wilson.

The Chairman of the Council (Mr. H. Blackmore) said it was a great pleasure to him to welcome the members in the name of the local authority. Nature, he remarked, had done a great deal for Exmouth, and it was to men like those belonging to the institution to whom they looked to help them in making the most of its attractions. They had been obliged to embark on large and expensive schemes at Exmouth, but with the advice of level-headed officials they need have little fear of going far wrong. A surveyor who, if he were skilful, could hold his own, was a man of the right calibre, and was able to show what a town required, would receive every support. Of their own engineer and surveyor, Mr. Hutton, he could only say he had every credit for what he had done, and it was no exaggeration to say that he had made the town better than it was before he came to it.

The President, in acknowledgment, said that councillors, like officials, had their duties to perform, and as long as both worked together it must be to the advantage of a town. He was glad that the chairman of the council had spoken so well of the services of their surveyor. Those of them who knew him knew that he thoroughly understood his business, and it was satisfactory to learn that he had improved the town so much since he had been in Exmouth. Mr. Hutton read a paper at one of their annual meetings, and it was considered so good that it gained the premium of the institution. Proceeding, Mr. Greatorex said that was the first meeting which had been held since the death of the esteemed founder of the institution, Mr. Lewis Angell. Mr. Angell had earned the [illegible] respect of the members of the body which he was instrumental in forming nearly forty years ago, and his loss was regretted by all. Referring to the recent [illegible] the [illegible] the previous day, [illegible] represented the final stages of the work in connection with the alteration in the constitution of the institution, and it was his hope that no time would be lost by the committees in getting to work, and that the [illegible] would [illegible] to the body by which they [illegible]. His own view was that they had now a very good council, and everyone might look forward to some good work being accomplished. He must congratulate the South-Western District on their choice [illegible] Mr. Chapman the county surveyor of Somerset, as chairman, and Mr. Moulding the city surveyor of Exeter, as hon. district secretary. He knew Mr. Chapman would do his best for the district, and knowing [illegible] something of the energy which Mr. Moulding put into his work, he felt that the district was in good hands.

The minutes of the last district meeting held at Plymouth on September 30, 1911, were read and confirmed.

Among the letters regretting inability to be present at the meeting was the following from the Right Hon. [illegible]: "I am much obliged to the [illegible] for the kind invitation to their meeting on Saturday next. It would give me much pleasure were I able to attend, but unfortunately, I cannot, though I have recovered from my accident; so far as general health is concerned, my moving-about powers, though slowly improving, are still such as prevent my attending public functions. I have read your paper which you kindly sent with much pleasure. It plainly shows what I have noticed during my usual visits to my native place—that Exmouth is a thoroughly well-governed town, and its government to-day does great credit to the local authorities and to their official helpers and advisers. I hope the paper will be well circulated among the visitors to our beautiful town, who would be greatly interested in the work and progress described therein."

### EXMOUTH: A DECADE OF PROGRESS IN A RESIDENTIAL SEASIDE TOWN.

By Samuel Hutton.

Surveyor and Water Engineer, Urban District Council of Exmouth.

[Mr. Hutton was born at Pudsey, near Leeds, in 1875, and after completing his education at Fulneck School entered the offices of Messrs. Holtom & Fox, architects and surveyors, of Dewsbury, in September, 1890, as an articled pupil for five and a half years. He remained after his pupilage for one and a half years as assistant. During the seven years named Mr. Hutton had experience in various works to the extent of over £300,000, including, baths, hospitals, town halls, infirmaries, large estate developments, road-making, sewering, and so forth. In March, 1898, he was appointed deputy borough surveyor and water engineer of Dewsbury, and whilst in that office he prepared drawings, &c., for the tramways, electricity works, covered market, sewers, private street works, riverside road to Ravensthorpe, and the usual routine work. In September, 1900, Mr. Hutton was appointed principal assistant and deputy to Mr Creer, the city engineer and surveyor of York. During his stay at York large schemes were prepared, such as tramway and street improvements (£150,000), York Corporation Bill, 1901, new street near the Minster called Deangate many important street widenings, pleasure grounds, &c. Experimental work in the bacterial treatment of sewage was carried on continuously, and in this Mr. Hutton was responsible for important work. In January, 1905, he obtained his present position as surveyor and water engineer to the Exmouth Urban District Council. Since his appointment he has carried out many important works, viz.:—high-level waterworks, filters and reservoirs, extension of mains, &c., £12,000; destructor; sheds, disinfector, &c., £4,500; twenty-one road widenings, two reinforced concrete bridges, beach gardens and sea wall, extension and improvement of sewage system, including scheme for flushing middle level outfall, plans for marine drive and sea defence work, &c. Mr. Hutton is a Member of the Institution of Municipal and County Engineers (being elected an Associate in 1902), a Member of Institution of Water Engineers, Royal Sanitary Institute, and Concrete Institute. He obtained an Institute of Municipal and County Engineer's premium in 1910 for a paper on engineering works carried out by him, and is also a prizeman of South Kensington for architectural design.]

Situate at the mouth of the river Exe, and consisting of the two civil parishes of Littleham and Withycombe Raleigh, Exmouth claims a prominent place in the ancient history of Devonshire. Two Saxon settlements were said to exist on the site of modern Exmouth as far back as the early part of the eleventh century, and a well-known portion of Exmouth, "Bystock," was included in the great Norman Survey of 1086. From this date it appears to have gradually grown until Leland in his Itinerary of 1549 refers to it as "the fischer fonulet of Exmouth." From this period it [illegible] a port of some importance and supplied a goodly number of vessels to fight the

Spanish Armada. About 1680 shows its commencement as a health resort, and therefore it claims to be the oldest watering-place in Devon. Since the early part of the eighteenth century it has gradually grown until now it ranks as one of the principal resorts in the county.

PHYSICAL.

Exmouth is partially situated on a peninsula surrounded with water on three sides, and enjoys a remarkably equable temperature, together with the highest sunshine records in the county. The rainfall is extremely low (for Devon), the average being only 28in.

STATISTICS.

Population (1902) 10,489 (1901 census); (1912) 11,963 (1911 census). Area (1902) 5,295¼ acres; (1912) 5,295¼ acres. Rateable value gross (1902) £56,000, (1912) £69,000; nett assessable (1902) £51,202, (1912) £63,951. General district rate—district town wards (1902) 5s. 2d., (1912) 4s.; district rural (1902) 4s. 10d., (1912) 3s. 8d. Loans Outstanding Public Health Act (1902) £47,964, (1912) £41,160; Water Acts (1902) £84,558, (1912) £99,820. Roads—main roads (1902) 4 miles 4 furlongs, (1912) 4 miles 7 furlongs; district roads (1902) 50 miles, (1912) 52 miles 2½ furlongs.

It will be seen that the rates have decreased considerably since 1902, and that the amount allowable for borrowing under the Public Health Acts stands at present at £87,000, possibly a record for a town this size.

ROADS.

The roads in the district are typical of the county, the main road running right through the centre of the town; the outside district roads are in many cases narrow Devonshire lanes through most charming country. The cost per annum for maintenance only and tarring is £1,300 for district roads, £480 for main roads.

The advent of the motor car has necessitated much road widening work, and the author has carried out twenty-one improvements at a cost of about £3,500, all of which (except £700) has been provided out of rates. The greater part of the town district and main roads are tar-sprayed or tar-macadam. Tar-spraying works out at about ¼d. per yard super. for ordinary tar, and ¾d. per yard super for distilled tar.

Exact costs are kept, and the following is an example of work done from May 1 to June 14, 1911:—

Men employed, five; machine used, Johnson Bros.', with Wraithman brooms. Area covered, 72,292 super yds.; using ordinary tar—cost per yard super. in pence—tar, 0·29; labour, 0·07; teaming, 0·09; sand, 0·02; total, 0·47; area covered 10,250 super. yds.; using distilled tar—cost per yard super. in pence—tar, 0·487; labour, 0·125; teaming, 0·15; sand, 0·02; total, 0·782.

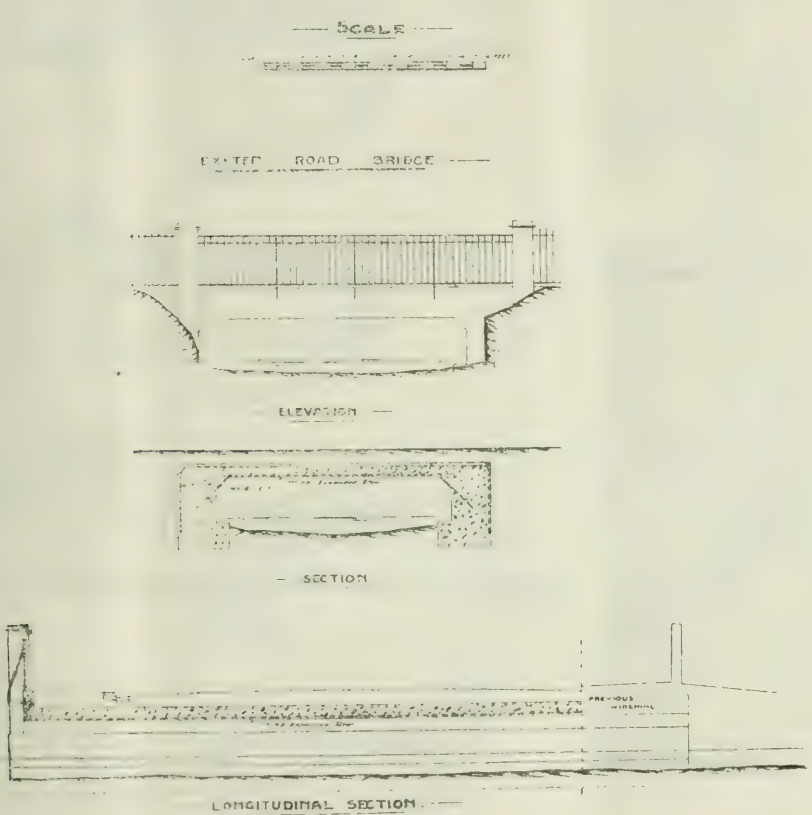
Grit for spreading on roads after tarring free at the beach. Area covered in twenty-two days equalled 3,863 yds. per day. Area covered per gallon, with distilled tar 6·17 yds. super.; with ordinary tar, 7·08 yds. super.

Tar-spraying has been done in Exmouth since 1904, and the results are excellent. The cost of road maintenance since 1904 has been reduced by £700 per annum.

The Private Street Works Act, 1892, is in force and usually two or three streets are under construction, generally by direct labour. The 1892 Act works very well in Exmouth, and during the author's tenure of office (nine years) not one penny has been irrecoverable.

BRIDGES.

There are many small bridges and culverts in the district which require keen attention. In order to meet the increased traffic it has been necessary to rebuild entirely two bridges on very important roads viz., Exeter main road and Withycombe road. These have been carried out during the past eighteen




REINFORCED CONCRETE BRIDGES, EXMOUTH.
(Plate I.)

months, and are of reinforced concrete, designed to carry a 20-ton traction engine. The details are as follows:—

Withycombe-road—width, 42 ft; square span, 18 ft.; skew span, 20 ft.; cost, £133. Exeter-road—width, 42 ft. to 50 ft.; square span, 18 ft.; skew span, 20 ft. 6 in.; cost £150.

The works were carried out by direct labour under the author's supervision. The details of cost of the Withycombe-road Bridge are as follows, and include pulling down the old brick arch structure. The concrete was composed of 4 parts beach gravel, 1 of granite chips, and 1 of Portland cement; the structure contains 102½ cub. yds. of concrete:

| | £ | s. | d. |
|---|---|---|---|
| Wages | 39 | 1 | 11 |
| Reinforcement and supervision | 38 | 16 | 4 |
| Cement, 23 tons | 32 | 13 | 5 |
| Chips, 31 tons | 7 | 7 | 3 |
| Teaming, including carting of gravel | 10 | 4 | 9 |
| 25 per cent gross cost of timber | 5 | 9 | 10 |
| Railing and stays | 8 | 6 | 1 |
| Tiles, clay for dam, nails, &c. | 2 | 13 | 1½ |
| Oil and sundries | | 4 | 10 |
| | £144 | 17 | 6½ |
| Less credit old material | 12 | 0 | 0 |
| | £132 | 17 | 6½ |

The gravel (102 loads) was free at the beach. Allowing for this, the structure can reasonably be claimed to be an economical one, and the author is of opinion that few contractors would care to carry out the work for the amount named. These two bridges are illustrated on Plate No. 1.

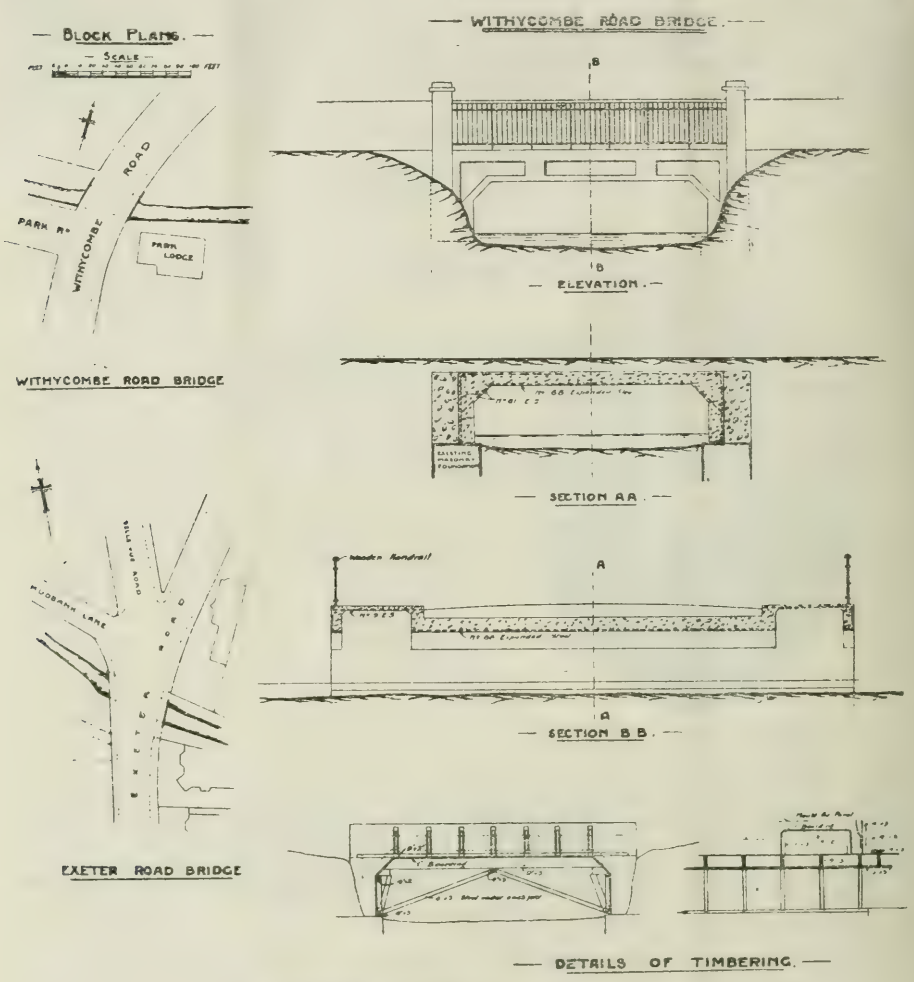
SEWERAGE.

The sewerage is on the combined system generally, though where possible storm water is carried into streams direct. There are three systems, low-level, middle-level and high-level.

The low-level system, which drains the lower portion of the town, about one-fifth of dry-weather flow, delivers to a pumping station containing three pumps, which are operated by two 5 n.h.p. and one 10 n.h.p. gas engines, lifting the sewage into the high-level sewer, which gravitates to the outfall in the channel.

The following are the particulars of pumping with working costs for a year: Pump and engines, two 5 n.h.p. engines and pumps used for dry-weather flow; gallons lifted, 39,095,300; height of lift, 37·35; length of lift, 580 ft.; gas consumed, 279,200 cub. ft.; total cost of gas at 3s. 5d. per 1,000, less 15 per cent, £40 10s. 10d.; cost of gas per 1,000 gallons in pence, 0·277; cubic feet of gas per 1,000 gallons, 7·956.

No. 1, 10 n.h.p. engine and pump used for storm water; gallons lifted, 4,270,327; height of lift, 35·35; length of lift, 574 ft.; gas consumed, 31,300 cub. ft.; total cost of gas at 3s. 5d. per 1,000, less 15 per cent., £4 10s. 11d.; cost of gas per 1,000 gallons in pence, 0·255; cubic feet of gas per 1,000 gallons, 7·33; total cost per 1,000 gallons, including wages and maintenance, 0·848d.



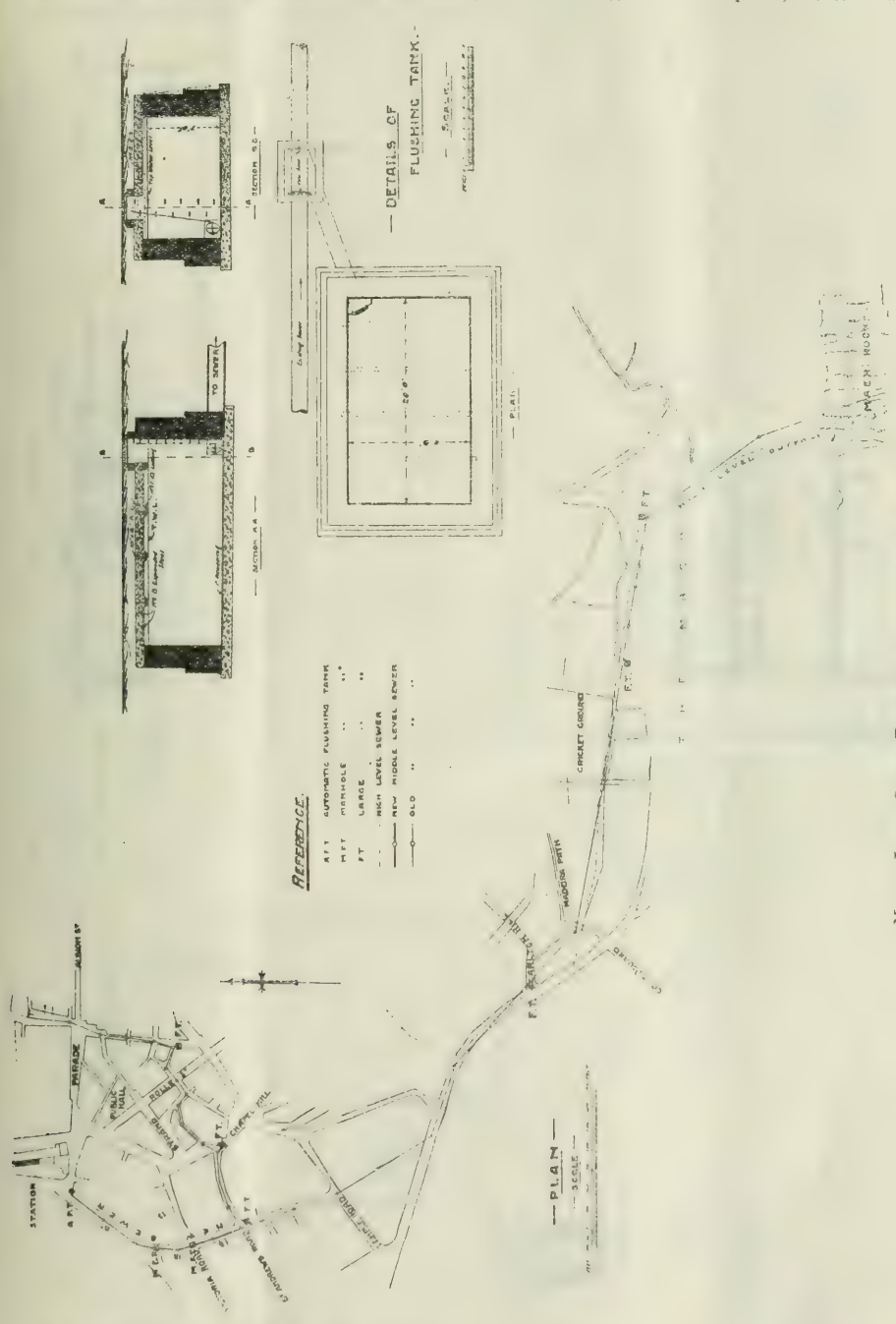

Reinforced Concrete Bridges, Exmouth.

(Plate 1.)

The low-level and high-level systems are entirely modern, and were designed by James Mansergh, Esq., and completed in 1902.

The middle-level sewer (two-fifths of the dry-weather flow), except for a short length, is some thirty years old, and has been more or less a worry and trouble since it was laid. The attempt to drain the whole of Exmouth by gravitation was a mistake, and frequent flooding occurred. The town muddled through until the new system was brought into use in 1902, and has since been practically free from flood.

It was hoped by Mr. Mansergh that when a certain district was transferred to the pumping zone the existing outfall by gravitation would serve for the middle-level district. This hope was never fully realised, and considerable silting up occurred, and until the author relaid certain lengths of this outfall sewer, and placed large flushing tanks (10,000 gallons capacity) at different points, the sewer was far from satisfactory. The flushing arrangements for this sewer are somewhat unique, and the Sanitary Committee for a time took some persuading to undertake the work. The late medical officer (Dr. Eaton) and the author persistently pressed the proposals, until the council agreed to apply to the Local Government Board for a loan to carry it out.




Middle-Level Sewer Flushing Arrangements, Exmouth.
(Plate 2.)

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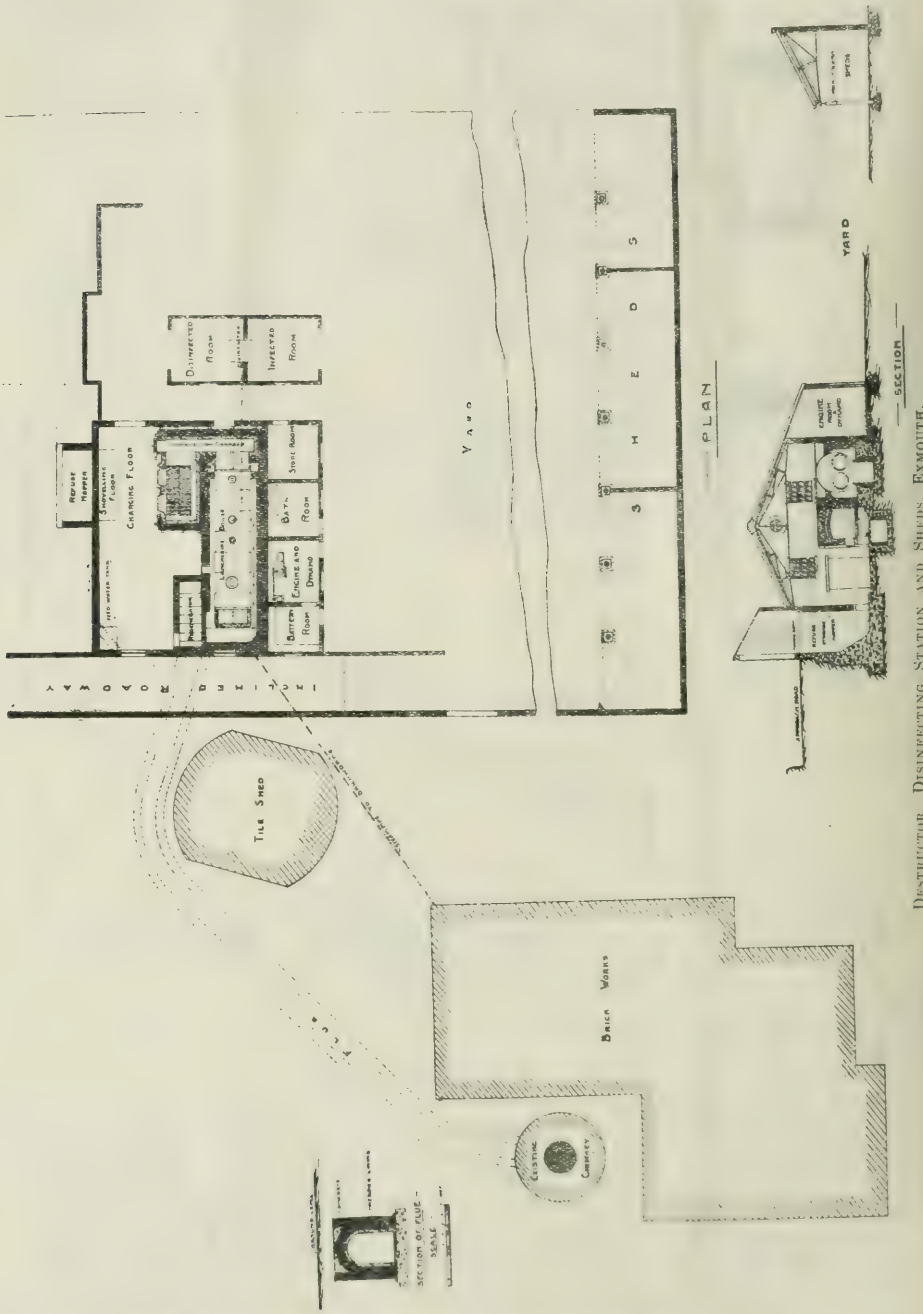
There was considerable opposition, but, as the author put it to the inspector, the only alternative (with which the author did not agree) was another pumping system, to cost about £10,000; the board agreed to the council's proposals entirely, and gave the sanction for a ten years' term as applied for. The cost was about £800, the large flushing tanks

at Maer Rocks, a little inside the Fairway buoy, and the discharge is at all tides.

REFUSE DISPOSAL.

The house refuse is collected by the council's own staff, and disposed of by a refuse destructor, situate close to the railway line, about ½ mile from the



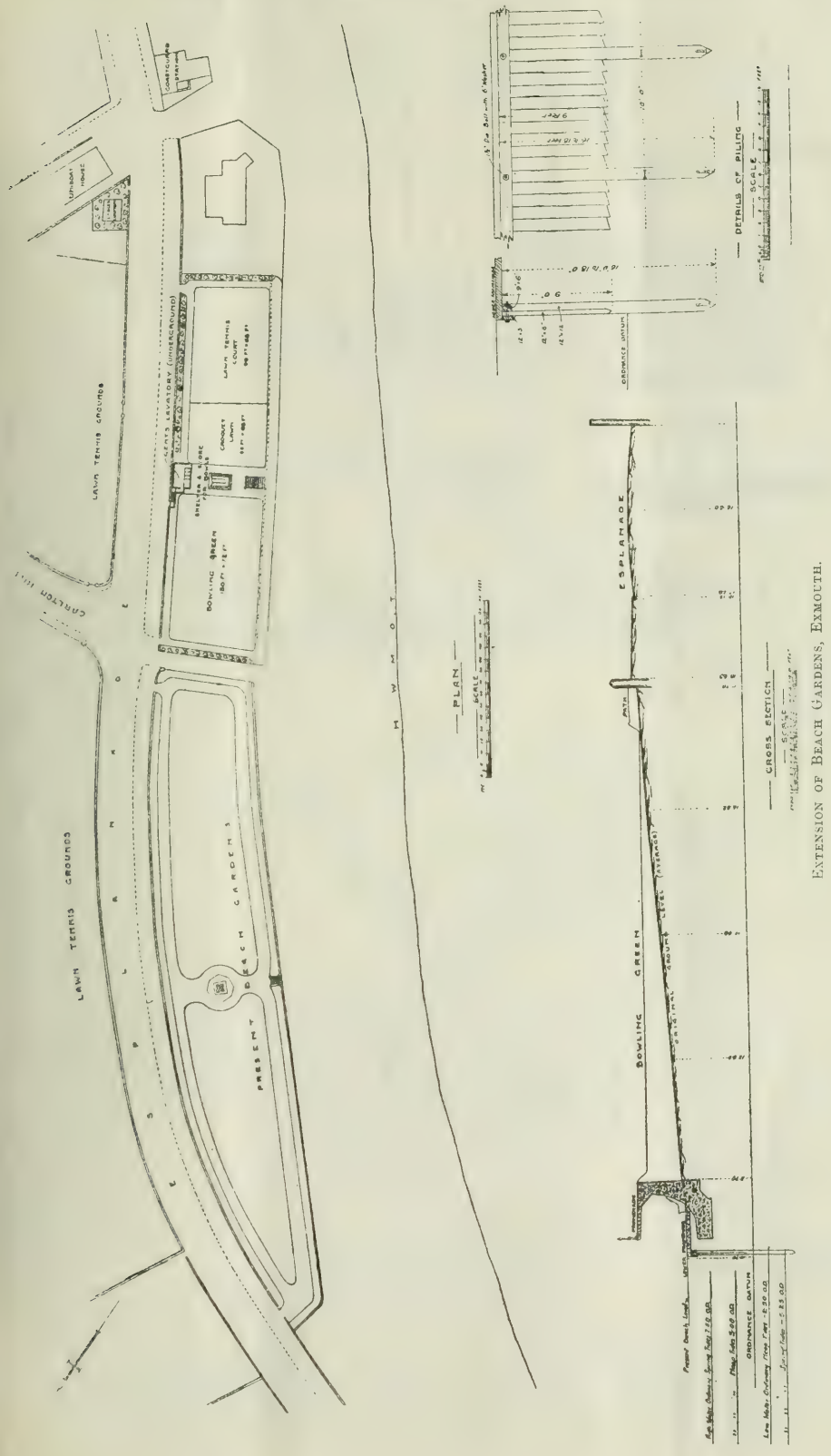

Destructor, Disinfecting Station and Sheds, Exmouth.
(Plate 3.)

costing £75 each. The arrangements of these tanks is shown on Plate No 2. They are operated by hand, working inwards from the outfall, as the varying tides do not permit automatic flushing at certain levels. The scheme has been an unqualified success, and a distinct saving of over £9,000.

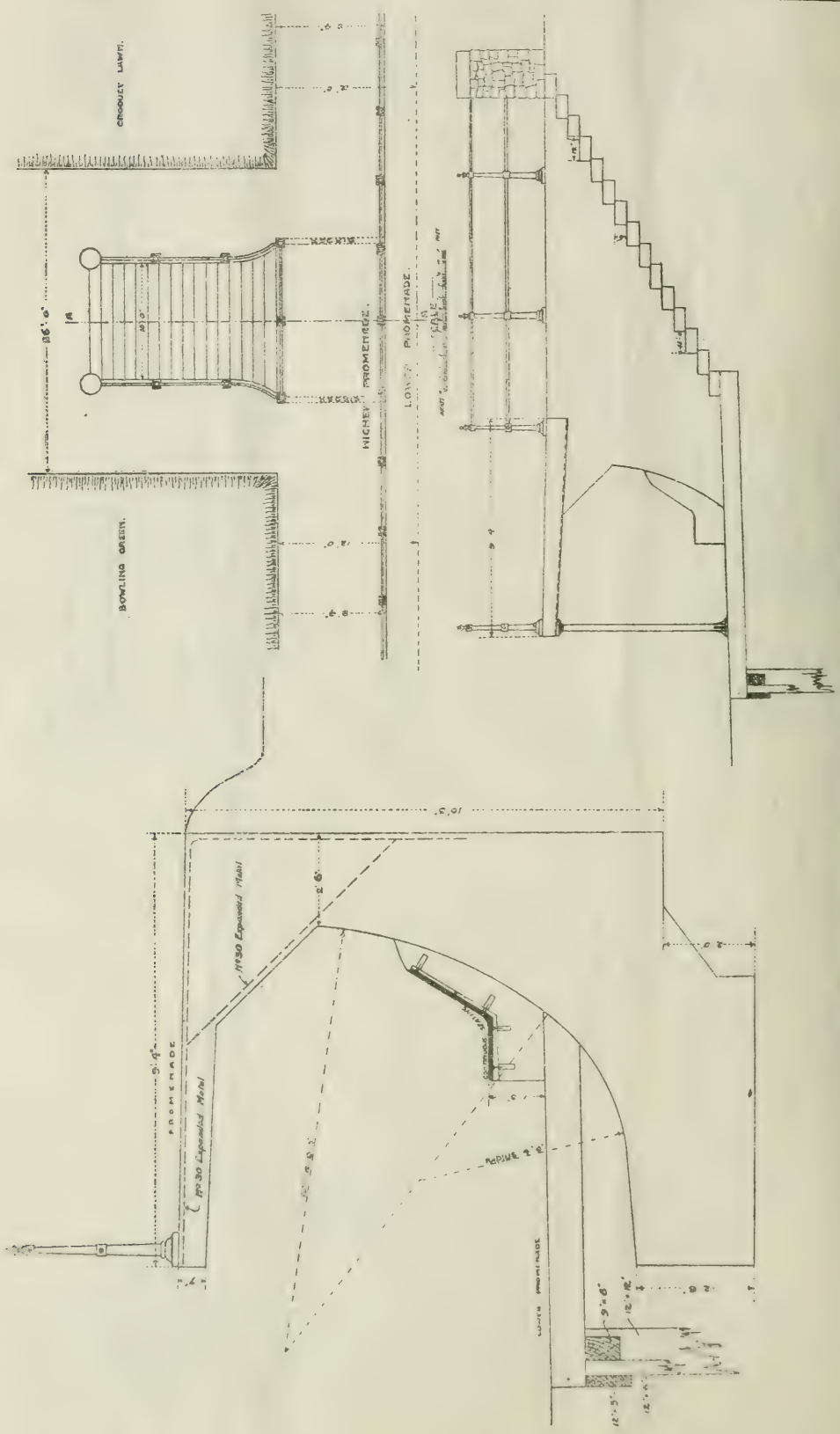
The whole of the sewage is discharged into the sea

station. The plant was completed in March, 1908, and the general arrangement of the destructor as shown in Plate No. 3. It is a Meldrum two-cell front feed. This method of feed, especially for a small plant, is, in the opinion of the author, the most satisfactory. The capital cost was £3,000.

The plant is exceedingly efficient, and though the




EXTENSION OF BEACH GARDENS, EXMOUTH.
(Plate 4.)

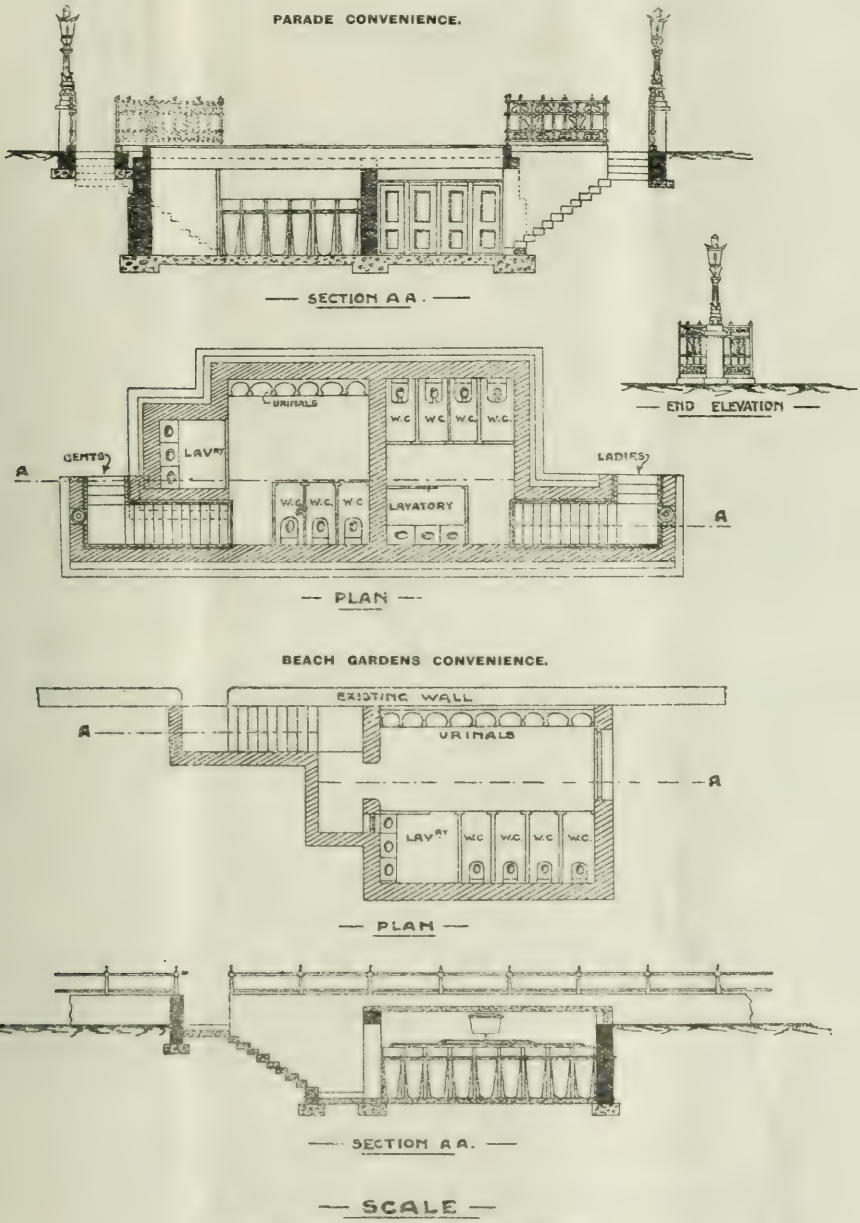



Beach Gardens Extension, Exmouth: Details of Sea-Wall and Steps to Beach.
(Plate 6.

refuse is light and of poor calorific value, yet, as the residue (a clinker) is only 16 per cent, it proves that the combustion is carried out effectually. The plant is run ten hours a day for five days, six and a-half hours on Saturday, and banked overnight and week-ends; it is therefore run at only about 40 per cent of its full capacity.

works engine is very old and very inefficient, and consumes about 60 lb. of steam per horse power per hour.

The steam for the destructor is connected with the engine at the point shown, and so arranged that the brickwork boiler can supply steam along with it, or each separately, as required.




Underground Conveniences, Exmouth.

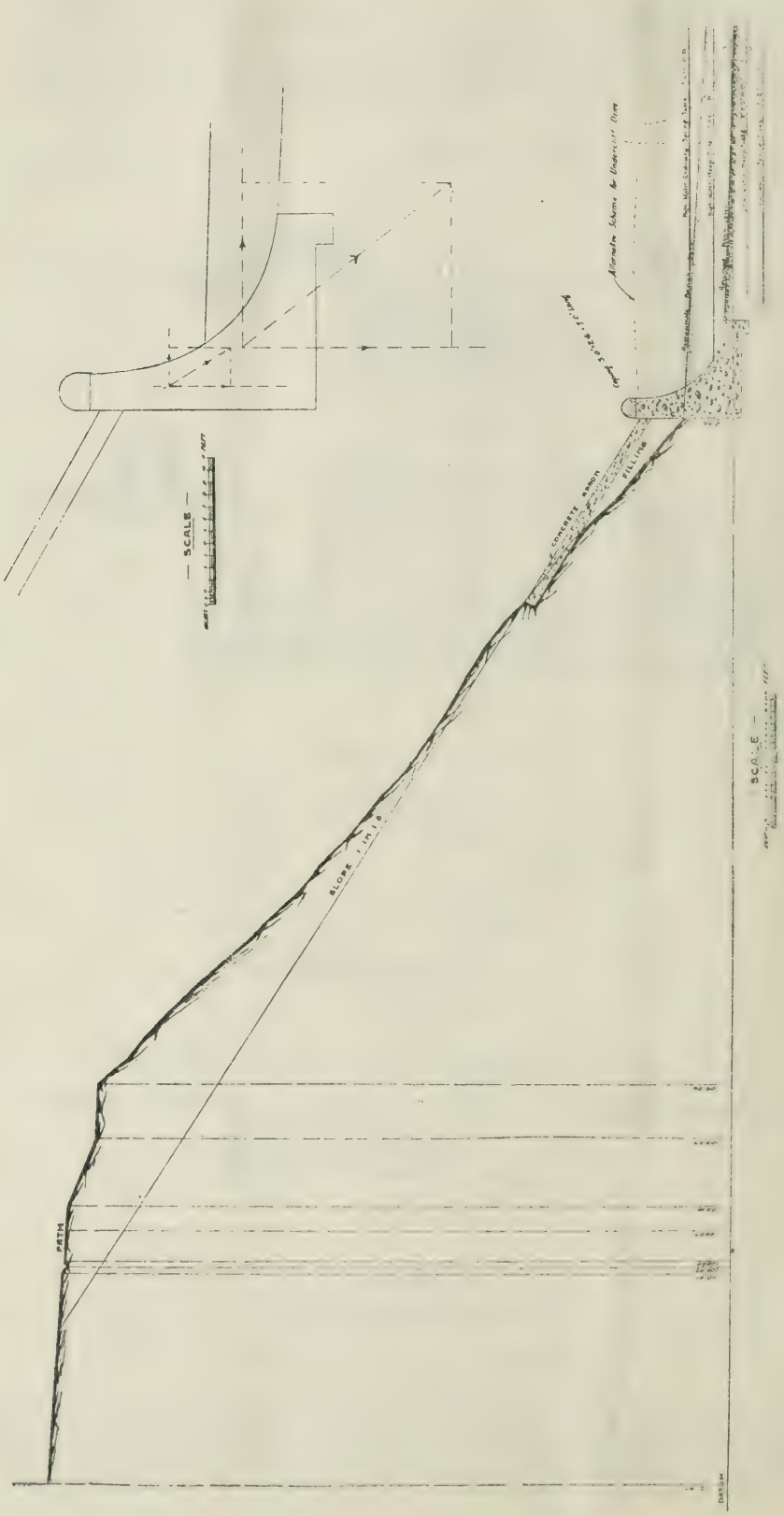
(Plate 6.)

The surplus steam is used for the steam disinfector, electric light for the works and sheds, and for driving the brickworks engine and machinery adjoining. The machinery is capable of turning out 4,000,000 bricks a year, and is run by destructor steam from five to seven hours each day. The brickworks engine is very old and very inefficient, and consumes about 60 lb. of steam per horse power per hour.

The steam for the destructor is connected with the engine at the point shown, and so arranged that the brickwork boiler can supply steam along with it, or each separately, as required.

The receipts from this source are 5¼d. per hour—totally inadequate—but the best terms the council could make. The brickwork plant breaks down regularly, and on very wet days stops, and the destructor has to blow off steam until they are ready for work.

The particulars for the year ending March 31, 1911,




CLIFF PROTECTION SCHEME, EXMOUTH.
(Plate 7.)

are as follows: Refuse destroyed, 3,660 tons; clinker, 600 tons, or 16 per cent.

| *Expenses:—* | £ | s. | d. |
|---|---|---|---|
| Oils, materials, &c. ... | 27 | 5 | 0½ |
| Wages ... ... ... | 135 | 12 | 0 |
| Insurance, rates, &c. ... | 12 | 19 | 3 |
| | £175 | 16 | 3½ = 11·54d. per ton. |

| *Receipts:—* | £ | s. | d. | | | |
|---|---|---|---|---|---|---|
| Clinker ... | 30 | 18 | 4 | | | |
| Steam ... | 25 | 5 | 0 | | | |
| Scrap tin, &c. | 15 | 7 | 1 | | | |
| | | | | 71 | 10 | 5 = 4·67d. ,, |
| Nett cost ... ... | | | | £104 | 5 | 10½ = 6·85d. ,, |

PLEASURE GROUNDS.

The pleasure grounds are Manor Grounds, 4 acres; Strand Enclosure, 1½ acres; Beach Gardens, 1½ acres; Phear Park, 16 acres; Beach Gardens extension, ¾ acre—a total of 23½ acres.

Phear Park was laid out and presented to the town in August, 1910, by the family of the late Sir John Phear, a prominent figure in Exmouth public life for many years. The author carried out the work of enlarging the Manor Grounds to its present area, and also the Beach Gardens, and is now engaged upon its extension. This extension will complete the scheme for sea-front gardens, and is certainly work of an interesting nature.

The new sea-wall is to form a promenade and shelter, and is designed on the cantilever principle, as shown in Plates Nos. 4 and 5. The calculations are based on a promenade load of 2 cwt. per foot super.

There will be no support to the outer edge of the upper promenade, except at the steps, where it is not practicable to cantilever from the wall. Wind screens will be placed at intervals, and, though only 100 yds. long, it will possibly be somewhat unique in sea-wall construction. The estimated cost of this wall is £710, and will, so far as the author can see, be carried out for that amount.

The timber for piling is red deal, and creosoted with 10 lb. of oil per cubic foot of timber. The timber is weighed both before and after creosoting to check the weight of oil forced in.

The whole of the scheme is estimated to cost £1,250, and includes sea wall, laying out, shelter, and underground conveniences for men.

NEW STREETS AND BUILDINGS.

The Model By-laws are in force, and examination of plans and inspection of buildings is carried out by the surveyor's department. On the average building to the extent of £20,000 is carried out in a year.

PUBLIC CONVENIENCES.

Public conveniences are provided in certain parts of the town; they are, however, not equal to the demand, and the author has placed a report before the council on the question of further provision being made. An underground convenience for men is being constructed in connection with the Beach Garden extension, taking the place of the existing above-ground structure, which is extremely unsightly.

In the new convenience nine urinal stalls, four water-closets, and three lavatory basins are provided; the work is being done by direct labour, and will cost about £160; the doors of the present water-closets are to be refixed, as well as the roof lights; otherwise everything is new. Plate No. 6 shows the arrangement of this, and the proposed convenience at the Parade.

SEA DEFENCE.

The owner of the foreshore and beach is the Right Hon. Lord Clinton, and he is responsible for the sea defence alongside the main promenade.

Erosion and subsidence of the cliffs and beach has been very considerable during the past eighteen months, destroying entirely the commencement of the charming cliff paths. The council are responsible for the surface of the path, but disclaim responsibility for the protection of the cliff supporting the path. The author has reported twice on the subject of protection, and submitted to the council a design of a sea wall (see Plate No. 7), to cost about £12 10s. per yard run, and for sloping back the cliffs to angle of repose—say of 1 in 1½. To protect the whole length would cost about £12,000. The council immediately referred the report and scheme to Lord Clinton. His lordship has also had a report and scheme from Mr. W. T. Douglas, M.INST.C.E. In general design it coincides with the author's suggestions. At present the matter is awaiting the decision of Lord Clinton.

Near the sewer outfalls erosion of the sand banks has exposed the manholes and placed the sewers in danger. The author, after the extreme gale and high seas of December 18th last (when all the damage was done), immediately placed around one manhole a retaining wall, and built up a breakwater of concrete in bags around another. This has been very effective, but it is feared that considerable further expenditure will have to be incurred, as the erosion continues every spring tide.

TOWN PLANNING.

A preliminary town plan on the 6-in. scale, along with a report from the author, has been submitted to the council, but further consideration is deferred for the present. Part of the town is already developed on good town planning lines, but this is only a high-class residential district. A properly developed town plan must provide for all classes of property.

The town is practically surrounded by roads upon which excellent highways could be developed, and in many ways the district is one which forms an excellent opportunity for developing a large district of exceptional beauty on good lines.

WATERWORKS.

A paper was read by the author at the annual meeting at St. Pancras in June, 1909, in which the existing waterworks were fully dealt with, and it is not his intention to say much under this head, except that the supplementary supply (to be used only when the gravitation works fail) foreshadowed in the paper has become an accomplished fact, and the works are to be visited after the reading of the paper. A short description of the new works is as follows: They are situated at Dotton, eight miles north-east of Exmouth.

The works carried out consist of borehole varying in diameter from 25 in. to 7 in., 338 ft. deep, pumping station, pipe line (rising main) 4¾ miles long to Squabmoor, and reservoir 4 miles north-east of Exmouth.

The pumping plant consists of suction gas engines in two units, each of 62 b.h.p. on anthracite coal; three-throw ram pumps in two units to lift from suction tank to Squabmoor.

The air lift plant is in duplicate to force water from borehole to suction tank.

The duty of pumps is for each unit to lift 18,600 gallons per hour against a head (including friction) of 290 ft., through 4 miles of rising main, coal consumption not to exceed 1 lb. of anthracite coal per b.h.p., coke consumption 1½ lb. per b.h.p.

*Borehole.*—The borehole is of a total depth of 338 ft., and varies in diameter from 25 in. at the top to 7 in. for the bottom 7ft.; it is made through varying layers of sand, gravel, and new red sandstone until it reaches the pebble beds, into which the bore is taken 36 ft. The construction was tedious, the principal delay being the loss of a tool for many weeks in the bottom of the bore. Many other minor difficulties arose, but eventually the pebble beds were reached after nearly ten months' work. The pumping test showed remarkable results, and there is available for use at least 1,000,000 gallons a day if required.

The borehole is lined for the first 50 ft. down with plain steel tubes, and, with the exception of about 35 ft. near the bottom, the rest of the lining tubes are perforated.

The cost of the work is as follows:—

| | | £ | s. | d. |
|---|---|---|---|---|
| Borehole | Carriage of plant ... ... ... | 40 | 0 | 0 |
| | Boring of various sizes, 338 ft. deep... | 643 | 14 | 8 |
| | Lining of borehole ... ... ... | 647 | 14 | 0 |
| | Pumping test ... ... ... ... | 231 | 14 | 0 |
| | Sundry items ... ... ... ... | 42 | 12 | 0 |
| | Supply of about 3¾ miles of 12-in. main and 1¼ miles of 9-in main with valves and washouts ... ... | 5,532 | 0 | 0 |
| | Laying of pipe line ... ... ... | 1,623 | 8 | 0 |
| | Engine house and approach road ... | 1,472 | 1 | 1 |
| | Supply of pumping machinery, air-lift plant, including small pumping plant at Dotton Farm ... ... | 2,852 | 12 | 0 |
| | Venturi meter ... ... ... | 182 | 4 | 0 |
| | | £13,267 | 19 | 9 |
| | Other items, as engineering fees, legal expenses, clerk of works' wages, will amount to, say ... ... ... | 1,250 | 0 | 0 |
| | Total cost (approximate) ... | £14,517 | 19 | 9 |

The whole of the land and wayleaves have been given free by Lord Clinton, the owner of the property through which the works are carried. The consulting

engineers for the scheme are Messrs. G. H. Hill & Sons, Westminster and Manchester.

CONCLUSION.

The foregoing illustrates the varied work that has to be undertaken now by the average municipal engineer and surveyor, and though the schemes under review are comparatively small, yet the engineering principles involved and problems to be solved are quite as great as much larger works.

The author takes this opportunity of expressing his indebtedness to the members of his staff, Mr. J. C. Matthew, ASSOC.M.INST.C.E., and Mr. G. Ponsford, for the great assistance rendered in the preparation of the paper and plates.

## DISCUSSION OF MR. HUTTON'S PAPER.

Mr. E. Y. SAUNDERS (Barnstaple), referring to the author's statement as to the cost of maintenance and tarring of main roads, inquired whether the whole of the £480 was obtained from the county council; also whether anything was allowed for widenings of main roads.

Mr. H. T. CHAPMAN (Somerset County) said he would like to take the opportunity of acknowledging the honour the members had conferred upon him by electing him chairman of the South-Western District. He would do his best to promote the interests of the district. It was too early yet to put forward any programme or indicate any line of action, but meetings would be held in due course to discuss various matters. He noticed the cost of main roads was put down as £480 for 4 miles 7 furlongs, which worked out at about £98 per mile. He would like to know whether the county council allowed the whole cost of the main roads, including scavenging. In regard to tar-spraying, it would be interesting to know the prices of ordinary and distilled tar, no mention of which was made in the paper. The cost of the tarring was extremely low, but it had to be remembered that Mr. Hutton got his shingle practically at the cost of haulage. Then the area covered per gallon was rather high—7·08 yds. super. He wished to know whether there had been any accidents due to the surface tarring; one thoroughfare in the town (Rolle-street) had a somewhat high camber. He was interested in the Withycombe-road Bridge, and he had one or two questions with regard to it. What size was the aggregate of beach gravel used for reinforcement broken to? also, what make of cement was used? The price of the cement—28s. 6d. per ton—was very low. As to the timber, the gross cost of that also seemed very low; it must be the wastage on the material. (Mr. HUTTON: Yes.) He would like to know what was done when the bridge was being built; was it closed to traffic and a temporary bridge built? The paper stated that 102 loads of beach gravel were free; what was the cost of the concrete per cube yard?

Mr. J. PATON (Plymouth) proposed a vote of thanks to Mr. Hutton for his paper. They must all agree that a great deal of very useful information had been given to them. Personally he knew Exmouth from the fact that he came there occasionally to spend a few days' holiday, and he had been struck when on his visits there by the excellent methods adopted in cleansing and in the sanitary arrangements. The streets were excellently kept, and all the other services appeared to him to be just as well ordered. There was another point which had struck him in reading this paper, and that was the system they had adopted of doing most of their work by direct labour. He thought they were right in that direction. It was difficult often for surveyors to get their councils into line to do many of these works which Exmouth was doing by direct labour. Private street work was particularly work which ought to be done by the authorities themselves. Streets had to be taken over and maintained afterwards as highways, and it was essential that the roads should, in the first instance, be so made as to last a number of years without coming a charge upon the rates. Mr. Chapman had referred to one matter which had also struck him as being particularly low, that was the cost of tar-spraying. The tar-spraying he had done had cost him considerably over 1d. per yard. However, they appeared to have got a happy knack of doing it at a very low rate in Exmouth. He was quite sure in visiting the smaller towns and viewing the work carried out by the surveyor and engineer to the authority one could not help feeling that they had their difficulties even to a greater extent than the engineers of larger authorities. In large towns they had a high rateable value to draw upon, and they could deal with schemes with a freer hand and a bolder way than they could in the smaller towns, where probably £100 or £200 meant a 1d. rate. He did not know what a 1d. rate meant in Exmouth. (The CHAIRMAN: £230.) That being the case the engineer had always to bear in mind that he must, consistent with proper design and good work, bring forward a scheme at low cost, and, having regard to that, greater knowledge and skill was required than in some of the larger schemes. The author had drawn attention to that point in the last paragraph of his paper, and to that extent he agreed. He thought the authorities of Exmouth were to be congratulated upon the excellent work done by their engineer, and he was pleased to hear—as he had heard previously—that his services were highly thought of by the local authorities and the public generally of the town, and there was that excellent feeling existing between the officers of the council and the town itself which tended so much to the benefit of the public service.

Mr. H. A. GARRETT (Torquay) said he rose with very great pleasure to second the vote of thanks so ably proposed by Mr. Paton. He (the speaker) came from a sister health resort, and they were rather jealous of their sunshine record. Mr. Hutton claimed that Exmouth enjoyed the largest number of hours of sunshine, but he thought the author of the paper might add the actual figures for the purpose of reference. (Laughter.) It was very satisfactory to the ratepayers when they were working on a decreasing rate. Having regard to the decrease which had occurred since 1902, he would like to know whether the basis of assessment was the same now as then, or had there been a revaluation. On the matter of roads, he would like to know what the words "maintenance only" covered. If only road repairs, he was satisfied, but if it was to cover all other contingencies it was rather a low figure. With regard to the tarring, it would be just as well, in arriving at the cost of the tarred roads, to add the estimated value of the shingle used. Otherwise it might be misleading to the authorities of other places which had to pay something like 5s. per load for the shingle. Since 1904, when tar-spraying was adopted in Exmouth, the cost of maintenance had been reduced by £700 a year—a very considerable amount indeed. He congratulated the town on the way in which it was kept. They had gone in for tar-painting everywhere in Exmouth; it was a splendid system of dust prevention, and saved a great deal in the cost of road repairs. In Torquay, however, he was somewhat handicapped in this connection, owing to the hilly nature of the town, and was obliged to watch every inch of road on the heavy gradients. By adopting direct labour for a good deal of their work Exmouth had done the right thing, for it made them independent of contractors. Mr. Hutton's concluding observations were interesting, and he agreed with him that the engineering principles and problems to be solved in the smaller towns were of equal importance to those in the larger places.

Mr. CHAPMAN remarked that there was one other question he would like to ask—that was the extent to which the cost of his scavenging had been reduced in consequence of tar-spraying, and whether the amount of street watering had been diminished and therefore the cost of it.

Mr. GARRETT asked, in connection with tar-spraying, the wages per hour paid to the workmen.

Mr. SAUNDERS asked whether trade refuse was taken.

Mr. D. EDWARDS (Taunton) said he noticed that the waste heat from the destructor was used for supplying steam for the disinfector, electric light for the works and sheds, and for driving the brickworks engine and machinery adjoining. In the expenses there was nothing put down for coal, although there was a certain amount of coal used for the damping down every night. He would like to know whether any coal was used for the purpose of increasing the heat. He knew destructors which had been put up for creating heat and it failed to pump sufficient water for their own boilers. He did not know whether they found that in Exmouth. With regard to the sunshine, he was glad to see a certain amount of rivalry between different seaside resorts.

Mr. J. SIDDALLS (Tiverton) said he wished to emphasise the fact that Mr. Hutton was in a most advantageous position as regarded his tar painting. At Tiverton they had to pay 7s. 6d. per ton for all their sand, that raised their price to 98 of a penny per

yard. There must be some cost in connection with the sand at Exmouth, as there was the carting.

Mr. HUTTON: It is included—labour and teaming.

Mr. SIDDALLS said he must join in the eulogies of the way in which the streets were kept. Since Mr. Hutton had been there he had greatly improved the streets in that respect. He had gradients in Exmouth, though not so steep as Torquay. What was the maximum gradient Mr. Hutton was able to tar? The surfaces of the streets in Torquay and in Exmouth were very largely different owing to the different kinds of material used. It would be very interesting to know what were the gradients it was safe to tar. They were all in the same trouble. If a horse came down it was attributed to the tar; if there was no tar he did not know what the owners of horses would do.

Mr. R. STEPHENS (Chard) asked what material was used for the roads.

Mr. GILBERT PHEAR said he belonged to the Public Works Department of India, and in the roads and buildings part their work was very similar to that of the municipal engineer of this country. He had read Mr. Hutton's paper with very great interest, and he hoped from the discussion he would be able to pick up some crumbs of information. Their conditions were very different, their climate was different, their materials were different, and their labour entirely different, and they were very much handicapped in not getting the material they had here in England. In concrete work the price of the cement was so high that they could not use concrete at all except with big and expensive works. It works had to be carried on they had to import the concrete from England. As regarded the beach extension wall, did they intend to use any waterproofing medium in their concrete, because it seemed to him there might be some trouble from dampness through the wall from the earth behind and interfere with the comfort of the people who had to use the seats below. He was speaking from their experience in India, where their rainfall was very heavy. He would also like to ask as to the method of laying the concrete in the sea wall, and whether they intended to use any netting or anything like that to prevent children falling over the edge.

A Member asked the cost of cement in India.

Mr. PHEAR said he did not know that he could tell that. They imported it in barrels, and it worked out up country at 15 rupees 8d. per barrel, 14 cwts.

The PRESIDENT said he would like to associate himself with the vote of thanks. The paper was full of interesting facts, and would form a record to be added to the volume of the institution which would be found of the utmost importance as referring to towns such as Exmouth. There was no doubt it was necessary that they should have a good water supply, a thorough good system of drainage, and that they should keep their town thoroughly clean and provide for all the comforts of visitors. The question of tar-spraying seemed to have been the debatable point. There it was necessary to consider the various factors which made up the total amount. He could not in his town get tar-spraying done for less than 1½d. per yard. They had to pay for all the gravel and sand they used, heavily in some respects. They could not compare the expense of roads except they went into all the questions of traffic and so on.

Mr. HUTTON, in reply, said he was asked by Mr. Saunders what proportion of the cost of main roads he had got from the county council. For the last seven years he had got within £10 of what they had cost him. Practically the county paid for the whole of the main roads, maintenance, scavenging, and everything. They had got a contract with the county for £610, and it was in the form of an agreement. If they carried out the work for less they gained by it; if it cost them £620 the next year they averaged it. They had nothing to grumble about so far as their main roads were concerned. He collected traders' refuse at 1s. 6d. per load, or destroyed it for nothing if taken to the destructor. That was very little, not more than six loads a year.

A Member: As to the cost of main roads for widening purposes. How is it calculated?

Mr. HUTTON replied that he got one-third for property and one-half for the actual engineering work. The £480 for main roads was the actual maintenance, the difference between £480 and £610 was in respect of watering and scavenging. The cost of sand ran was 9d. per gallon and he had had tar 3d. As regarded the camber of the road, that was the one thing he objected to in Exmouth. When they began to make the roads they did so in accordance with the Model By-laws. With a high-camber road the traffic went in the middle of the road, the wear was in the middle, and all the repairs were there, with the result that the camber was further increased. He was making 29-ft. roads, with a 6-in. rise in the centre, and he would not have to increase the camber on that, as the traffic would be on all parts of the roads. For the work at Withycombe-road Bridge the gravel varied from inch to pea size, with a good deal of sand. The cement was the best Portland—J. B. White—at 28s. 6d. per ton. The £5 allowed for timber was the actual loss on the work. The bridge was closed for traffic; there was a private road which the owner allowed him to use by arrangement. The cost of the concrete, without reinforcement, worked out at about 12s. 6d. The cost of scavenging had certainly been reduced. It was no greater now than it was nine years ago, and since then they had put up 600 or 700 houses. With regard to watering, previously he had used four water carts, but only used one now for the roads he was unable to tar. He had been stopped taking grit from the foreshore, and, having been obliged to buy a quantity of chippings, the cost of the work had been slightly increased; but he could still easily keep below the figure of 1d. He used Wraithman brooms mostly, covering with them easily some 3,000 yds. per day. As to Mr. Paton's question as to what a 1d. rate produced, the answer was about £235. As regards sunshine, they always beat Torquay by about two hours a year—(laughter)—and he would give Mr. Garrett the figure for 1911. It was 2,098·37, to be correct. With reference to the rateable value, they had had no revaluation to any extent except in certain cases; the rateable value itself, however, had gone on increasing year by year. The cost of roads referred to maintenance only. Scavenging was quite a different department. The wages of workmen in Exmouth were fairly low—4½d. per hour. As regarded the destructor, they had never used an ounce of coal in it since it was started. After shutting down they started again with a light refuse—nice clean stuff, specially selected for its dryness. As to gradients, he believed he had a gradient of 1 in 10 tarred. The material used on the side roads was a limestone they got from Budleigh Bay at a cost of 4s. 2d. per yd. Well-graded to the point as to waterproofing, the only thing he proposed to do was to asphalt the top of the promenade, the Local Government Board having asked him to do that. In conclusion, Mr. Hutton said he appreciated very much the manner in which his paper had been discussed.

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**Institution of Electrical Engineers: Annual General Meeting.**—The annual general meeting of the Institution of Electrical Engineers (members, associate members, and associates only) will be held in the lecture theatre of the institution on Thursday next, at 7.45 p.m., to receive and consider the accounts for the year ended December 31, 1911, and the annual report of the council, and to elect two auditors. The announcement of the election of members of council will be made at this meeting, if the counting of the ballot papers is completed in time.

**Housing Problems: Tiverton Borough Surveyor's Report.**—In a report on the housing conditions of Tiverton, the borough surveyor, Mr. J. Siddalls, writes: "Judging from my knowledge of the general conditions of the borough, and an experience extending over a quarter of a century, I am of opinion that fifty houses in the town and a few here and there in the rural portion of the borough will be ultimately required, and that steps should be taken as soon as practicable to build twenty-five of these in the town. The most difficult feature of the problem is that the chief need is for houses which may be let at the lowest possible rents. The wages of the labourers vary from 15s. to 20s. per week, and out of this the working man cannot afford more than 2s. 6d. to 3s. per week for rent, and many of this class have large families, which makes the case all the more difficult. I do not see how it is possible to obtain land cheap enough in or near the town or to build houses at a figure low enough to be a financial success even though the repayment of the building loan may be spread over eighty years. As to the housing accommodation in the country portion of the borough, the problem here is complicated by the unwillingness of owners to put the cottages into a proper condition, preferring to let them remain unoccupied rather than expend the necessary sum on repairs; but cottages are badly needed here and there, and in some way or other should be provided."

L.

# The Softening, Purification and Sterilisation of Water Supplies.

## DR. HOUSTON'S EIGHTH REPORT ON RESEARCH WORK.

A Review by H. C. H. SHENTON.

The eighth report on Dr. Houston's research work for the Metropolitan Water Board introduces a novel method of using lime, primarily as a germicidal agent and secondarily or incidentally for softening purposes. It is shown that by the application of this method to the flood waters received at the metropolitan intakes the construction of new storage reservoirs might be postponed and the period of storage in the existing reservoirs might be prolonged so as to establish absolute safety.

Dr. Houston had already in his seventh report stated that he found that quicklime (about 75 per cent CaO), added to raw Thames water in the proportion of 1 part of quicklime to 5,000 parts of water, killed B. coli in from five to twenty-four hours. The practical application of this discovery is dealt with in the present report.

It is evident that the origin of the eighth report was the need felt for finding some practical way of safeguarding the London supply by works which should take the place of the large storage reservoirs proposed in the New Works Bill, 1911. The board sought to secure safety by the construction of eight huge reservoirs, which should provide such storage that the satisfactory purification (by storage) of the London water should be secured for many years to come. The board were prepared to abandon their unrestricted right to abstract 130,000,000 gallons daily from the Thames in the hope that certain concessions would be granted. They also asked for a new intake. From the facts that only three out of the eight reservoirs were granted, that the new intake has not been obtained, that, while the unrestricted right to abstract water has been cancelled, the concessions have only been granted in part, there is not the slightest doubt that the safety and purity of the London water supply is less satisfactory at the present time than it would have been if the board's proposals had been sanctioned. It has been declared that certain safeguards are required. These have not been obtained, and consequently it is necessary to do something else. Hence Dr. Houston's present report.

It should be carefully observed that the cancelling of the unrestricted right to abstract 130,000,000 gallons a day from the Thames makes it necessary to abstract flood waters in larger volume, and that these waters are of very inferior quality to the water which is abstracted in dry weather, "as during periods of drought the water in the river has been found to be considerably better than the average in quality, both chemically and bacteriologically." Thus the unrestricted right was of special value. Dr. Houston infers that the limiting regulations imposed upon the Metropolitan Water Board, as regards the abstraction of water, are "indefensible" on public grounds. He emphasises the fact that we have now the same sources of river supply, but increased consumption of water. Intakes are seldom or never closed, and thus "flood water loaded with suspended matter, rich in organic matter and swarming with bacteria, is frequently pumped into the storage reservoirs." This fact troubles the minds of those most concerned but little, lulled as they are in the ready belief that the natural purification afforded by storage will render the most impure water safe. This belief is, however, unjustified at the present time, for Dr. Houston has taken elaborate trouble in a series of reports to tell us that, while sufficient storage will purify ordinary river water, the reservoirs required to give it have yet to be built. What stronger criticism of present methods is required than the words in clause (c), page 8, of the report: "In any case, I am quite unable to support the view that the safety conferred by storage affords a sufficient pretext for the ill-considered abstraction of the river water of most undesirable quality. In my reports to the Water Board I have urged again and again that this specially impure water should either be excluded from the storage reservoirs or *purified antecedently*." In other words, the present storage is insufficient purification for the water which, upon Dr. Houston's showing, must at times flow into them in large quantities.

### A NOVEL METHOD OF PURIFICATION.

The new method of sterilisation by means of quicklime does not, in Dr. Houston's opinion, justify the making of specific recommendations as yet.

As already stated, 1 part of quicklime added to 5,000 parts of raw Thames water kills the B. coli within a given period, and thus we get not only the softening and mechanical precipitating effects, but also sterilisation. The water is, however, unfit for human consumption, being overdosed with lime, and to neutralise this, *not less* than 25 per cent of untreated water must be added. Now it is quite clear that in the case of the London supply this addition of untreated water could be added very satisfactorily, seeing that it is only necessary to sterilise and clear the water of bad quality that is admitted at flood times, or when the river is in a bad state. All the other water—and it is to be supposed that the quantity would exceed 25 per cent of the whole—would be pure enough to be satisfactorily treated by storage, seeing that the time for storage of this smaller quantity would be ample. Thus the sterilised water overdosed with lime would be mixed with the water purified by storage, and the mixture would thus be of a very much purer and incidentally of a softer quality than that which is at present used.

It must not be imagined that the ordinary lime-softening process sterilises water. "In practice the utmost care has been wittingly or unwittingly exercised so to arrange the process as to prevent any *true bactericidal* action taking place, by accurately treating the *whole* of the water to be softened with less than the amount of lime required to combine with the bicarbonates, so as to form the insoluble and bacteriologically inert carbonate of lime."

In the new method the water must be overdosed with lime, and thus only part of the supply can be so treated, and it must then be mixed with at least 25 per cent of untreated pure water, or else with water which has been sterilised by adequate storage, chlorine, ozone, or other method.

### GENERAL CONSIDERATIONS.

The report shows that "the rate of mortality is uninfluenced by the softness or hardness of the water" supplied for drinking purposes, and it is argued that on the grounds of health there could be no objection to the softening of the London water. Neither does it appear that there could be any reasonable objection to the process as to the taste of the water.

A considerable section of the report is devoted to the question of the saving of soap effected by softening water, and some interesting figures are given. It seems that, in Dr. Houston's opinion, the saving actually effected is less than is generally supposed.

### COST OF THE PROCESS.

Some interesting figures are given as to the cost of lime softening. These, however, only deal with the cost of the lime, and, although useful in that respect, are no guide as to the actual cost of the whole process of softening. No account is taken of capital outlay, labour, removal of carbonate of lime from the water after treatment, &c., which, as the report justly states, are matters for engineers and financiers to deal with. They are, however, a very important consideration, and it is difficult to see how the new system, interesting as it is, can be applied to the London water without involving an expense which will render it very costly. It is to be noted that the Government Commission of 1851 stated that the softening of the metropolitan supply would add 10 per cent to the original cost of the water, or 4 per cent to the price charged to the consumers.

What the cost of treatment of the London supply would be by this new method is a matter which cannot be decided even approximately without further information, and the figures quoted from the report of the 1851 commission have very little bearing upon

the present case. The proportion of the supply that would have to be treated with an overdose of lime might be relatively small, taken over the whole year, but it is the *rate* at which this quantity would have to be treated which must decide the magnitude of the works. Presumably when the waters of the Thames are "loaded with suspended matter, rich in organic matter and swarming with bacteria" in flood times, they remain so for some days, or at least for twenty-four hours. This is the time when water must be abstracted in full volume, and it is perfectly clear that the works to be efficient must be of a size to deal with the whole flow and to store it for from five to twenty-four hours. If the works can really do this they must be large enough to give, not the shorter time of storage, but the larger if required—*viz.*, twenty-four hours. Thus we must have settling basins to deal with the largest volumes of water that can be drawn from the Thames and Lea in one day. The rest of the works must be in proportion, and their working must be difficult and costly.

The report contains various references to the conclusions and recommendations of the Rivers Pollution and certain other commissions. These relate to the quality of softened water, and are quoted in order to show its merits and possibilities. Also, the findings of the Richmond Commission of 1869 as to the quality of the Thames water show that it was at that time considered unnecessary to soften the water, and that all that was then considered necessary was to exclude sewage and other pollutions from the Thames and Lea, and to give the water perfect filtration. Seeing that it was then, and is now, impossible to exclude sewage and other pollutions from these rivers, and that the present suggestion is to soften, or partially soften, the river waters, it is difficult to see the application of the Richmond findings of 1869 to the present case.

TRUSTWORTHINESS OF THE PROCESS.

The trustworthiness of the process of overdosing with lime is next discussed. On the average of twenty-nine samples tested, the addition of 1 part of quicklime (about 75 per cent CaO) to 10,000 parts of raw Thames water reduced the total hardness from 22·36 to 11·03, while the addition of 1·5 parts of quicklime to 10,000 parts of river water reduced the total hardness in eight samples from 23·82 to 8·42.

With regard to sterilisation, the rivers Thames and Lea generally contain over 10 B. coli per c.c., and during about half the year over 20 per cent of the samples contain over 100 B. coli per c.c. With 1 part of quicklime in 5,000 parts of raw Thames water and five hours' duration of contact, the B. coli were dead in twenty-six out of 33 cases in five hours, in three cases they were alive in 10 c.c. and in 1 c.c., in four cases they were alive in 10 c.c. and dead in 1 c.c., and in twenty-six cases they were dead in 10 c.c. and in 1 c.c. With twenty-four hours' duration of contact the B. coli were dead in forty-two cases in 10 c.c. and in 1 c.c., and in one case were alive in 10 c.c. but dead in 1 c.c. It seems fairly clear that, in order to allow a proper margin of safety if sterilisation is to be produced, a period of contact of twenty-four hours is required. Other experiments made with Thames water inoculated with 1 per cent of London crude sewage appear to show that twenty-four hours' contact would be insufficient with 1 part of quicklime in 7,500 parts of water, but that better results can be obtained with 1 part of lime in 5,000 parts of water. In this case, however, B. coli were alive in 10 c.c. in one experiment out of ten.

Various other experiments were made, of which the results are given. Hard and soft waters were treated, and Dr. Houston, after drawing attention to the fact that he has never ceased to lay stress on the limitations of laboratory experiments, makes the statement that, "*subject to these qualifications* and *apart from debatable economic considerations*, I see no reason why expert application of the principles laid down in this report should not render the most impure waters (whether hard or soft) absolutely safe for drinking purposes. With hard waters it is a case for adding an *excess* of lime to the major proportion of the total volume, rendering the minor proportion 'safe' by adequate storage, ozonation, chlorination, or other method, and mixing the two together, so as to neutralise the excess of lime. With soft waters the procedure is to treat the whole bulk of the water with an excess of lime and neutralise with carbonic acid, or sulphate of alumina or acid."

ECONOMY OF THE METHOD.

Various illustrations are given showing the treatment to be given, and cost of lime in the case of definite volumes of water of different qualities. It is pointed out that the usual objection to ozone or heat is the cost in application, but that by the lime sterilisation method the cost would be reduced by 75 per cent, as only 25 per cent of the whole volume would require such treatment. Whether the treatment of the remaining 75 per cent by an overdose of lime would be so much more economical has yet to be shown. It is also pointed out that the objection to active chlorine is the taste. Here, again, it is argued that, the dose being reduced by 75 per cent, any question of taste would be practically eliminated. Whether there is really any practical advantage of this kind is open to question, however, seeing that 400 towns in America have adopted chlorine sterilisation, and one hears very little of any trouble from the taste of the water, which has been proved in many cases to be purely a matter of the imagination, and a lively imagination would probably detect a taste or unpleasing difference in lime-treated water as soon as a new system was installed.

ADVANTAGES AND DISADVANTAGES.

Taking into account the disadvantages of the system, which are very clearly stated by Dr. Houston, the capital expenditure required, the disposal of sludge on a very large scale, the difficulty of filtering the water so as to get rid of the precipitated lime, the need for skilled supervision, the cost of labour, and so forth, it is perhaps rather optimistic of Dr. Houston to say: "I believe this to be a final solution to the vexed problem of how to deal with impure well waters." On the other hand, the advantages of the lime method deserve our serious attention. Its adaptability, its suitability for the treatment of flood waters, the advantages and saving due to softening the water, its capacity to render an impure water safe bacteriologically, its power to increase the yield of our sources of supply, the possibility of saving the expense of the construction of huge storage reservoirs for London, and of giving proper storage to such water as is not lime-treated, its harmlessness and safety, and the possibility of being able to render the London water supply pure are advantages which cannot be lightly overlooked.

CONCLUSIONS.

The chief lesson of this report is that sterilisation of the London supply is necessary and possible. We find that lime can be used primarily for sterilisation, and incidentally for softening; that flood water, though impure, may be safely and speedily utilised with the absolute elimination of any danger from epidemic water-borne diseases from that source. Whether we have before us a method superior to the process of coagulation and settlement, dealt with in Dr. Houston's seventh report, or better than the methods now generally adopted in America, are matters for future consideration. It is to be hoped that the outcome of Dr. Houston's valuable work will be the improvement of the quality of the London water till it reaches a perfect standard. This is not beyond the bounds of possibility, and it ought ultimately to be achieved.

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**Sheffield Garden Suburb.**—The Sheffield City Council have before them a scheme for laying out a garden suburb, at a cost of £60,000.

**Disposal of Trade Effluents.**—With respect to the question of charges for the treatment of manufacturers' effluent, the Local Government Board have written to Dewsbury Town Council pointing out that they were prepared to issue a Provisional Order in accordance generally with an application of the town council. It appeared to them, however, that they could not properly include in the Order a provision to enable the corporation to make a charge on the manufacturer for the reception and disposal of trade effluent from his premises except in such cases as those contemplated in paragraph 29 of the Third Report of the Royal Commission on Sewage Disposal. In this connection the board considered that any pumping back of the effluent from the disposal works that might be necessary in order to enable manufacturers to comply with their obligation and to riparian owners was an exceptional circumstance, which would justify the cost of the pumping works in connection therewith being charged to the manufacturers. Before giving instructions for the preparation of a Provisional Order, the board desired to be informed whether, if the provision for charging the traders were limited as indicated, the corporation would be prepared to support the Order in Parliament if the Bill for its confirmation were opposed. The consideration of the letter has been adjourned.

# Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

## QUESTIONS.

This week answers are invited to the following questions:—

**238. Small Sewage Disposal Installation.**—Sketch and describe an installation consisting of a septic tank and filters for dealing with the soil sewage of about 750 persons, showing all the calculations for size of filters, &c. The filters are to be arranged so as to be capable of being enlarged if required. It is possible to have land treatment afterwards on about ½ acre to ¾ acre of land. The effluent is to discharge into a ditch, and must be kept to a high standard. The scheme is not meant to be permanent, and is only required for a period of about six years, until sufficient assessable value is created to apply for a sewer loan to connect to a now existing sewerage system. ("Somerset.")

**244. Illumination.**—The intensities of two sources of light are in the ratio 4:9. Find the ratio of the distances at which they must be placed from a screen in order to produce on it the same intensity of illumination. ("Luminous.")

**245. Pumping.** What is the discharge in gallons per hour from a single-acting pump, 6 in. in diameter, working thirty strokes per minute, length of stroke being 12 in.? Allow 10 per cent for loss due to friction, leakage, &c. (B. M. R.)

## REPLIES TO QUESTIONS.

**242. Joinery.** Show by sketches what is meant by the following terms: (*a*) Lying panel, (*b*) raised panel, (*c*) fr eze panels, (*d*) diminished style, (*e*) bolection moulding, (*f*) dovetailed backing to jamb linings.

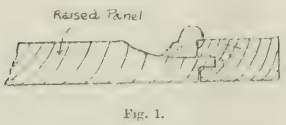



Fig. 1.

Fig. 2.

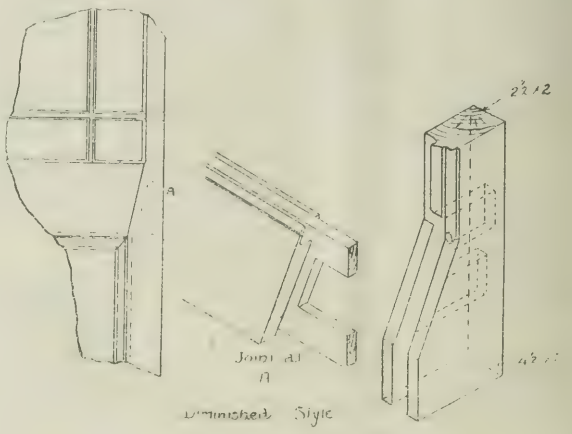
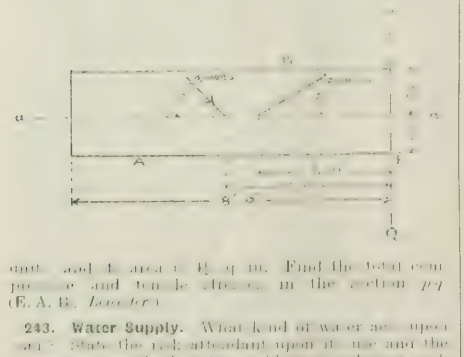



Fig. 3.

Fig. 4.

**239. Stresses in a Beam.**—A B is part of a beam, of which *p q* is a cross-section, cut by the plane P Q; *a a* is the axis of the beam. Forces of 4,000 lb. and 12,000 lb. act at the inclinations and distances shown. The moment of inertia of the section is 12-in.



unit, and A area 12 sq. in. Find the total compressive and tensile stresses in the section *p q* (E. A. B., *Inventor*.)

**243. Water Supply.** What kind of water accepted as? State the risk attendant upon its use and the means you would adopt to avoiding or reducing such risk. (M. C. I.)

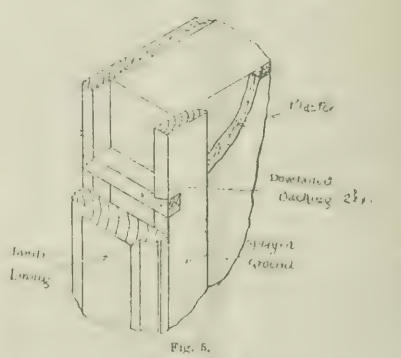



Fig. 5.

JOINERY.

(*a*) A lying panel is one which is put in with the grain running in a horizontal direction, instead of vertical. This is sometimes resorted to in the fireze panel of a five-panelled door, and where finely-marked timber is used has a beautiful effect.

(*b*) A raised panel is one which is brought out flush with the face of the surrounding frame, as in Fig. 1.

(*c*) Doors 7 ft. high, and over that height, are often divided into more than four panels, the top panels being termed fireze panels, as shown in Fig. 2.

(*d*) When a door has glazed upper panels the

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styles are generally narrower at their upper part, in order to gain more light, and also to give a better appearance. The styles have then to be diminished, as shown in Fig. 3, being known as diminished or gunstock styles.

(e) A bolection moulding is one that is raised above the surface of the framing, and usually rebated to it, as in Fig. 4.

(f) The two sets of grounds on each side of a door opening should be connected across the face of the jambs with 2½-in. by 1-in. backing pieces, dovetailed in, as shown in Fig. 5, about every 2 ft. apart. (H. F. B., *Milton Regis.*)

**The International Road Congress.**—The Corporation of the City of London have decided to hold a *conversazione* at the Guildhall in the summer of next year on the occasion of the International Road Congress. A sum of 1,000 guineas has been voted for this purpose.

**Trackless Trolley Systems: The Road.**—The Committee of the House of Commons on the Light Railways Bill have adopted an amendment providing that the owners of any trackless trolley system should pay the cost of road alteration to suit the system and also a contribution towards maintaining the road.

**Surveyors' Institution.**—The next ordinary general meeting will be held at the institution on Monday next, when the adjourned discussion on Mr. G. Taylor Lobban's paper on "Some Principles in the Valuation of Land and Buildings" will be continued. Mr. Cuthbert J. Lake (Fellow) will reopen the discussion. The chair will be taken at 8 o'clock.

**The Paris Visit: A Question of Expenses.**—Mr. A. H. Walker, borough surveyor and waterworks engineer of Loughborough, has been voted eight guineas towards the expense of attending the Whitsuntide visit of the Institution of Municipal and County Engineers to Paris. A minute of the General Purposes Committee opposed a suggested grant of £7, but at Monday's meeting of the town council, at which the matter came up for consideration, Alderman Clifford moved that expenses to the amount of eight guineas should be paid. The alderman said he thought it was for the benefit of the corporation that the surveyor should attend the proceedings, as a great deal of information, unobtainable from published reports, could thus be obtained. Members questioned the fairness of the ratepayers being called upon to bear the expenses, but another councillor suggested that it would be very mean for the corporation to get the advantage of Mr. Walker's attendance at the meeting and make him bear the cost, and the amendment was finally carried by 16 votes to 6.

## DEATH OF MR. JOHN T. EAYRS.

### PAST-PRESIDENT OF THE INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

With deep regret we refer in "Minutes" to the death, which took place on Wednesday evening, of Mr. John T. Eayrs, M.INST.C.E., F.S.I., of Birmingham and West Bromwich.

Mr. Eayrs was the son of the late Mr. T. W. Eayrs, head of the firm of T. & G. Eayrs, timber merchants, Leicester. His education was received at Stoneygate School, near Leicester, after which he served his articles with the late Mr. E. L. Stephens, who was for upwards of twenty-five years borough surveyor of Leicester. During his apprenticeship he had exceptional opportunities of gaining knowledge and experience in his profession, and was engaged on the main outfall sewer in the Abbey Meadows, the eastern relief sewer, the borough lunatic asylum, and other important works. On leaving Leicester he became an assistant in the borough surveyor's office, Oldham, and afterwards received the appointment of assistant surveyor to the Llanelly Local Board, where he remained upwards of three years. Here Mr. Eayrs prepared the whole of the detail plans for extensive and important waterworks, and in addition to this a great deal of the responsibility for the management of the town was thrown upon his shoulders, owing to the fact that the surveyor, Mr. Douglas, was appointed engineer to the waterworks, a post which practically monopolised his time and attention. Messrs. Beardmore & Barnes were consulting engineers to the scheme. Mr. Eayrs prepared plans for, and carried out, three large sections of the main drainage works.

When these were completed he obtained the appointment of borough engineer and surveyor of Newcastle-under-Lyne, one of the oldest, if not the oldest, of the municipal boroughs in the kingdom, cities excepted. Here Mr. Eayrs remained three and a half years, during which he designed and carried out the outfall precipitation works for the disposal of sewage, about which there had been considerable litigation with the late Duke of Sutherland. He also duplicated the main outfall sewer; carried out various street improvements, notably the widening of Church-street; and constructed, from the designs of the late Sir Gilbert Scott, R.A., a retaining wall and entrances to St. Giles's Churchyard. He also re-roofed the markets, and carried out some river improvements which were much needed. In addition he acted as surveyor to the corporation estates.

Mr. Eayrs was appointed borough engineer and surveyor of West Bromwich in July, 1879, being unanimously selected out of 150 candidates. At that time the town was governed by improvement commissioners. In 1882 Mr. Eayrs took an active part in the proceedings for the incorporation of the borough. Since then the life of the town has been very vigorous, and it now has a borough bench of magistrates, a separate court of quarter sessions, and under the Local Government Act is a county borough. When Mr. Eayrs was appointed surveyor the sewage difficulty was the most prominent question, as the commissioners were threatened with legal proceedings by Birmingham for the pollution of the Thame. Mr. Eayrs was requested to prepare a scheme for the drainage of the entire borough, which until then had discharged the whole of the sewage into the river, watercourses, and the canals. This was no easy task, as the town was intersected by canals and railways, and in many parts is liable to subsidence through mining operations. He succeeded, however, in devising a scheme which met with the approval of the Local Government Board, the estimated cost being £120,000. Mr. Eayrs also added 10 acres to the attractive public park, constructing a large boating pool and open swimming bath. He also laid out a recreation ground; superintended the construction of 8¼ miles of tramways laid by the South Staffordshire Tramway Company and the Birmingham and Midland Tramways Company; laid down a complete system of fire hydrants; and, generally, lost no opportunity for increasing the comfort, welfare, and good government of the town.

Mr. Eayrs had considerable experience in Parliamentary work, and was often called upon to give evidence in cases relating to municipal matters. He identified himself with most of the public work and social life of West Bromwich, where he lived, and was a well-known Freemason. He was a familiar figure at the meetings of the Institution of Municipal and County Engineers, of which he was president in 1893, an occasion marked by an address from him ever memorable for [illegible] combination of literary [illegible]

# Comparative Reports of General Practice.—LXXIX.

## HAULAGE BY MOTOR *v.* HORSE.—(*Conclusion.*)

The table reproduced below sets out the information in regard to the relative economy of motor and horse haulage which, as stated in last week's issue, was obtained by Mr. C. H. Cooper, M.INST.C.E., borough engineer and surveyor of Wimbledon, as a result of inquiries among fifty-eight municipal authorities having populations of from 50,000 to 100,000 persons.

| District. | Area. | Greatest dimensions of district. Length. | | Width. | | Length of highways repairable. | Heights above O.D. Max. | Min. | Population. | Rateable value. | Distance hauled. (a) Materials. | (b) House refuse. | (c) Slop, &c. | (d) Watering. | (e) Other purposes | Motor haulage installed. | Number of motors kept. | Price to motor | Horses kept. Nos. | Cost of haulage per ton per mile. Councils horses. | Contract. | Motor. | Cost of motors and rolling stock. | Average price paid per horse. | Cost of forage per horse per week. | Annual costs. By motor. | By horse. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | acres | m. | yds. | m. | yds. | | ft. | ft. | | £ | m. | m. | m. | m. | m. | | | | | | | | | | | | | |
| 1. Aberdare U.D.C. | 15,127 | 6 | 586 | 6 | 146 | 40 m. 1650 y. | 1291 | 386 | 50,841 | 183,522 | — | - | -- | — | | — | | | 17 | 9d. to 2s. | *5½d. to 1/3 | | | £54 | 6 mths. 10s. 9d. aver. 12 mths. 12s.3½d. | | £2,344 13 5 | Horses kept refuse collection only. *Haulage road materials only. |
| 2. Barnsley B.C. | — | — | — | — | — | — | — | — | — | — | — | | | | | — | — | — | — | | | | | | | | | Have not employed motors, nor do they possess any. |
| 3. Barrowford U.D.C. | 1,368 | 2 | — | 1¼ | | 4 m. 425 y. | 740 | 370 | 5,600 | 19,781 | — | | | | | | — | — | 1 | 10d. to 1s. | 10d. to 1s. | | | £55 | 12s. 6d. | | £111 15 0 | — |
| 4. Barrow-in-Furness B.C. | 21,000 | 8 | 440 | 5 | 440 | 97 m. 1298 y. | 270 | 13 | 63,775 | 313,124 | 2¼ | | | 1¼ | | 1906 | 1 | 18 | 18 | 11d. * | *8s. day | 8½d. * | £730 | £60 | 11s. 6d. | £3,128 8 1 | £3,136 19 3 | * Includes cost of one return journey empty. Variation each year in amount of hired team labour on special works. |
| 5. Blackpool ... | 4,244 | 4 | 533 | 2 | 740 | 100½m. | 99 | 22 | 58,652 | 533,619 | 1 | 1½ | | 1¼ | -- | | | | 52 | 10d. to 1s. | 8d. to 10d. | — | | £50 | 11s. 4d. | — | £3,310 11 9 | — |
| 6. Bournemouth C.B. | 5,850 | 6 | | 3 | | 110 m. | | - | 80,000 | 721,000 | 2 | 1½ | 1½ | Yes | 3 | 1903 | 3 | 80 | 120 | * | * | * | | £60 to £65 | | | | * Cost of haulage varies with materials and district. Does not pay to use motors except for long distances and full loads. |
| 7. Burnley ... ... | 4,624 | 2 | — | 2 | — | — | — | — | — | — | — | — | — | — | -- | — | — | — | — | — | — | — | | — | | — | — | Had a motor, but did not find it paid for such short distances. |
| 8. Burnley R.D.C. | 43,000 | 11½ | — | 11½ | — | 88 m. 211 y. | 1831 | 253 | 20,292 | 162,859 | — | - | — | — | — | — | — | — | 6 | | 9d. | — | — | £50 | 19s. | — | £795 | Horses kept for scavenging. |
| 9. Burton-upon-Trent | 4,207 | 3 | — | 3 | 660 | 43 m. 1392 y. | 410 | 110 | 49,000 | 301,000 | | — | — | — | 6 | 1906 | 1 | - | — | 11d | | 4½d. | £597 | 5s. £58 | 13s. 5d | — | — | Foden steam wagon. |
| 10. Darlington ... | 3,929 | 3 | 200 | 3 | 700 | 56 m. | 220 | 120 | 56,000 | 268,813 | — | — | — | — | — | — | — | — | 28 | — | — | — | — | £70 | 14s. 6d | — | £5,872 3 11 | Horses hired 7s. 6d. day. |
| 11. Dewsbury ... | -- | -- | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | No information. |
| 12. Ealing ... ... | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | One steam lorry — 3 horses (roughly). |
| 13. Eastbourne ... | 6,833 | 4½ | — | 3 | — | 50 m. | 170 | 12 | 52,000 | 138,422 | 1 to 1½ | — | — | — | — | Temporary use only | 2 | 55 | 55 | 11½d | 1s. | 10d. | Pay for hire | £60 | 12s. | — | | 'Buses are hired from the motor 'bus dept. |
| 14. Edmonton ... | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | Motor haulage not adopted. |
| 15. Enfield | [illegible] | — | — | — | — | [illegible] | [illegible] | 13 | [illegible] | [illegible] | [illegible] | | | | | | | | 18 | 7d. | 7d. | | | | 18s. | | £22,955 | 5 horses hired at 8s. per day including driver. |

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18. Grimsby ... | 3,260 | 3 | | 2 | | 50 m. | 12 | 9 | 71,063 | 303,095 | | | | | | | | 33 | | | | | | £1,105 | Horses are hired at 11d. hour for horse, cart and man. |
| 19. Hammersmith | 2,282 | 3 | 350 | 2 | 150 | 52 m. | 145 | 14 | 121,603 | 862,788 | | | | | | | | 63 | - | - | - | - | £65 to £70 | 11s.6½d. | — | — | — |
| 20. Hastings ... | 4,857 | - | | - | | 70 m. | 487 | 13 | 63,000 | 427,600 | | | | | | | | 50 | | - | | | £62 5 | 13s. 2d. | — | £7,789 10 3 | Wages include sick pay, holiday pay and pensions. |
| 21. Ilford ... ... | 8,503 | 4 | 1600 | 4 | 750 | 80 m. | 210 | 24 | 80,000 | 420,050 | | | | | | | | | | | | | | | | | |
| 22. Ipswich ... ... | — | — | — | — | — | — | — | — | — | | | | | | | | | | | | | | | | | — | No reliable information. Is of opinion motor haulage does not pay for short distances. |
| 23. Kingston-on-Thames | — | — | — | — | - | — | — | — | — | — | | | | | | | | | | | | | | | | — | Steam wagon for 7 months will forward particulars after 12 months' experience. |
| 24. Lincoln ... ... | 3,755 | — | | — | — | 47 m. 633 y. | 225 | 15 | 58,000 | 244,000 | | | | | | | | 38 | — | | | | | | — | | No motor haulage. |
| 25. Merthyr Tydfil | — | — | — | | | | | | | | | | | | | | | | | | | | | | — | | No information. Scavenging by contract. |
| 26. Newport C.B. | 5,020 | 4½ | - | 3½ | — | 58 m. | 26 | 25·1 | 85,690 | 434,000 | — | — | — | — | | | | — | — | 9d. to 1s. | — | — | | | | — | Horses by contract. |
| 27. Oxford ... ... | 4,719 | 3 | 700 | 3 | 129 | 63 m. 120 y. | 312 | 182 | 53,000 (C) 3,500 (U) | 428,000 | | | | | | | | 26 | * | * | * | — | £60 | 18s. est. | — | £1,035 18 0 | Horses also hired. * No record. |
| 28. Rochdale ... | — | — | - | — | — | | — | | — | | | | | | | | | — | - | 1s. | - | — | — | — | — | — | Motor wagon in use too short period to give figures. |
| 29. St. Helens ... | | | | | | | | | | | | | | | | | | | | | | | | | | | No motor traction. |
| 30. Southend-on-Sea | 5,172 | 5 | — | 2½ | — | 49 m. | 124 | 7 below | 63,000 (w) 120,000 (s) | 431,796 | Yes | — | Yes | Yes | Sewer flushing | 1905 | 2 | — | — | — | 1 1 | 10d. | £1,500 | £60 | 12s. 9d. | — | — | Credit motor-van account with cost as it work done by horses, and after debiting all charges it is found average annual profit is £250 on each motor wagon. |
| 31. Southport C.B. | 11,057 (inc. foreshore) | 4½ | — | 2½ | | 60½ m. | 33 | 16 | 51,650 | 101,791 | - | — | — | — | | | | — | - | — | | | — | — | — | — | No motor haulage. |
| 32. Wallasey ... | 3,108 | 1 | 600 | 2 | 100 | 60 m. 370 y. | 174 | 15 | 80,000 | 161,515 | - | — | — | — | — | - | | 36 | 10d. | 10d. | | — | £60 | 13s. 6d. | — | £8,117 16 0 | — |
| 33. West Bromwich | | | | | | | — | | | | | | | | | | | | | | | | | | | | |
| 34. West Hartlepool C.B. | 2,958 | 3 | 831 | 2 | 230 | 71 m. | 98 | 12 | 63,932 | 266,000 | — | — | — | — | - | — | — | 19 | — | — | — | — | £60 | 13s. 9d. | — | £3,957 9 8 | No motor traction. |
| 35. Wigan ... ... | 5,083 | 4 | 460 | 3 | 753 | 59 m. 477 y. | 260 | 82 | 89,171 | 347,116 | - | — | - | — | — | — | — | 21 | 1 1 | — | — | - | £67 | 12s. 1d. | — | £2,617 9 6 | No motor traction. |
| 36. Willesden ... | — | - | - | | | | — | | — | | | | | | | | | | | | | | | | | | No motor traction. Use of motor for haulage work is not beneficial for municipalities except for long distances. |
| 37. Wolverhampton | 3,525 | — | — | | — | | | — | 96,000 | 409,948 | — | — | - | — | — | — | — | 64 | — | — | | — | £596 | 18s. 2d. | — | * £3,308 6 8 | Various items not filled in. |
| 38. Wimbledon ... | 3,220 | 3 | — | 2 | — | 46¾ m. | 183 | 32 | 55,000 | 431,800 | — | — | | — | — | — | — | 55 | 8d. to 10d. | 1s. hr. | - | — | £65 | 14s. 6d. | — | £8,284 0 0 | |

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Birmingham T.C.** (May 2nd. Mr. Edgar Dudley).—£1,750 for the purchase of land at the corner of Easy-row and Edmund-street for the purpose of street improvement; and £1,035 for the purchase of land adjoining Victoria Common, Northfield, for the purpose of a recreation ground or open space.—Mr. E. V. Hiley, town clerk, explained that the area of the land proposed to be acquired at the corner of Easy-row and Edmund-street was 58 sq. yds., and the purchase money would amount to £1,700, £50 being devoted to various fees. Edmund-street was a very narrow thoroughfare at one point, being only 40 ft. wide at the corner which was proposed to be widened. With regard to the second project, Mr. Hiley mentioned that the new piece of land had a frontage of about 66 yds. to Bristol-road, and it would enable the recreation ground which was presented to the King's Norton and Northfield Urban District Council by Mr. George Cadbury in 1905 to be brought to the front of the road, and made more commodious as a playing field.

**Darfield U.D.C.** (April 25th. Mr. F. H. Tulloch).—£1,850 for the provision of a cemetery near the junction of Edderthorpe-lane and the Doncaster and Saltersbrook main road.—Mr. E. Hammerton, surveyor to the council, presented plans of the proposed cemetery, and pointed out that the council were making an improvement in School-street, which was the principal street to the proposed cemetery. He was not aware that the Barnsley seam had been worked from under the site. He said it was a suitable site. To a certain extent subsidences occurred by reason of the working of the bed of coal. In the new cemetery there was accommodation for 3,404 graves.

**Newport (Mon.) T.C.** (May 2nd. Mr. R. H. Bicknell).—£2,446 to carry out paving work in Alexandra-road.—Mr. Treharne Morgan (deputy town clerk) represented the corporation. The borough engineer (Mr. H. Tremelling) said the road was one of 1,850 ft. The proposal was to pave 34 ft. of the 50-ft. carriageway with a mixture of granite and Trinidad bitumen. The corporation asked for ten years for repayment, but the inspector thought seven years would be sufficient.

**Okehampton T.C.** (April 3rd. Major J. Stewart).—£800 for the purchase of land in George-street, as a site for a town hall and other public buildings, and £697 for purposes of street improvement.—The town clerk, Mr. J. J. Newcombe, stated that the work of street widening had been commenced because of the existence of a dangerous corner. The inspector pointed out that the Local Government Board did not look with favour on applications for sanction to borrow money for works that had been commenced. The town clerk, proceeding, intimated that £135 already spent had been taken from general funds, and it was set out as a suspense account. They were negotiating with the county council, who, they hoped, would purchase a part of the site for the purpose of a police station. The inspector: Have you any idea as to when you will [illegible] on the site? The town clerk: No. The present town hall was inadequate, and the county court judge and the magistrates complained of the noise. The borough surveyor (Mr. F. J. Worden) stated that the area was 7,688 ft., and the slice of the land with which the county council was concerned was 3,314 ft. The inspector: It seems that you only want [illegible] of the land and you want to sell the rest at a profit. I feel convinced the board will not consent until they know what is going to happen with the county council.

**Stroud U.D.C.** (April 25th. Mr. R. G. Hetherington). [illegible] for the purpose of a refuse destructor at the [illegible] and £7,000 for works of sewage [illegible] the execution of works in the parishes of Cainscross and King Stanley.—The engineer to the council, Mr. G. P. Manes, stated that the sewage scheme dealt with was about 50 [illegible] years. Provision would be made under the scheme for dealing with the sewage of the rest of the district. Attention had been given to the prevention [illegible] The committee had given a [illegible] to the question of sewage disposal [illegible] that the outfall would be at [illegible] and [illegible] the south of Libbet Mill.

**Sutton-in-Ashfield (Notts) U.D.C.** (April 26th. Mr. F. H. Tulloch).—£2,000 for street improvements.—The clerk (Mr. J. D. Fidler) and the surveyor (Mr. W. Burn) explained the details. The council, it was stated, desired to borrow the money for a period of five years.

**Torquay T.C.** (May 1st. Major J. Stewart).—£3,000 for furnishing and equipping the new pavilion in course of completion.—There was no opposition, and, in reply to the inspector, the town clerk (Mr. F. S. Hex) stated that during the progress of the building the possibility of extending the service for the provision of refreshments was considered, and the council agreed that special arrangements should be made for the refreshment service. The borough surveyor (Mr. H. A. Garrett), as the architect of the pavilion, said under the original plans the refreshment service was on a small scale, and it would now be twice as large. The buffet proposal had been abandoned. The council was dead against anything of the sort, and the buffet had been knocked out.

### APPLICATIONS FOR LOANS.

**Ballymena U.D.C.**—£2,000 for laying granite setts.

**Batley T.C.**—£1,806 for street improvement purposes.

**Blackrock U.D.C.**—£3,000 for tar-macadamising purposes.

**Chelmsford T.C.**—£2,120 for street improvement purposes.

**Colchester T.C.**—£820 for new sewers.

**Cuckfield U.D.C.**—£550 for the purchase of the Glebe land.

**Derby T.C.**—£10,750 for the electricity undertaking.

**Doncaster T.C.**—£1,633 for the purchase of a site for sixty dwellings.

**Doncaster R.D.C.**—£2,270 for sewerage and sewage disposal works.

**Ellesmere R.D.C.**—£2,500 for the Dudleston Heath water supply scheme.

**Frome R.D.C.**—£950 for road-widening purposes.

**Manchester T.C.**—£200,000 for gasworks purposes, and £4,310 for a filtering and aërating plant for public baths.

**Margate T.C.**—£1,500 for the purchase of a site for a fire station.

**Northam U.D.C.**—£4,650 for a sewerage scheme.

**Salford T.C.**—£1,084 for the provision of an intercepting sewer.

**Upton R.D.C.**—£4,300 for a sewerage scheme.

### LOANS SANCTIONED.

**Belfast T.C.**—£4,986 for a trunk sewer, and £25,813 for branch sewers.

**Brighton T.C.**—£4,060 for the purchase of land for a playground.

**Chelmsford T.C.**—£200 for a public convenience.

**Chertsey R.D.C.**—£2,290 for the purchase of land and the erection of dwellings.

**Coleraine U.D.C.**—£1,750 for the provision of workmen's dwellings.

**Felixstowe U.D.C.**—£570 for widening part of the Promenade.

**Hebden Bridge U.D.C.**—£1,400 for works of paving.

**Prescot U.D.C.** £150 for a public convenience in Gloverner-road.

**Turton U.D.C.**—£1,404 for road improvement purposes.

### FORTHCOMING INQUIRIES.

MAY.

| | | £ |
|---|---|---|
| 13.— | **Maldens and Coombe.** For the extension of the depot (Mr. M. K. North) | 400 |
| 14. | **Aldeburgh.** For the purchase of property (Mr. Edgar Dudley) | |
| 14. | **Barking Town.** For the provision of small dwellings and street improvements | 11,193 |
| 14.— | **Buxton.** For water supply purposes (Mr. H. Shelford Bidwell) | 2,350 |
| 14. | **Cannock.** For sewage disposal purposes (Mr. R. G. Hetherington) | 5,200 |
| 14.— | **Cudworth.** For gasworks purposes (Mr. F. O. Stanford) | 6,700 |
| 14. | **Leeds.** For the construction of new streets (Major J. Stewart) | 24,767 |
| 14 | **Skipton.** For the provision of heating apparatus for baths (Mr. T. C. Ekin) | 600 |

| | | £ |
|---|---|---|
| 15.—**Blackpool.** | For electricity plant and street purposes (Mr. T. C. Ekin) ... ... ... | 12,224 |
| 15.—**Carshalton.** | For allotment purposes (Mr. Edgar Dudley) ... ... ... ... ... | 1,000 |
| 15. **Chapel-en-le-Frith.** | For the provision of a reservoir (Mr. H. Shelford Bidwell) ... | 4,000 |
| 15.—**Cottingham.** | For the extension of water mains (Major J. Stewart) ... ... ... | 600 |
| 15.—**Leatherhead.** | For street improvement purposes (Mr. Courtenay Clifton) ... ... | 230 |
| 15.—**Lichfield.** | For sewage disposal purposes (Mr. R. G. Hetherington) ... ... ... | 10,139 |
| 15. **Ossett.** | For sewage disposal, water supply, public convenience, and road purposes (Mr. F. O. Stanford) ... ... ... ... | 3,740 |
| 15. **Oundle.** | For water supply purposes. (Mr. A. A. G. Malet) ... ... ... ... | 1,350 |
| 16.—**Chester.** | For electricity purposes (Mr. T. C. Ekin) ... ... ... ... ... ... | 14,830 |
| 16.—**Droylsden.** | For sewage disposal, destructor, and street purposes (Mr. R. G. Hetherington) ... ... ... ... ... | 7,063 |
| 16.—**Ebbw Vale.** | For education and electricity purposes ... ... ... ... ... ... | 16,000 |
| 16.—**Hoddesdon.** | For the provision of a store-yard (Mr. Edgar Dudley) ... ... ... | 780 |
| 16.—**Kettering.** | For sewage disposal purposes (Mr. A. A. G. Malet) ... ... ... ... | 5,900 |
| 16. **Sutton-in-Ashfield.** | For the construction of a sewer (Major J. Stewart) ... ... ... | 1,366 |
| 17. **Birmingham.** | For the provision of additional bacteria beds (Mr. A. A. G. Malet) | 56,000 |
| 17. **Widnes.** | For the conversion of privies (Mr. R. G. Hetherington) ... ... | 3,000 |
| 17. **Worksop.** | For electricity purposes (Mr. H. Shelford Bidwell) ... ... ... | 5,170 |
| 17. **Wrotham.** | For sewage disposal purposes (Mr. F. O. Stanford) ... ... ... | 10,000 |
| 21. **Frinton-on-Sea.** | For the paving and lighting purposes, and the provision of fire hydrants (Major J. Stewart) ... ... | 350 |

## TAR WASHINGS AND FISH LIFE.

### ALLEGED WHOLESALE DESTRUCTION IN HERTS.

Mr. R. B. Marston, editor of the *Fishing Gazette*, informs the *Daily Mail* that on Saturday he received the following telegram from Mr. F. Napier Sutton, president of the Friendly Anglers' Society, who fishery is in the Colne, Hertford:—

"Every fish between Watford and Rickmansworth killed today. Friendly Anglers' fishery destroyed."

Thousands of fine trout and other fish in 5 miles of water have therefore, says Mr. Marston, been killed, the destruction, it is supposed, being caused by storm water from roads dressed with raw, unpurified tar.

The *Daily Mail* remarks: "Surface washings where properly purified tar is used, are stated to have no effect on the fish nor on the water flies and insects on which they live. The Watford destruction, the latest and most serious of several imputed to the same cause—the more unfortunate as the river, from an angler's point of view, was just recovering from a wholesale destruction of fish by poisoning three years ago."

#### NOT DUE TO TAR.

It was reported on Tuesday that although the statement as to the destruction of fish in the Colne is unfortunately true, the destruction was not caused by tarred road drainage.

In Wednesday's *Daily Mail* Mr. Bernard Alford, dealing the suggestion that in tarring operations steps should be taken to avoid that part of the road where excessive rainfall would drain directly into the river, "I am sorry to say," many such parts are on the Hemel Hempstead road. To prohibit the Tarring of the Roads on the Banks of the Colne, the Lea, the Ivel, or the Avon would be an unpardonable sin, and yet if tarring is extensively practised on the banks of these roads modern locomotion has made that impossible but save the finely bevelled kerb and channel each side of the road where it crosses a river. Indirect drainage by percolation through the soil does not matter, all the deadly effects of tar have vanished; it is only the immediate contact that kills."

#### COUNTY SURVEYOR'S STATEMENT.

Mr. Urban A. Smith, M.Inst.C.E., the county surveyor of Hertfordshire, has not at present been able to obtain information as to the cause of the injury to the fish, but points out that the county council have not done any tarring this year upon roads in the neighbourhood affected, and adds that they use only refined tar.

It appears from the annual report of the Board of Agriculture and Fisheries on the salmon and freshwater fisheries of England and Wales for the year 1911, which was issued on Tuesday, that no fresh instances of fish being damaged by washings from tarred roads have been reported to the board by any Board of Conservators since those quoted in the last report. The circular to local authorities referred to in that report elicited only expressions of concurrence in the suggested precautionary measures, coupled in most cases with the statement that no instances of suspected poisoning from tarred roads had come to the notice of the county council concerned.

## LOWER THAMES VALLEY DISTRICT SURVEYORS' ASSOCIATION.

### ANNUAL DINNER AND VISITS OF INSPECTION.

The annual dinner and visits of inspection of the Lower Thames Valley District Surveyors' Association were held on Saturday last. A most excellent programme had been arranged, and about thirty members and friends were present at the visits. A start was made shortly before 3 o'clock from Turnham Green Station, whence the party proceeded by motor to the Metropolitan Electric Supply Company's generating station at Willesden. By kind permission of the company the party was conducted over the works by Mr. Markby, the engineer to the works, and by Mr. Chapman.

Upon leaving the generating station the party were conveyed to the Willesden Isolation Hospital, where, by permission of the Willesden Council and the medical superintendent, Dr. Stewart, they made an inspection of the administrative block and of the laundry, which is believed to be one of the best-equipped buildings of its kind in the country.

Next, by kind permission of the Willesden Council, and Mr. O. Claude Robson, the engineer and surveyor, the party stopped to inspect a sewage recorder, which registers the Willesden sewage as it enters the London County Council's sewer. The working of the recorder was explained to members of the party by Mr. Cole.

The members next proceeded to the Brentford Gas Company's works, where tea was kindly provided by Mr. A. A. Johnston, the engineer and manager to the company. Afterwards, by kind permission of the company, the party was conducted in three sections over the gasworks, where the process of emptying and recharging the retorts was viewed, after which an inspection was made of the water-gas, stove-cleaning and smiths' departments.

A hearty vote of thanks was passed at the close of each visit in acknowledgment of the very excellent manner in which the various points were explained, and of the kindness of the various companies and the Willesden Council in allowing inspections to be made.

On the conclusion of the visit to the Brentford Gas Company's works, the party proceeded to Chiswick Town Hall, where the annual dinner was held. The dinner was well attended, the following being present, making in all a total of thirty-three: Messrs. E. Willis (president), H. T. Wakelam, A. A. Johnston, E. F. Collins, R. H. Jeffes, H. V. Gunn, S. H. Chambers, A. H. Vanner, M. Hainsworth, King, Powell, Thos. Cole, H. F. Coales (vice-president), J. G. Carey, F. W. Pearce, J. Stevenson, F. C. Fread, C. Chambers-Smith, C. H. Cooper, F. Cook, J. H. Abbott, S. Eydmann, A. G. Davies, J. H. Chapman, J. H. Brierley, C. Willis, Thos. Cole, junr., A. Gladwell, G. W. Manning, J. A. Webb, R. J. Thomas, J. Leith and J. W. Croxford (hon. secretary).

In the course of the evening the toast of "The Lower Thames Valley District Surveyors' Association" was proposed by Mr. H. T. Wakelam, and responded to by the president. "The Institution of Municipal and County Engineers" was proposed by Mr. J. H. Brierley, and responded to by Mr. R. J. Thomas, president-elect of the Institution of Municipal and County Engineers. Mr. A. Gladwell afterwards proposed "The Visitors," Mr. H. V. Gunn replying.

The usual keen interest displayed by members in the association was again manifested, and reference was made during the evening to the visits paid in the afternoon. Altogether a most enjoyable evening was spent.

# Municipal Work in Progress and Projected.

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The following are among the more important projected works of which particulars appear below: Buildings—Birmingham £20,000, Kettering, Littlehampton, Youghal; roads and materials—Lancashire, Nottingham £3,650, West Sussex £18,000; sewerage and sewage disposal—Cannock; water, gas and electricity—Greenock £10,000, Kelso £31,500, Nottingham. —Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

## ADMINISTRATION.

**Berwick T.C.**—The council met recently to consider a letter from the Local Government Board stating that the salary it was proposed to give the new sanitary inspector was inadequate. After two divisions, it was agreed to fix the salary at £100, additional emoluments amounting to £13 10s. The council had previously decided that it should be £80, the same as that with which the late inspector began over thirty years ago.

**Gateshead T.C.**—A letter has been received from the Local Government Board with respect to the local inquiry held in February last as to the thickness of the outside walls of domestic buildings. The board state that they are not satisfied that the erection of dwellings for the working classes in the borough is unreasonably impeded in consequence of the by-laws making it compulsory to erect 14-in. walls. The board therefore have decided that the case was not one for action under the section. "I am at the same time to state," the letter adds, "that the inquiry did not, in the board's opinion, show any strong case for the position taken up by the town council when the draft of the by-laws confirmed last year was under consideration—namely, that they would not be willing to entertain any modification of the by-law as to thickness of walls." The board hope that the council will reconsider the matter when a convenient opportunity occurs.

## BUILDINGS.

**Birmingham T.C.**—The new sanatorium for consumptives at Yardley is to be enlarged at a cost of between £20,000 and £30,000. Accommodation will be provided for 205 persons.

**Durham C.C.**—A recommendation from the Health Committee has been adopted in favour of the provision of sanatoria for consumptive patients and tuberculosis dispensaries, and inviting the county boroughs to discuss the question whether they are prepared to join in such a scheme.

**Hereford T.C.**—Alterations and improvements to the floor of the butter market are to be carried out at a cost of over £1,000. Extensions are to be effected to Lord Scudamore's elementary schools at a cost of £3,650.

**Hove T.C.**—Further consideration of the provision of some means of shelter on the roof garden at the library has been given by the Library Committee, who, after having before them designs and estimates for the erection of a glass roof with cast-iron supports, recommend that means of shelter from the sun and rain be provided on the roof garden, as recommended by the borough surveyor, Mr. H. H. Scott, and that the tender of Messrs. Helliwell & Co., to carry out the work according to plan produced for the sum of £144, be accepted.

**Ilkeston T.C.**—Lodges and offices are to be erected at the Park Cemetery at a cost of £1,130.

**Ilkley U.D.C.**—Sanction has been received from the Local Government Board for a loan for the erection of an annexe to the King's Hall, and for public conveniences. The plans have been prepared by Mr. Henry West, building surveyor.

**Kettering U.D.C.**—The Special Water Sub-Committee has been asked to consider a scheme for the improvement of the existing public baths and the provision of slipper baths.

**Lindsey (Lincs) C.C.**—It has been agreed to postpone action in regard to the constitution of an isolation hospital district for Brumby and Frodingham, Roxby-cum-Risby, Scunthorpe and Winterton, and part of the Brigg district, the county medical officer meanwhile to make inquiries as to the working of such joint hospitals elsewhere.

**Littlehampton U.D.C.**—The Highways and Lighting Committee has received authority to negotiate for a site for a central fire station, and to confer with the fire brigade as to the plans of the new building.

**London C.C.**—At Tuesday's meeting the question of the insufficiency of the present accommodation for London Quarter Sessions and the negotiations with the City Corporation was raised by Mr. Edward Smith. He described the existing condition of things as a grave public scandal. The Home Secretary, he said, had sent a letter to him stating that it was now more than two and a half years since the committee of which the Lord Chief Justice was chairman reported that the Sessions House at Newington was insufficient for its purpose, and could not be rendered suitable by enlargement or alteration, and that a new Sessions House should be provided, either at Newington or on some more central site. The Home Secretary desired strongly to urge the county council to take immediate steps for the selection of a suitable site.

**Middlesex C.C.**—The foundation-stone of the New Guildhall which is being erected at Westminster at a cost approaching £90,000 was laid on Thursday of last week.

**Wallasey T.C.**—The site at North Meade, on the sea front, has been selected for the erection of the new town hall.

**West Hartlepool T.C.**—A scheme for providing an exterior fireproof staircase at the town hall, in order to increase the means of egress from the building, has been adopted. The cost is estimated to be £115.

**Worthing T.C.**—The General Purposes Committee recommend the acceptance of the tender of Mr. J. W. Greenfield, Worthing, at £970, for the erection of firemen's cottages, and of Messrs. A. Churcher & Sons, at £109 10s., for painting shelters and seats on the Parade.—The Sanitary Committee recommend the acceptance of the tender of Messrs. F. Sandell & Son, at £340, for the construction of an underground lavatory at the corner of Winton-place.

**Youghal U.D.C.**—A public swimming bath is to be provided.

## HOUSING AND TOWN PLANNING.

**Cardiff T.C.**—The Health Committee have requested the city engineer, Mr. W. Harpur, to prepare a report on all vacant property owned by the corporation suitable for the erection of workmen's dwellings. With the putting into force of closing orders against a number of houses in the city, it becomes necessary to consider what provision is available for the displaced tenants.

**Exeter T.C.**—The Streets and Sanitary Committee advise the purchase of several properties in Bartholomew-street West and Blackboy-road, for the housing scheme. The price to be paid exceeds £3,000, and negotiations are in progress for the purchase of other properties in the improvement area.

**Hartlepool T.C.**—It has been decided to purchase certain property in High-street in order to make a suitable entrance to what is described as the slum area between High-street and the town hall, on which area the corporation eventually propose to erect workmen's dwellings.

**West Ward (Westmorland) R.D.C.**—The medical officer of health, Dr. Craven, in his annual report to the council, discusses the Housing Act as it affected a rural population. He said in the cases already noted under the Act the chief defects observed were defective ventilation and lighting, but a very important point demanded the attention of the council—namely, that a minimum height of ceilings in old houses should be fixed. A low ceiling compelled inmates to breathe over and over again the foul air which had been expired from their own lungs. Unless rural councils were determined that the old, damp, low ceilings, badly-lighted and ill-ventilated rooms of the cottages were brought up to the requirements of modern knowledge, the health of rural districts would compare badly with that of modern towns. Knowing that there was, generally speaking, a dearth

of good cottage houses, it should be the object of the council to compel the renovation and repair of existing cottages, and not give the owner an opportunity of pulling down a cottage because it required repair and was not a paying investment.

**Wrexham T.C.**—The borough surveyor, Mr. J. England, has reported respecting an area which, in his opinion, could be conveniently dealt with by a town planning scheme, and has submitted a plan giving a rough outline of the scheme. He has been instructed to confer with the surveyor of the rural council, Mr. J. P. Evans, with a view of arranging the directions of the proposed roads within the area referred to, so as to connect with the roads in the rural district.

## PARKS AND OPEN SPACES.

**Leatherhead U.D.C.**—It has been decided, subject to official sanction for the necessary loan, to purchase 4½ acres of land in the Forty Foot-road for £1,000, for the purpose of a recreation ground. The estimate of the surveyor, Mr. S. R. Drake, of the cost of making up and fencing the ground is £477.

## REFUSE COLLECTION AND DISPOSAL.

**Worthing T.C.**—The Sanitary Committee recommend the acceptance of the tender of Messrs. Hughes & Stirling, London, at £595 for the construction of additional cells at the refuse destructor.

## ROADS AND MATERIALS.

**Berwickshire C.C.**—It has been decided by the Middle District Committee to form a new road from Cranshaws Post Office to the boundary line of East Lothian, provided that a suitable arrangement could be made with East Lothian as to their share of the cost. Probable estimates were submitted at £1,750 and £1,450. The matter has been referred to the County Road Board.

**Blackburn R.D.C.**—The council on Saturday declined to accede to a petition from the residents of Langho for the main road from Blackburn to Whalley to be treated with tar, to allay what the petitioners described as "an intolerable nuisance and discomfort." The chairman described one stretch of road so treated as "a veritable death trap," and Mr. Gerrard alleged that in his district alone there had been over 100 accidents to horses since the tar-spraying system was adopted. He mentioned that proceedings were pending at the Assizes for damages as the result of accidents, and these would come on for hearing in the near future. Mr. Gerrard claimed that it was possible to meet the dust nuisance without making the roads so slippery as to make them unfit for other traffic. Motor cars ought to be fitted with larger wheels, and the speed reduced. The county council wrote that they did not intend to treat any more roads with tar in the rural council's area on account of numerous complaints of the slippery state of the roads after treatment.

**Breconshire C.C.**—A grant of £1,100 has been obtained from the Road Board for the ensuing year.

**Camelford (Cornwall) R.D.C.**—This council, with other local authorities, have arranged for an inspection of the road from Stratton to Tintagel, in order to ascertain approximately the cost of bringing it up to main road requirements.

**Cannock R.D.C.**—Upon the advice of the surveyor, Mr. H. M. Whitehead, it has been decided to purchase a 250-gallon tar-spraying machine, at a cost not exceeding £68.

**Carshalton U.D.C.**—For tar-spraying, the tender of Dustabate, Limited, has been accepted, at 1d. per yard for ordinary tar and 1¼d. for special tar.

**Dover T.C.**—The Road Board and the Kent County Council have each promised a contribution of £600 towards the cost of Crabble Hill improvement.

**Grantham T.C.**—Application is to be made through the Kesteven County Council for a grant from the Road Board towards the extra cost of constructing London-road, High-street, and Gonerby-road in tarred granite.

**Hammersmith B.C.**—A loan of £18,000 is to be taken up for the King-street improvement.

**Hampton Wick U.D.C.**—The tender of Messrs. Horsefield for the supply of 200 yds. of flints, at 5s. 3d. per cub. yard, has been accepted.

**Holborn B.C.**—In spite of the protest made by frontagers, it has been decided to repave that portion of the carriageway of High Holborn lying between Kingsway and Bury-street with granite setts, and the tender of Messrs. John Mowlem & Co., Limited, at 13s. 4d. per yard super. has been adopted.

**Kensington B.C.**—Kingsbridge-road is to be made up and taken over as a "new street" under the provisions of the Metropolis Management Acts. It has been decided to purchase another tar-spraying machine at a cost of £88, similar to that already purchased.

**Lancashire C.C.**—On the adoption of the recommendation of the Main Roads Committee to grant £61,421, plus a supplemental £2,247 for the tar-spraying of highways, a suggestion was made, but not discussed, that the roads should be sprayed across only half their width at once. The author of the proposal, who spoke specially of the Lancaster and Carnforth roads, remarked that the tar did not dry quickly, and if the spraying were divided much injury to the tyres and paint of vehicles, and personal inconvenience, would be avoided.

**Marylebone B.C.**—It is proposed to widen the roadway at the junction of Marylebone-road and Baker-street Station, at an estimated cost of £1,811, and to ask the London County Council to contribute towards the cost. It is also proposed to form a circus at Baker-street in connection with the improvement.

**Nairnshire C.C.**—The county road surveyor, Mr. P. McFarlane, in his annual report states that the annual allocation of road metal to the main through highways is proving insufficient to keep them in satisfactory condition owing to the comparatively short life of metal coatings under the new mode of traffic, which on sections of the main through route running east and west averages about five years. Apart from this fact also, the surfaces of new coatings in the course of two years or so become cup-holed, and difficult to repair satisfactorily or economically. He states that he is firmly of opinion that to continue to lay down the annual quantities of metal on this main through route with water-bound macadam will in the long run prove wasteful and more costly than tar-macadam, when it is considered that larger quantities of road metal will annually be required, involving additional haulage of materials from the quarry over the roads, with the consequent wear and tear to the roads and plant. He is of opinion that the exceptional position of the county should be placed before the Road Board with the object of getting a special grant towards the purchase of plant. Such a grant would be directly to the interest of the Road Board when it is considered that they agree to pay 75 per cent of the cost of special road improvements.

**Newnham U.D.C.**—The surveyor, Mr. H. Ferris, has been instructed to include in his estimate the cost of tar-spraying the streets of the town.

**Newry U.D.C.**—The town surveyor reports that he has carried out several important experiments with tar-macadam on the main roads, with very satisfactory results.

**Nottingham T.C.**—The Improvement Committee recommend the widening of the north side of Hockley at an estimated cost of £3,650, this including purchase of land, street works and incidental costs.

**Plymouth T.C.**—The borough surveyor, Mr. J. Paton, has been instructed to report as to the cost and desirability of using motor vehicles for street watering purposes.

**Stoke Newington B.C.**—The repair of the carriageway of Mountgrove-road, at an estimated cost for materials of £234, has been approved, also the repaving of the footway in Stoke Newington-road, between Trumans-road and Castle-street, at an estimated cost for materials of £86.

**West Sussex C.C.**—The county surveyor, Mr. H. W. Bowen, reported at the meeting held last week that, in accordance with instructions, he prepared a detailed estimate of the cost of carrying out works of reconstruction on the London and Portsmouth main road amounting to £4,267, and also for similar work upon the main road leading from Pulborough through Storrington to Washington at a cost of £8,679, and upon the main road between Washington and Shoreham at a cost of £5,056, making a total sum of £18,002. The Road Board approved the scheme, and were prepared to meet the case by increasing their grant to £3,000, and would issue a loan to the county council of £15,000, free of all interest, to be repayable in five annual instalments. The specification of the work as submitted and approved allows for putting in proper foundations and surfacing with good approved granite, afterwards treating the finished surface with distilled tar and chippings.

## SEWERAGE AND SEWAGE DISPOSAL.

**Cannock R.D.C.**—The surveyor, Mr. H. M. Whitehead, has been instructed to prepare a sketch plan for the drainage of between 500 and 600 houses at Huntingdon. The houses are to be built by the Littleton Collieries Company.

**Chester T.C.**—The question of the preparation by the city surveyor, Mr. W. M. Jones, of plans and specifications of the sewage works extension has been referred back to the Sewering Committee for further consideration.

**Keighley T.C.**—The owners of fifty-four houses have been given notice to provide conveniences on the water carriage system.

**Loughborough R.D.C.**—A special committee has been appointed to consider a scheme of sewerage for Hathern, the medical officer of health having expressed the opinion that a drainage and sewage purification scheme, with a public water supply, was needed.

**Samford R.D.C.**—In reply to a complaint made by this council that the river Orwell is seriously contaminated by the sewage of Ipswich, a letter has been received from the town clerk of the latter town stating that upon examination the Sewerage Committee found the water at the quay and the foreshore of the river remarkably clean, and the sand and shingle bright with no trace of deposit. The retention of the crude sewage in the settling tanks and the screening of the effluent prior to its discharge into the river, which have now been in vogue for several years, appeared to be effective. The committee, it was added, proposed to fix Messrs. Smith's patent rotary screens above the present fixed screens. They thought that the result of this will be to do away with all ground of complaint. The Samford Council have again decided to request the Local Government Board to hold an inquiry into their complaint.

## WATER, GAS, AND ELECTRICITY.

**Abercarn (Mon.) U.D.C.**—A sub-committee has been appointed to consider the question of improving the water supply, the surveyor, Mr. John Williams, having reported that the Cherry Tree tank was dry, and that there was no overflow at Penyrel.

**Blackpool T.C.**—A nett profit of £14,700 has been claimed from the working of the gas undertaking during the past year.

**Crail (Fifeshire) T.C.**—An additional reservoir, holding 2,740,000 gallons, was formally opened last week. The engineer was Mr. Carfrae, of Edinburgh, and the contractor Mr. Robertson, of Inverkeithing.

**Elland (Yorks) U.D.C.**—The question of an improved water supply is becoming urgent. At present the council pay about £2,000 a year for water to the Halifax Corporation, and it is complained that the mains are too small, being only 6 in. in diameter.

**Ellesmere R.D.C.**—The council have adopted the scheme prepared by Messrs. Berrington, Son & Watney, of Westminster and Wolverhampton, for the water supply of Dudleston Heath, at a cost of £2,500.

**Glasgow T.C.**—The gas department have now completed the high-pressure gas installation, with the exception of a small portion of Bath-street, which is expected to be ready for next lighting season. There are forty-one lamps in operation at present, seventeen of 4,500-candle power each, and twenty-four of 3,000-candle power each, emitting a total light of 148,500 candles at 80-in. water-column pressure. These lamps have been supplied by different makers—eighteen are Keith & Blackmann, eleven are Graetzin, and twelve are Pharos lamps. These powerful units will displace the small existing street lamps in their immediate vicinity, which only yield approximately a light equal to 10,000 candles. The compressing plant consists of two compressors, having together a capacity of 14,000 cub. ft. of gas per hour at 90-in. water-column pressure, and both compressors are driven by gas engines. By a simple device the Graetzin and Pharos lights can be controlled from the compressor-house, so that two of the burners can be extinguished, leaving one burner lighted in each lamp.

**Greenock T.C.**—The Gas Committee have agreed to recommend that the work of installing a new high-pressure plant, at a cost of £10,000, be proceeded with.

**Kelso T.C.**—It has been agreed to borrow the sum of £31,000 to meet the cost of the capital works of the Heriot-hope gravitation water scheme for the town, and the cost of the Provisional Order.

**Nottingham T.C.**—The Electricity Committee has been instructed to consider and report to the council the possibilities and prospects of obtaining powers to harness Colwick and Beeston Weirs, with a view to generating electric current to supply the city and district, and to ascertain from experts the horse power which could be relied upon at low water.

**Rothesay T.C.**—Approval has been given to a scheme of electric light decoration for the esplanade gardens, costing about £800. The scheme includes festoons of fairy lamps for the flower gardens and illumination of the bandstand and enclosure.


## FOR OTHER ADVERTISEMENTS
See End of Paper.

BARNET URBAN DISTRICT COUNCIL.

HOUSING OF THE WORKING CLASSES.

TO BUILERS, &c.

ERECTION OF WORKMEN'S DWELLINGS.

The Urban District of Barnet invite Tenders for the Erection of 22 cottages in Totteridge-lane, Barnet, within the Urban District.

Persons desiring to submit Tenders may, upon depositing with the Council the sum of £1 1s., obtain on loan copies of the Drawings and Specification and other information from Mr. W. F. Wilkins, Surveyor to the Council, at their offices, No. 40 High-street, Barnet, and such deposit will be refunded after the Council have come to a decision upon the Tenders, provided the person or persons obtaining the copies aforesaid have submitted a *bonâ-fide* Tender to the Council.

The Contractor will be required to employ local labour so far as possible, and to satisfy the Surveyor that this is being done.

Tenders, on the official form, and in sealed envelopes, endorsed "Cottages," must be addressed to the undersigned at No. 40 High-street, Barnet, and delivered not later than noon on the Fourth Day of June, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

HY. W. POOLE.
Clerk of the Council.

May 8, 1912.

BOROUGH OF FOLKESTONE.
STEAM MOTOR LORRY.

The Corporation of Folkestone are prepared to receive offers for a Steam Motor Lorry, at present used for the Collection of House Refuse.

Built by Savage Brothers, Limited, of King's Lynn, in 1904, loco. type boiler, 7 cub. yds. capacity, tipping body, &c.

May be seen in use at any time by arrangement with Mr. A. E. Nichols, M.INST.C.E., Borough Engineer, Municipal Offices, Folkestone.

Sealed offers, endorsed on the envelope "Steam Motor Lorry," to be addressed to the undersigned and delivered at the Town Clerk's Office not later than the 25th day of MAY, 1912.

The Corporation do not bind themselves to accept the highest or any offer.

(By order)
A. F. KIDSON,
Town Clerk.

Town Clerk's Office,
Folkestone.
May 8, 1912.

BOROUGH OF BRIGHOUSE.

Wanted, Temporary Engineering Assistant in the Borough Engineer's Department to assist in preparation of Plans for Sewage Works extension. Applicants to be good draughtsmen, and have thorough knowledge of modern sewage works construction. Appointment for three months; salary £3 per week. Applications, with copies of three testimonials, to be sent to the Town Clerk, Brighouse, not later than May 22nd, 1912. Canvassing prohibited.

JAS. H. ROTHWELL,
Town Clerk.

Brighouse.

CONTRACTORS require a young Civil Engineer on Drainage Contract. State age, training, salary required, and when at liberty.—Box 1,154, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

## PERSONAL.

Mr. R. Curtis Cordon, district surveyor to the Buckingham Rural District Council, has been granted an increase of salary.

Mr. Herbert Holloway, a well-known public works contractor, died at his Wolverhampton residence on Friday last. Mr. Holloway, who was sixty-one years of age, carried out many important contracts for local authorities.

Mr. Herbert Bailey, of the paving department, Manchester Town Hall, is leaving the corporation service to take up a more lucrative appointment in the commercial world. Mr. Bailey has had many years' service under the city surveyor.

Sir Maurice Fitzmaurice, C.M.G., chief engineer to the London County Council, has specially contributed to the *Contract Record and Engineering Review* of Toronto a detailed description of the "Construction of the Rotherhithe Tunnel." The article appears in the fine annual number of that journal dated April 24th last.

Mr. Thomas Joshua Orme, road surveyor of Birmingham, died, we regret to state, on Saturday night at his residence in City-road. Mr. Orme was formerly road surveyor at Cambridge and Norwich, and he came to Birmingham from the latter city in August, 1898, during the time the late Mr. John Price was the chief surveyor. He reorganised the department of which he was appointed the head, and introduced many improvements in the detailed work, all of which were to the advantage of the establishment as a whole. Mr. Orme was fifty-six years of age.

Mr. J. Pulteney Tolland, who has been in Uganda, is returning to England on furlough for six months. He has had an interesting experience in the Protectorate. During 1910-11, as district surveyor, he was on special duty on a tour of the western part of Uganda, laying out the townships at Hoima, Masindi, and Fort Portal, the headquarters of administration in the kingdom of Bunyoro and Toro respectively. He also laid out the township at Butiaba, the port on Lake Albert. Other surveys necessitated the carrying of a triangulation over a large tract of country in Bunyoro. As regarded the Fort Portal survey, it was necessary to connect to the recent triangulation of the Anglo-Congo Boundary Commission. This necessitated the ascent of one of the peaks on Ruwenzori (Mountains of the Moon, called "Karangara," 10,000 ft. above sea-level, to take observations. The cold was intense, and the view of the snowfields and glaciers magnificent. There is perpetual snow at an altitude of 13,000 ft. To the west, as far as the eye could see, stretches the Great "Ituri" Forest, in the Congo. Mr. Tolland's wife accompanied him in the ascent; the party camped on the mountain. Only four ladies have previously made the ascent.

Mr. Herbert E. Bellamy—the subject of the accompanying portrait—has recently been appointed resident engineer of the first Pacific Ocean section in connection with the constructional work of the great Southern and Western Ocean outfall sewer for the city of Sydney and suburbs. This enormous undertaking is being carried out under his supervision by the New South Wales Government Public Works Department. Mr. Bellamy was born in Bedfordshire in 1877, and is thus only thirty-five years of age. In the year 1890 he was appointed an assistant in the office of Mr. Geo. J. C. Broom, M.INST.C.E., F.G.S., then borough engineer and surveyor of St. Helens, Lancashire. After remaining there for a period of seven years, he subsequently filled various chief municipal appointments in the counties of Devon and Cornwall. In April, 1900, he was unanimously appointed city and waterworks engineer to the Rockhampton Municipality in Queensland. There he designed and carried out public works amounting in cost to £100,000 including sums spent on waterworks, roads, bridges, drainage works, pumping plants, and new depots of various kinds. He also designed a new water supply scheme for the city estimated to cost £110,000. The engineering details of the latter work were approved of by the Inspector-General of Public Works of Victoria, Mr. W. Davidson, M.INST.C.E., but on account of lack of funds the project fell through. At the time of the bubonic plague epidemic in 1901 Mr. Bellamy supervised the demolition and reconstruction of several quarters within the city occupied by Chinese. In 1905 he toured through America, South Africa, Egypt, and the Continent of Europe. From February, 1906, to February, 1909, he was engaged on the Colombo main drainage works for the Ceylon Government, for which Messrs. James Mansergh & Sons, MM.INST.C.E., Westminster, are the consulting engineers. There he carried out, under the direction of Mr. R. Eustace Tickell, M.INST.C.E. (son-in-law of Sir Alex. R. Binnie), the main intercepting sewer—which was laid in treacherous ground—bacteriological treatment works, outfall works, and main pumping station, at a cost of Rs.1,150,000. Upon completion of the latter works, Mr. Bellamy visited many large engineering works in Germany, Great Britain, America and Canada. In February, 1910, he was appointed hydraulic engineering surveyor in the Queensland Government Hydraulic Department. He was engaged on works of water supply, irrigation, and water conservation, flood prevention and drainage works in Northern, Central and Southern Queensland. In October last he was called in by the Rockhampton City Council as consulting engineer to report and advise upon a new water supply for the city. He submitted an exhaustive report, and designed twenty-six drawings for a scheme estimated to cost £124,530. He also acted in a consulting capacity for a new town drainage scheme, a flood prevention scheme, and a ferro-concrete bridge of 120 ft. span. Mr. Bellamy is a qualified engineer under the Local Government Act of 1906 in New South Wales. He is the author of some one hundred articles, including

MR. HERBERT E. BELLAMY.

*From photo. by Pitt, Sydney.*

"Floods in the Fitzroy River, &c." (to the Institution of Civil Engineers), "Water Supply Intakes" (vol. 5 of *Public Works*), "Concrete Culverts," "Timber Dwellings," and "The Design of Bacterial Sewage Works for Cities and Towns in Australia" (to the Australasian Local Government Engineers' Association). He has acted as hon. secretary of the Ceylon Engineering Association. For many years he was a keen Volunteer, and has served in three branches—namely, the Engineers, the Artillery, and the Infantry. In his new position, according to all reports, Mr. Bellamy will have abundant scope for his well-known determination and resourcefulness in dealing with difficulties in large engineering works.

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The periodic lectures on practical and theoretical concrete engineering have been resumed at the Cambridge University Engineering Laboratories, the lecturer being Mr. A. C. Davis, of the Saxon Cement Company, Cambridge.

The election of officers of the Sheffield Society of Architects and Surveyors for the ensuing year has resulted as follows. President—Mr. J. B. Mitchell-Withers (re-elected); vice-president—Mr. A. F. Watson (re-elected); hon. treasurer—Mr. R. W. Fowler; hon. secretary—Mr. J. R. Wigfull (re-elected); council—Messrs. W. G. Buck, F. E. P. Edwards, C. B. Flockton, J. R. Hall, C. F. Innocent, H. L. Paterson, H. I. Potter, E. Winder and F. H. Wrench.

# Mass and Bulk in Highway Engineering.

## TWO PRIMARY FACTORS IN THE MECHANICS OF ROAD CRUSTS.

The word "mass" is used in physics to denote quantity of matter. This quantity is usually measured by the weight which is the product of the mass and the acceleration of gravity. The energy of a moving body is measured by half the product of its mass and the square of its velocity. Similarly, mass is a factor of the inertia possessed by any body. A blow or push given to a body of material tends to move it with a velocity which is inversely proportionate to the mass of the body. Since the masses and weights of different bodies are exactly proportional, there is no error in the statement that it is the body with the greater weight which is the more easily moved. A good example of the importance of the inertia of mass is afforded by a case such as the following:—

Suppose that a traveller comes to a stream and wants to cross it. It is too wide to be taken in a stride and the margins do not allow of jumping. There are two places at each of which a single stone provides a chance of crossing. Now, if both stones are wobbly, and equally wobbly, and both afford exactly the same amount of actual vertical support, the better for our traveller's purpose is the larger, which, in everyday language, is the heavier, and has the greater mass. Whether the traveller be a blacksmith or an engineer, the same idea is in his mind. The blacksmith knows that a large hammer held behind a rivet will give him the support he needs for driving the rivet better than a small one, because it will jump less; the engineer knows that the stone with the larger mass will move with less speed and, therefore, shift less in the short time that his foot touches it than will the smaller stone, the mass of which is less.

### THE VALUE OF INERTIA UNDER FOOT.

Take another case. An angler who is accustomed to cross trout streams many times in the day finds that where he wants to cross an unfamiliar stream there are two natural bridges, one formed by a rotten trunk and one by a decayed but less rotten bough. Both rest firmly in the banks, so that friction does not come in. The trunk is much larger and heavier than the bough, but in one part it is thin as well as much decayed, and it seems to be incapable of supporting so heavy a load as the bough could support. As, however, the angler does not think that the bough is strong enough to support his weight, standing still on it, he selects the trunk as a bridge to be crossed in two or three strides, although it is the weaker, and because it is the larger and heavier. Its mass is greater, and even if it break it will not move from under his feet before he can cross.

The same principle applies to a road crust. Suppose that we have two materials, such as limestone and sandstone. Suppose that the rates for these materials and for putting them down are such that the limestone costs sixpence per cubic foot and the sandstone threepence. Let the shear resistance of the limestone crust be twice that of the sandstone crust; we may then regard 6 in. thickness of the former as in this respect equal to 12 in. thickness of the latter. If we consider a square foot of each crust, the limestone square slab has four sides 2 sq. ft. in total area, and the sandstone slab has four sides totalling 4 sq. ft. in area, but the resistance to shear, or to punching through, is the same. (As regards the punching out of a cone of material, the sandstone would have a great advantage in a similar comparison.) The cost of the cubic foot of sandstone will be the same as that of the half cubic foot of limestone. In order to keep the issue clear it is necessary to assume in the present argument that the direct support of the subsoil is worth very little. On this assumption let us consider which is the better crust. If the limestone is a better wearing stone, and, on the whole, provides the better surface, it is, so far, to be preferred. But this is not the whole story: we have to take the mass of the square foot of crust into account. The mass of the sandstone slab is twice as great, or nearly twice as great, as that of the limestone slab. Its resistance to the shocks of traffic is therefore greater; it provides a crust which is less likely to be shaken loose, and deals less severe blows to the subsoil than does the less massive crust. The engineer has to balance this advantage against the better surface provided by the limestone. In applying this principle to practice we must not, of course, regard it as necessary that we should have such thicknesses of crusts that the punching resistances are equal. Nor need we take the thickness of one crust as any fixed proportion of that of the other. If equal punching resistance were afforded by a sandstone crust half as thick again as the limestone crust, the cost of the former would be reduced by a quarter if we took this as a guide to thickness; but the advantage as regards mass would be proportionately reduced. Matters of this kind cannot be decided by rules. They have to be settled either by thinking the whole thing over and forming a single judgment upon it as a whole, or by taking the different factors one at a time, estimating the relative advantage or disadvantage, in each case expressed as a fraction, and multiplying these fractions together. Before going further into this it is necessary to consider the effect of bulk.

### THE VALUE OF BULK.

In the design of road crusts bulk is an important factor, not as a matter apart, but in conformity with principles of design generally. One of the most striking examples of the value of bulk is that afforded by a comparison of beams of different materials. Suppose that we have to design a structure which will contain a number of timber beams, the total cost of which is a matter of importance. Let us suppose that the choice is between hard wood costing 3s. a cubic foot and soft wood costing 2s. Both timbers are sufficiently lasting and capable of filling all requirements, but the hard wood has a fibre strength twice as great as that of the soft wood. How do they compare as to cost? The fact that the soft wood is the cheaper is at once apparent to the structural engineer, but the principle is not always acted up to in practice, nor is it fully recognised in highway engineering. The widths of the beams to be compared will be assumed the same, for the width seldom depends upon the strength, being usually determined as a matter of bearing area or of attachments. For the same spans, then, cost will depend upon the rate and upon the depth. The moments of resistance being equal (having to be equal) we get:—

$$\text{Moment of resistance} = f \times \frac{bh^2}{6} = \left(\tfrac{1}{2}f\right) \times \frac{b\mathrm{H}^2}{6}$$

where $f$ = fibre stress of the hard wood
$\frac{1}{2}f$ = fibre stress of the soft wood
$h$ = depth of the hard wood beam
H = depth of the soft wood beam

therefore $h^2 = \frac{1}{2}\mathrm{H}^2$

or $\mathrm{H} = 1{\cdot}414\,h$

if $h$ = 12 inches, then H = 17 inches

The depth of the soft wood beam being 17 in., the cost of a beam 20 ft. long, 6 in. wide, and 17 in. deep, at 2s. per cubic foot, is 28s. 4d. against 30s. for the hard wood beam 12 in. deep. If the depths were designed to give equal stiffness the comparison would be still more favourable to the soft wood beam; but this principle hardly applies to road crusts, since, for reasons which need not be discussed here, there is little or no advantage in stiffness in so far as it is more than proportionate to strength.

But we may take into account the beam strength of a road crust since it is from time to time called into play over weak places in the foundation or subsoil. If we have a sandstone crust 12 in. thick which has only half the tenacity of a limestone crust 6 in. thick, it is, nevertheless, twice as strong regarded as a beam. It would have equal strength if it were 8½ in. thick. The limestone crust, if 8½ in. thick, would be twice as strong as the same crust 6 in. thick, in so far as it acted as a beam.

### REDUCTION OF PRESSURE ON THE SUBSOIL.

The most important effect of bulk is that gained by using the greater bulk to give greater depth of crust. For the same "spread" of the load the greater depth gives a much larger area of support by the subsoil.

For a load resting on an area of a few square inches at the surface a crust 9 in. thick gives a supporting area twice as great as that under a similar crust 6 in. thick. The area of support under a 12-in. crust is nearly four times that under a 6-in. crust. See Fig. 1.

The other diagram, Fig. 2, shows the widths of sub-

soil under the wheel tracks for a 6-in. crust and for a 12-in. crust.

It is quite clear that on a soft subsoil, bulk, or "mass *quâ* size," may be of dominating importance. It is, however, of much less use to get the depth by dumping in a nominal "foundation course," which only stiffens the subsoil a little and does not form a part of the crust proper. To get the full effect of depth we must make use of "spread," and this we do not fully obtain except with a single crust or with

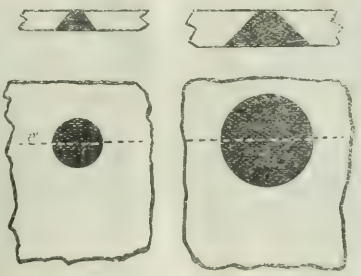

Fig. 1.

a genuine foundation course incorporated with the crust. Where a cheap stone is good enough for, or suitable for, the wearing course, the crust may be a single homogeneous one; and where a harder or tougher material is necessary for the wearing course, this should not be a slab resting upon the crust, but

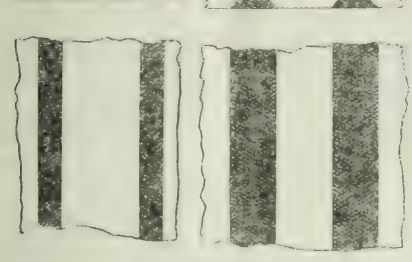

Fig. 2.

should be a part of it. When the wearing course is a carpet layer, its thickness should not be included in the thickness of the crust in calculations for strength, or relative strength.

OTHER USES OF BULK.

It is not always desirable to use the whole of the extra quantity of a cheaper material in the provision of additional thickness. The greater volume may be used to give greater width. We may carry the crust beyond the incidence of wheel loads, so strengthening and supporting the edges; we may provide greater thickness under the edges only, if the material be suitable; we may use some of it to resist scour in places which would be left bare if costly stone were used; or, where the width of the carriageway seems to be less than the economical width for the traffic and the weathering effects, we may increase it, and watch the effect of it on the total loss of material per mile. On the whole, however, the most important advantage of greater bulk is to give greater general thickness to the crust. This not only applies to comparisons such as those between local sandstone or limestone and hard road metal costing much more, but it applies also to a comparison between two kinds of hard road metal, one of high specific gravity and one of low specific gravity. If the prices are the same per ton we get the same quantity of material for the same money. As regards "mass *quâ* mass," the thicker crust is no better than the other, but as regards "mass *quâ* size" it has some advantage. It is possible in such a case to compare crusts of equal thickness, the lighter material costing less; but since the quantity of matter purchased is then actually less, a fairer comparison is to spend the same amount of money in each case, and, instead of penalising the lighter stuff by using the same volume but less matter, give it the advantage of its greater bulk, and consequently greater crust thickness, to balance any advantage which the heavier stone may possess on account of its greater density. That is the fair way to compare a light granite with a heavy diorite, for instance, or a light limestone with a heavy limestone.

COMPARISONS BY FACTORS.

To some minds, and under some circumstances, comparison by factors is the best method of assisting the judgment in a comparison involving a number of different considerations. In other cases comparison by addition is preferred. In either case the numerical study may be a great help.

Let us take first a typical example of comparison by factors, in the case of a limestone crust 6 in. thick compared with a sandstone crust 12 in. thick, cheaper and poorer stuff. The numerator of each fraction represents limestone, the denominator sandstone. The sandstone, in place in the crust, is assumed to cost a little more than half the cost of the limestone.

| | d. | d. |
|---|---|---|
| (1) Cost of a square foot ... ... ... | 3½ | to 3 – ½ |
| (2) Merit of the surface ... ... ... | 4 | to 3 – ¼ |
| (3) Liability to punching in favour of sandstone ... ... ... ... ... | 4 | to 5 – ¼ |
| (4) Wearing life, or value as a strength crust after long wear and small repairs ... ... ... ... ... | 5 | to 6 – ⅝ |
| (5) Dustiness when old ... ... ... | 5 | to 6 – ⅝ |
| (6) Life as a wearing crust; the sandstone grinding up to sand has the disadvantage ... ... ... ... | 4 | to 3 – ¼ |
| (7) Greater spread and larger surface on the subsoil (sandstone) ... ... | 3 | to 4 – ½ |
| (8) Greater value of the limestone as a binding material when broken up for complete renewal (the district is supposed to be poor in such material) ... ... ... ... ... | 5 | to 4 – ½ |
| (9) Fretting under motor traffic, especially at corners ... ... ... ... | 5 | to 4 – ½ |

Multiplying up, the advantage is

$$\frac{\text{Limestone}}{\text{Sandstone}} = \frac{7}{8} \times \frac{4}{3} \times \frac{5}{4} \times \frac{5}{4} \times \frac{4}{3} \times \frac{3}{4} \times \frac{5}{4} \times \frac{5}{4} \times \frac{5}{4} = \frac{875}{648}, \text{ or nearly } \frac{88}{65}$$

Suppose, now, that a "practical man" to whom calculation is vexatious, desires to make a similar comparison. He might do it as follows:

| Items. | Advantage to limestone. Halfpence. | Advantage to Sandstone. Halfpence. |
|---|---|---|
| (1) | 1 | – |
| (2) | 2 | – |
| (3) | – | 1 |
| (4) | – | 1 |
| (5) | – | 1 |
| (6) | 1 | – |
| (7) | – | 2 |
| (8) | 2 | – |
| (9) | 1 | – |
| Total | 7 | 5 |

He would find an advantage of a penny per square foot in favour of the limestone.

Rough as such calculations are, they are of very great value in training the person who uses them to think definitely. A great deal of useful work can be done in the broad and fruitful land which lies between the realm of pure judgment and the domain of accurate measurement and exact calculation.

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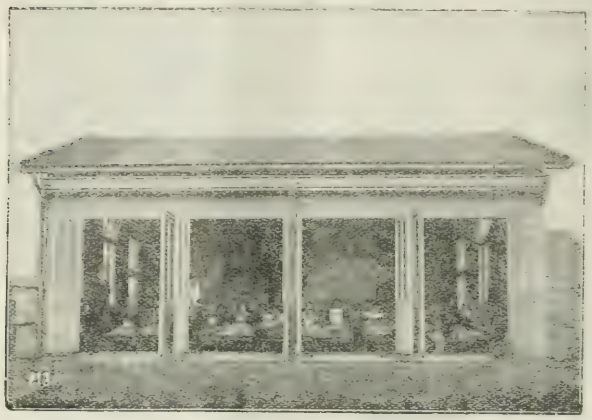
**Public Health Law.**—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangement well suited for easy reference.—*The Law Times.*

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By Sydney G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

## PORTABLE BUILDINGS.

### THE "DOECKER" SYSTEM.

Public bodies—and hospital and education authorities in particular—who from time to time are faced with the necessity of providing at short notice buildings which, while possessing all the advantages of a permanent structure, are capable of easy removal to another site as occasion arises, will be interested in the following notes on a system of construction which has already done much to prove its superiority over others. It has been the aim of the designers of the system in question to place upon the market a building which, while embodying all the essential features of a firm structure of brick and stone as regards comfort, hygiene, ventilation and stability, would at the same time differ from those buildings which, although claimed to be portable, are portable only in the sense that they admit of removal if the important factors of time and money can be disregarded. "Doecker" buildings, as they are called, are manufactured in two types—light and strong type. The first are intended to permit of absolute portability for cases where frequent removals are anticipated, or where it is desired to provide for emergencies such as sudden inundations of water or outbreaks of contagious disease. The semi-permanent type, on the other hand, meets the requirements usual in connection with hospitals, schools, reading-rooms and offices, lightness of material and extreme portability not being considered to the same extent as with the temporary type.



School at Reading.
Can be used as open-air school.

In both types the walls of the buildings consist of sections about 3 ft. 3 in. wide, connected by patent hooks, which, besides providing quite as substantial a fixture as nails or screws, are naturally to be preferred where portability is an all-important question. The hooks are a very simple fastening, admitting of quick erection and dismantling, and the absence of damage to the material during the operation is, as can readily be imagined, in striking contrast to the condition of structures in which screws and nails are employed. Every part is accurately fitted before despatch from the works and the various sections numbered, rendering the process of re-erection a comparatively simple matter.

The system of the light type consists of strong wooden frames, which are covered on both sides with a double layer of "Doecker" material applied to form closed air spaces between. The flooring is of wood, and also formed in sections. This has been carried further in the case of what are called "Flying Buildings," where the sections of the floor are so constructed that they can be used as packing cases for the remainder of the building while in transit. In addition, the flooring is provided with alterable wooden supports, which compensate for any unevenness in the ground on which a building is to be placed, and render the provision of a foundation unnecessary.

The sections of the strong type are covered on the outside over a layer of insulating material with morticed weather boarding, and on the inside with a double layer of "Doecker" material. The air spaces thus formed are again divided by various layers of insulating material, in addition to which grooved wood panels or cork slabs are inserted according to the purpose for which a particular building is being made.

"Doecker" material, besides being flame, water and acid proof, is perfectly smooth and washable, preventing the harbouring of germs or other deleterious matter, and admitting of easy and certain disinfection; it is therefore especially suitable, from an hygienic point of view, for hospitals and schools. If the walls are to be subjected to rough treatment—as, for instance, in storehouses, workmen's dwellings, &c. — the "Doecker" material can be replaced by plywood panels or matchboarding. The buildings are supplied with and without ceilings, the former obviously being preferable. Through the spaces between the roof and ceiling passes a current of air which materially assists in keeping the building cool in summer; in winter the apertures can be closed by means of shutters, thus forming a miniature attic, which protects the building against the cold. Particular attention has been given to the provision of ventilators in the ceiling, and a perfect circulation of air takes place in the rooms. The internal arrangements, number and size of rooms, and so forth, can be made to suit individual requirements, and adornment or embellishment of the exterior can, within certain limits, be embodied in the design. The buildings are of best material and workmanship throughout; they are thoroughly finished, and painted with three coats of good oil colour.

Infectious Diseases Hospital Erected for Sudbury (Suffolk) Town Council.

Two elementary schools on the "Doecker" principle were erected a short time ago at Leith, where the education authorities were suddenly faced with an urgent demand for increased accommodation, and Mr. J. M. Johnston, the architect of the School Board, in reporting as to the buildings since their occupation, testifies to their many excellent qualities. "During warm weather," he says, "the coolness and freshness

of the atmosphere of the class-rooms was to be remarked, and in frosty weather, in spite of the light nature of the construction, no difficulty was experienced in maintaining a temperature of 60 deg. Fahr. throughout the buildings. While the construction is of a light nature, and composed of separate portable sections, they are set and held together in such a

Sanatorium for Consumptives.

manner that their strength and rigidity is remarkable, and there are no appearances of any movement having taken place."

The accompanying photographic views will serve to indicate a few of the numerous directions in which the "Doecker" buildings can be employed, and for further information we would recommend readers to communicate with Hygienic Constructions and Portable Buildings, Limited, of Stockholm-road, Bermondsey, S.E., the sole makers.

**Sewage Screening Apparatus.**—Messrs. John Smith & Co., of Carshalton, have just received orders for complete installations of their mechanical sewage screening apparatus from the Folkestone and the Ipswich Town Councils. At both places the screens will be driven by waterwheels utilising the flow of the sewage itself.

**Public Works and Engineering Review of Reviews** (Vol. xii., No. 1. London: The Civil Engineering Press).—All interested in works of a public character and matters particularly of a municipal nature would do well to procure a copy of this journal. The articles upon "Water and Petroleum Boring and Machinery," and "Roads and Streets" will be found of particular interest. —*Machinery User.*

**Middlesbrough's New Library.**—A new public library at Middlesbrough was formally opened on Wednesday. The general lending library is on the ground floor, adjoining the main entrance in Dunning-road. At the north end there is a juvenile library, and these rooms are provided with seats and reading desks.

Open-Air Shelters.

On the first floor is the reference library and the reference reading-room, where general reading tables and students' tables are provided. There is also a law library, and a patents library for full specifications of patents. The general news-room is entered from Grange-road East, and has a bright and sunny ladies' room attached to it. The cost has been £18,000.

## PRESENTATION TO MR. CHAMBERS-SMITH.

At a dinner given in his honour last week at the local Masonic Hall, Mr. C. Chambers-Smith was presented by a number of the townspeople with a gold chronometer in recognition of his fourteen years' services as surveyor to the Sutton (Surrey) Urban District Council.

Mr. W. Hunting, F.R.C.V.S., who presided over the gathering, said that in Mr. Chambers-Smith Sutton had lost a sound, good, honest official. He had had two years of misery, in which suspicion hung over him, but now all that was cleared up, and he was in smooth water again. In asking their guest's acceptance of the gift to which they had subscribed, Mr. Hunting added that he had also to present to Mrs. Chambers-Smith a diamond and platinum pendant. Mrs. Chambers-Smith had had to suffer under the innuendos and reflections which had been cast upon her husband's character, and she had had to suffer in silence—one of the most difficult things for anyone to do. There was also a little cheque, which he handed to Mr. Chambers-Smith.

Mr. Chambers-Smith, who was accorded an enthusiastic reception, expressed his thanks for the kindly references to his wife and for the present which had been made to her. He thanked them also for their magnificent present to himself, which he would always treasure as an answer to all the aspersions, insinuations, and charges which had been made during the past two years. He heartily thanked the friends who had come around him and had stuck to him through

Four-Class School.

Originally erected at Long Eaton, Derbyshire, but afterwards divided, one half being removed to Shipley and the other to New Mills.

thick and thin, who had faith that he had clean hands, that he had fought the fight honestly, would do nothing dirty or strike below the belt, but would always be English. Mr. Chambers-Smith then spoke at considerable length on the events leading up to his resignation and the attitude of certain members of the council since that date. In conclusion, he expressed his willingness to put into the hands of any committee of investigation which might be formed all the documentary evidence in his possession. (Applause.) He thanked them again on behalf of himself and his wife for their handsome presents, which would always remind them of the generosity and good feeling of their friends in Sutton.

Mr. J. Wakeford, who served for six years on the council, finishing up as its chairman, paid tribute to Mr. Chambers-Smith's character. He had peculiar opportunities of studying his work and actions, and never found him other than a good, honest, hard-working servant of the town. His faith in him had never been shaken, and he held him in as much respect at the time he resigned as he did that night.

**Invergordon Water Supply.**—The new water supply for the burgh of Invergordon was formally inaugurated recently. The new water comes from Kinrive Spring, and the approximate cost of the scheme amounts to £5,300. Messrs. G. Gordon & Co., C.E., Inverness, were the engineers, and Mr. Hector Macvinish, Inverness, the contractor. The reservoir has been constructed at Newmore.

## THE PROPOSED WESTERN APPROACH TO LONDON.

### ATTITUDE OF ROADS IMPROVEMENT ASSOCIATION.

The Roads Improvement Association, who are strongly supporting the scheme of the Road Board to make a substantial grant towards constructing a new western approach road to London, have issued the following: -

"As was indicated in the annual report, this scheme was initiated by the Roads Improvement Association some ten years ago, and has passed through various phases since that time; the association was actively engaged in the preliminary negotiations which led up to the announcement of the present proposal.

"In some parts of the country suggestions have been made that the allocation by the Road Board of such a large sum towards one particular scheme is open to objection, but this criticism would appear to be based upon an incomplete knowledge of all the circumstances, and it is probably desirable to indicate why the Roads Improvement Association has taken so much trouble to foster the scheme and now strongly supports it.

"Soon after the Road Board commenced operations they indicated, in a series of resolutions, their proposed policy in connection with the distribution of the Road Improvement Fund. Briefly, the Road Board stated that first consideration would be given to the most dangerous curves, turnings, corners and cross roads, where public safety was endangered, even with careful driving, and in dealing with them attention would be concentrated upon opening out a clear view of approaching vehicles only, unless circumstances were such that improvements in alignment could be carried out without additional cost. Widening and other works for the relief of traffic congestion were to be postponed for the moment, and the improvement or strengthening of the crust or foundation of the existing important roads was to take precedence. This policy was endorsed by the Roads Improvement Association, as representing the users of the highway.

"It must be borne in mind that over £1,000,000 of the Road Board funds has been, or is being, expended upon the improvement of country roads. As such a good start has now been made with the 'works of precedence,' referred to in the Road Board policy, it is felt that town and urban areas, which provide a very large proportion of the taxes to the Road Improvement Fund, are now entitled to a share.

"The Roads Improvement Association is strongly of the view that it is more desirable, in the case of town and urban areas, for the Road Board to spend its funds upon really comprehensive schemes of public utility which will benefit large sections of the community rather than fritter the money away in small expensive urban improvements of purely local interest. It will be obvious that if the Road Board commenced to contribute towards town and urban widenings there would be no money left to carry out big national schemes; further, urban widenings that are really necessary are carried out, in the long run, by the localities which benefit by them. Unless the Road Board is willing to spend money upon big national schemes, improvements of this character will never be accomplished, as they are, of course, beyond the resources of the local authorities.

"It will be universally admitted that London (which incidentally provides the majority of the funds derived from the petrol tax) undoubtedly has first claim for a big scheme. London is used more by the inhabitants of the provinces than any other town; a London improvement always means a national improvement. In the Metropolis the congestion of traffic is greater than in any other part of the country. The loss to the trading community through this cause is enormous, and London's most urgent need in road matters is for new exits, and its need in this direction is much greater than in any other part of the kingdom.

"The Roads Improvement Association has naturally taken a very keen interest in this matter, and it is quite satisfied, from the information before it, that no part of the community is 'going short' of funds to enable London and the West to have the benefit of this scheme. The London and Middlesex areas are, of course, entitled to a share of the Road Improvement Fund, and in employing their share for constructing a new exit to the West the Roads Improvement Association is of the view that the greatest benefits will be conferred upon the largest possible section of the community."

## SOME RECENT PUBLICATIONS.*

Climate and Weather. By H. N. Dickson, M.A., D.Sc., F.R.Met.Soc., President of the Royal Meteorological Society, Professor of Geography at University College, Reading. Price 1s. nett. London: Williams & Norgate.

In this little volume, which is one of the "Home University" Series, Dr. Dickson successfully explains the nature and the causes of climatic differences and seasonal changes, and draws in outline a faithful picture of the main effects upon the vegetable kingdom and upon mankind of the chief of these different conditions and the most important of the recurring changes. He begins by describing, sufficiently for his purpose, the nature of the planet on which we live, and the great natural forces at work upon its surface. He next describes the atmosphere, with its dual nature, gaseous and vaporous, and proceeds to explain with great clearness the conditions to which it is exposed and the manner in which circulatory movement is set up. Then follow two chapters connecting this primary matter with the descriptions of climatic regions and with the outline studies in the chapters headed "Climate and Vegetation" and "Climate and Man." The two connecting chapters, which together form the keystone of the work, are "The Planetary Circulation of the Atmosphere" and "The Influence of Land and Sea," and together they admirably serve the purpose of putting the student into a position to realise on the one hand the significance of the matter preceding them, and, on the other hand, the principles which govern the main features of the climatic regions afterwards described. Like the "plot" of a good tale, they link what corresponds to temperament and environment with the happenings and results. The analogy is a fairly close one because the study of climate and weather, though it is now something more than a sagacious grouping of observed phenomena, is not yet an exactly developed argument from definite and fully understood data. The book may be confidently recommended to all classes of engineers, since it forms a convenient summary of the primary facts of meteorology, and, as such, is a reliable book of reference, while the student will find it a sure guide to the subject; and even those engineers who take little interest in meteorology should find a place for it on the bookshelf as a work dealing with important facts which must be taken into account in the application of engineering science to the greater problems of the world.

One of the best tests of the value of a book dealing with one of the sciences in a general way is the extent to which it impresses the reader with its universality. When we read a really good "primer" of chemistry we feel that chemistry is the all-pervading, dominating science; but a subsequent study of a good work on mechanics suggests that mechanics is the dominating science, dealing as it does with mass and movement, and not with the mere stuff of which things are composed. The eager student, however, seeking fresh fields, may find in biology the science that really matters, and will wonder how he could have lingered so long over dry bones when life with all its marvels lay before him. Judged by this test, the author of "Climate and Weather" is one of the most successful writers of a book which is elementary in the sense of "primary," not merely "preliminary." He convinces his readers that there is no more interesting application of the natural laws studied under the designation "physics" or "mechanics" than their application to a study of climate and weather, and his references to vegetation suggest that a study of the vegetation of the world in its relation to climate is more interesting than the study of the flora of a country as a mass of detailed observations. Last, but not least, he makes it plain that climate is as important an element in the history of man as are tools, weapons, or racial temperaments. For young readers especially his book would be a very valuable companion volume to be read in connection with an outline history of the nations of the world or a general study of the development of the British Empire.

There are a few places in the book where the effort necessary to present important facts in a small space has led to some obscurity of expression, but this never extends beyond the particular passage and does not affect the general lucidity of the argument. On p. 85 the words *with* and *against* should be transposed. A very useful feature of the book is the inclusion of

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

the charts of isotherms and isobars, the latter showing also the directions of the prevailing winds. The bibliographical note at the end serves to indicate the most important works on the subject.

The Economics of Feeding Horses. By H. A. Woodruff, M.R.C.V.S. Price 3s. 6d. nett. London: Baillière, Tindall & Cox.

At the present time the problem of feeding horses so as to secure the maximum of efficiency at the minimum of cost is a very urgent one, inasmuch as the draught horse has to compete with methods of mechanical traction, and the question of cost is a decisive factor. In this book the author, who is the Professor of Veterinary Medicine in the Royal Veterinary College, London, deals with the subject of the scientific feeding of horses used for work, and sets out clearly the chemical composition and relative values and costs of various foods. The book contains many practical hints, and includes a valuable chapter on the feeding of sick horses; it should be useful not only to the veterinary surgeon and the student, but also to the horse owner.

Four Place Tables. Compiled by E. V. Huntington. Price 3s. nett. London: E. & F. N. Spon, Limited.

In this book are contained four place tables of logarithms and trigonometric functions, together with auxiliary tables (chiefly to three figures) of squares, square roots, cubes, cube roots, reciprocals, circumferences and areas of circles, &c. The angles are expressed in degrees and decimals of a degree instead of in degrees, minutes and seconds, and a conversion table is provided. All the tables are rendered exceedingly easy of reference by means of special tabs, which provide a complete marginal index visible in its entirety when the book is open at any page.

Volume iii. of the "Transactions and Notes" of the Concrete Institute contains full reports of the meetings of that body from October, 1910 to June, 1911. Part I. of vol. iv. includes reports of three ordinary general meetings, the presidential address of Sir Henry Tanner, and papers by Mr. G. C. Workman and Mr. R. W. Vawdrey being noteworthy contributions to the issue. The interim report of the Reinforced Concrete Practice Standing Committee on the Consistency of Concrete is also reproduced.

**Horses and Tarred Roads.**—The Blackburn Rural District Council on Saturday last declined to support a petition which has been presented by the residents in favour of roads in the district being sprayed with tar. The members of the council described tar-treated roads as veritable death-traps to horses.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President*—Mr. Albert D. Greatorex, M.Inst.C.E., Borough Engineer and Surveyor of West Bromwich.

The official programmes of the meetings of the Institution of Municipal and County Engineers to be held at Nuneaton, Paris, and Stirling are appended.

### MIDLAND DISTRICT MEETING AT NUNEATON.

(To-morrow.)

Programme.

11.30 a.m.—Assemble at the Law Courts, where members will be received by his Worship the Mayor (Councillor Thomas Horton, J.P.), district business, minutes, &c. Paper by the borough surveyor, Mr. F. C. Cook, Assoc.M.Inst.C.E., "Ten Years of Municipal Work in Nuneaton."

1 p.m. Lunch at the Newdegate Arms Hotel, by invitation of the mayor and members of the corporation.

2 p.m.—Leave by brakes (tickets, 2s. each) for inspection of sewage pumping station, refuse destructor, open-air swimming baths and public slaughter-houses.

3 p.m.—Leave for the sewage outfall works at Hartshill to inspect silt and humus tanks, contact beds, percolating filters, &c.

5 p.m. Tea at the farm buildings by invitation of Mr. Cook.

5.30 p.m. Leave for Nuneaton.

6 p.m.—Arrive at Nuneaton.

Should any members desire to return earlier from Hartshill, arrangements can be made for them to do so.

H. Richardson,
*Hon. District Secretary.*

Council House,
Birmingham.

### VISIT TO PARIS, WHITSUNTIDE.

Itinerary.

*Thursday, May 23rd.*

9.30 a.m.—Assemble at Victoria Station (L.B. and S.C. Railway).

10 a.m.—Train leaves London.

7.12 p.m.—Arrive at Paris.

*Friday, May 24th.*

10 a.m.—Conveyances leave hotel.

10.30 a.m.—Meet at the hall of the Société des Ingénieurs Civils, 19 Rue Blanche.
Return to hotel for luncheon.

2 p.m.—Leave hotel.

2.30 p.m.—Reception at the Hotel de Ville (morning dress), after which the members will proceed to inspect works of the public highways.

4.30 p.m.—Visit reservoirs of Montmartre.

*Saturday, May 25th.*

8.30 a.m.—Conveyances leave hotel.

9 a.m.—Visit the sewers, starting from Place du Chatelet, after which visit works of the public highways.

11 a.m.—Visit the reservoirs of Montsouris.
Lunch at the buffet of the Gare de Lyon.

2.30 p.m.—Visit the filters at St. Maur, and apparatus for purification by ozone.

4 p.m.—Visit the filters at Ivry, and apparatus for treatment by ultra-violet rays.

*Sunday, May 26th.*

Day left free for individual action.

*Monday, May 27th.*

9 a.m.—Conveyances leave hotel.

9.30 a.m. Visit the electricity works of Paris at St. Denis.

10.30 a.m.—Visit the Plain du Gennevilliers et l'Usine de Colombes.
Luncheon at Maisons Laffitte.

2.30 p.m.—Visit the purification works at Carrières-Triel du Picquenard et d'Achères.

*Tuesday, May 28th.*

9 a.m.—Conveyances leave hotel.

9.30 a.m.—Visit the works of the Metropolitan Railway of Paris at the Mirabeau Bridge. (Cross the Seine.)

11 a.m. Visit the works of the manufacture of paving blocks. (Quai de Javel.)
Return to hotel for luncheon.

2 p.m.—Leave hotel.

2.30 p.m. Visit municipal dust destructor works at Romainville.

4 p.m. Visit gasworks at Landy (Avenue de Paris).

*Wednesday, May 29th.*

9.15 a.m. Conveyances leave hotel for St. Lazare Station.

10.15 a.m.—Train leaves for Dieppe.

7.35 p.m.—Arrive London.

Thomas Cole,
*Secretary.*

### SCOTTISH DISTRICT MEETING AT STIRLING.

(June 7th and 8th.)

Programme.

*Friday, June 7th.*

11 a.m.—Reception in the Albert Hall, Stirling, by Provost Bayne and the magistrates of Stirling.

11.10 a.m.—District business.

11.30 a.m.—Discussion on paper (which will be taken as read) entitled, "The Municipal Works of Stirling," by Mr. A. H. Goudie, burgh surveyor, Stirling.

12.15 p.m.—Discussion on paper (which will be taken as read) entitled, "Work Carried Out in Central Stirlingshire under the Road Development Grant," by Mr. D. R. Cox, county road surveyor.

1 p.m. Luncheon, provided by Stirling Town Council.
2 p.m.—Inspection of burgh works, &c., and county improved roads and quarry.
Mr. Morris, town clerk, Stirling, has kindly consented (should a sufficient number so desire) to conduct members and their lady friends through the Castle and upper part of the town, and point out and describe the buildings of historical and antiquarian interest.
6.30 p.m.—Annual dinner, Golden Lion Hotel, tickets 5s. each.

*Saturday, June 8th.*

Circular tour by motor char-a-banc from Stirling to Lochearnhead, *viâ* Callander and Strathyre, and returning by St. Fillans, Comrie and Crieff.

The following is the probable time table of the tour:—

9.30 a.m.—Leave Stirling, Golden Lion Hotel.
12.30 p.m.—Lunch at Lochearnhead Hotel.
1.30 p.m.—Leave Lochearnhead Hotel.
3.15 p.m.—Afternoon tea, Drummond Arms Hotel, Crieff.
3.45 p.m.—Leave Crieff.
5.45 p.m.—Arrive Stirling.

Tickets for the tour, including lunch, 8s. 6d. each (exclusive of tea at Crieff, which can be arranged personally), can be obtained from the honorary district secretary. Those intending to make the tour should intimate their intention at least a week before the date.

DAVID RONALD,
*Hon. District Secretary.*

Falkirk, N.B.

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The following meetings have also been arranged:—

June 1st.—Council meeting.
June 15th.—East Ham.
June 22nd.—Lowestoft.
June 29th.—Bridlington.
July 6th.—Stourbridge.
July 11th—13th.—Annual meeting, London.

Provincial members who propose to take part in the visit to Paris will, in cases where the journey exceeds a distance of 30 miles, be able to obtain return tickets to London at a single fare and a quarter.

THOMAS COLE,
*Secretary.*

11 Victoria-street, S.W.

## INSTITUTION OF MUNICIPAL ENGINEERS.

*President*—Mr. E. A. STICKLAND, ASSOC.M.INST.C.E., Borough Surveyor, Windsor.

A discussion on "'Water Softening" will be opened by the chairman of the South-Eastern District of the institution in the council chamber, 4 Southampton-row, London, W.C., on Wednesday, May 22nd, at 7.30 p.m.

Open discussion, in which it is hoped that several experts will take part, is invited.

Dr. J. F. Meyer will read some notes on the Permutit system, now being introduced into this country. Copies of these notes can be obtained from the secretary of the institution, 39 Victoria-street, S.W.

Members of the Southern District are specially invited to attend the meeting.

BERNARD PARTRIDGE,
*Hon. District Secretary.*

Town Hall,
Walthamstow.
May 7, 1912

### COUNCIL MEETING.

The next meeting of the council of the institution will be held on Wednesday, May 22nd, at 5.30 o'clock.

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A visit will be paid to the show rooms and works of Messrs. Doulton & Co., Limited, Albert Embankment, London, on Wednesday, June 5th, at 2.30 o'clock.

Members will assemble in the show rooms at 2.30, and the [illegible] during the round of visits will include the manufacture of drain pipes and other sanitary stoneware, fireclay stoves, architectural terra-cotta, and Doulton and other art ware.

B. WYAND,
*Secretary.*

39 Victoria-street, S.W.

## INSTITUTION OF WATER ENGINEERS.

### SEVENTEENTH SUMMER GENERAL MEETING.

The seventeenth summer general meeting will be held at Cheltenham on Thursday, Friday and Saturday, the 6th, 7th and 8th of June next, under the presidency of Mr. J. S. Pickering, M.INST.C.E., borough surveyor and water engineer. The meetings will be held in the town hall, and at the opening of the proceedings on Thursday, June 6th, the institution will be welcomed to Cheltenham by His Worship the Mayor (Councillor C. H. Margrett, J.P.) The programme will include the presentation of premiums awarded by the council for papers presented during the year 1911, as well as other business of special interest to members, so that a large attendance is confidently anticipated.

PAPERS AND COMMUNICATIONS.

The following papers have been promised for reading and discussion at this meeting:—

(1) "The New Waterworks for Skegness," by Percy Griffith, M.INST.C.E. (held over from the last winter meeting).
(2) "The Rating of Water Undertakings," by Donald Dinwiddy, F.S.I.
(3) "The Rating of Water Undertakings," by Arthur Valon, ASSOC.M.INST.C.E.
(4) A discussion upon the desirability of standardising the "General Conditions of Contracts" will be introduced by Harold W. Woodall, M.INST.C.E., water engineer, Bournemouth.
(5) "The Hinckley Waterworks," by E. H. Crump, ASSOC.M.INST.C.E.
(6) "The Gloucester Waterworks (Whitcombe Reservoirs)," by R. Read, ASSOC.M.INST.C.E., city engineer.
(7) "The Use of Sulphate of Copper in Purifying Water Supplies," by Geo. Embrey, county analyst of Gloucestershire.
(8) "The Self-pollution of Water by Natural Growths," by Dr. J. H. Garrett, medical officer of health, Cheltenham.
(9) "The Geology of Cheltenham, with Special Reference to the Water Supply," by L. Richardson, F.R.S.(ED.), F.L.S., F.G.S.

NOTE.—Papers (2) and (3) will be discussed together.

The president-elect, Mr. J. S. Pickering, will deliver his presidential address on Thursday, June 6th, and will also supply a description of the Cheltenham Corporation waterworks. Dr. Samuel Rideal will give a few descriptive notes on the pre-filtration process now being introduced at the Tewkesbury works.

VISITS TO WORKS.

On Thursday afternoon a visit will be made to the Tewkesbury waterworks of the Cheltenham Corporation, including pumping station, new pre-filtration plant, &c.

On Friday afternoon a visit will be made to the Dowdeswell reservoir and filters, also the Hewletts reservoirs of the Cheltenham Corporation waterworks.

On Saturday afternoon a visit will be made to the Witcombe impounding reservoirs and filtration works of the Gloucester Corporation waterworks.

SOCIAL FUNCTIONS.

The annual dinner will be held at the town hall on Friday evening, June 7th, when the Mayor of Cheltenham and other distinguished guests of the institution will be present.

On Thursday evening members and their friends are invited by the Town Improvement Committee to attend at Montpellier Gardens from 8 p.m. till 10 p.m., when a concert will be given by the Munster Fusiliers.

On Friday afternoon members and their friends are invited by the Mayor of Cheltenham to attend a garden party in Pittville Park, from 5 p.m. to 6 p.m.

Tea will be provided on Thursday afternoon at the Tewkesbury pumping station, and on Saturday afternoon at the Gloucester waterworks.

The manager of the light railway company has arranged for members and their friends to have free use of the trams during the meeting, on presentation of programme card.

Admission to the public parks and gardens may be obtained free during the meeting on presentation of programme card.

PERCY GRIFFITH,
*Secretary.*

54 Parliament-street, S.W.

## ROYAL SANITARY INSTITUTE.

### MEETING AT BLACKPOOL.

On the 24th inst., at Blackpool Town Hall, discussions will take place on "The Card Index System as applied to Public Health Work," to be opened by E. W. Rees-Jones, M.D., D.P.H., M.O.H., and on "A Description of the Joint Scheme of Sewerage for Thornton-le-Fylde, Bispham-with-Norbreck, and Carleton," by Arthur Hindle, ASSOC.M.INST.C.E. On Saturday, May 25th, visits will be arranged to the new promenades, the new main sewerage works for Thornton-le-Fylde, Bispham-with-Norbreck and Carleton, and the new main drainage works of the Fleetwood Urban District Council.

## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

CLERK OF WORKS.—May 11th.—Runcorn Rural District Council.—Mr. G. F. Ashton, clerk, 71 Higlet-street.

ATTENDANT AT SEWAGE WORKS.—May 11th.—Tadcaster Rural District Council.—Mr. G. A. Bromet, clerk.

ASSISTANT INSPECTOR OF NUISANCES.—May 11th.—Corporation of Warrington. £78—£125.—Mr. J. Coote Hibbert, medical officer of health, 78 Sankey-street.

ENGINEER AND SURVEYOR.—May 13th.—Horbury Urban District Council. £150 per annum.—Mr. T. Barker, clerk.

DISTRICT MAIN ROAD SURVEYOR.—May 13th.—Derbyshire County Council. £200—£250.—Mr. N. J. Hughes-Hallett, clerk.

SURVEYOR AND INSPECTOR OF NUISANCES.—May 14th.—Southwell Rural District Council. £120 per annum.—Mr. John Ellis, clerk.

BOROUGH SURVEYOR AND INSPECTOR.—May 15th.—Corporation of St. Ives, Cornwall. £150 per annum.—Mr. Edward Boase, town clerk.

INSPECTOR OF NUISANCES.—May 15th.—Blaby Rural District Council. £110—£120.—Mr. B. A. Shires, clerk, 1 Friar-lane, Leicester.

INSPECTOR OF NUISANCES.—May 15th.—Chelmsford Town Council. £130—£150.—Mr. W. Smith, town clerk.

SUPERINTENDENT.—May 15th.—Ely Drainage and Navigation Commissioners. £150 per annum.—Messrs. Harold Archer and Goodwyn L. Archer, clerks to the Commissioners, Ely.

INSPECTOR OF NUISANCES.—May 15th.—Wanstead Urban District Council. £120—£150.—Mr. B. Blewitt, clerk.

SANITARY INSPECTOR.—May 16th.—Islington Borough Council. £148—£184.—Mr. W. F. Dewey, town clerk.

INSPECTOR OF MAIN ROADS.—May 16th.—Warwickshire County Council. £175—£210.—Mr. John Willmot, county surveyor, 6 Waterloo-street, Birmingham.

GENERAL FOREMAN.—May 22nd.—Bethnal Green Borough Council. £150—£172 10s. per annum.—Mr. C. G. E. Fletcher, town clerk.

FOREMAN.—May 28th.—Stroud Urban District Council. £104 per annum.—Mr. E. N. Wichell, clerk, 1 Lansdown, Stroud.

SURVEYOR.—May 29th.—Carmarthenshire County Council. £200 per annum.—Mr. J. W. Nicholas, clerk, county offices, Carmarthen.

ASSISTANT ENGINEER FOR BUILDINGS AND ARCHITECTURE.—May 31st.—Municipality of Bombay. 600 rupees—800 rupees per month.—Mr. P. R. Cadell, municipal commissioner.

CLERK OF WORKS.—Wycombe Rural District Council. £2 10s. per week.—Mr. B. L. Reynolds, clerk.

## MUNICIPAL COMPETITIONS OPEN.

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HALE.—June 28th.—Designs for a town planning scheme for the urban district council. Premiums of £50 and £25 are offered.—The Clerk.

DUSSELDORF.—July 1st.—Plan for the extension of the city. Premiums of £1,000 and £375 are offered.—The Chief Burgomaster.

## MUNICIPAL CONTRACTS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

### Buildings.

HARWICH.—May 11th.—For the construction of a public convenience, for the corporation.—Town Clerk.

CORNWALL.—May 11th.—For alterations at Connor Downs school, for the Education Committee.—Mr. J. R. Pascoe, secretary, Education Office, Truro.

BANDON.—May 11th.—For building seventeen cottages, for the rural district council.—Mr. A. Haynes, clerk.

RYDE.—May 13th.—For building a pumping station at waterworks, for the corporation.—Mr. Charles G. Vincent, town clerk.

DARTFORD.—May 13th.—For the construction of engine-house, cottage, and formation of roads, for the Metropolitan Water Board.—The Clerk, Savoy-court, Strand, W.C.

HERTS.—May 13th.—For rebuilding a bridge near Rickmansworth, for the county council.—Mr. Urban A. Smith, county surveyor.

MONMOUTH.—May 13th.—For alterations at a school, for the County Education Committee.—Mr. C. Dauncey, secretary, County Council Offices, Newport (Mon.).

PONTYPRIDD.—May 13th.—For the extension of refuse destructor, for the urban district council.—Mr. J. Colenso Jones, clerk.

WEST HAM.—May 14th.—For painting, cleansing, and repairing of public buildings, for the corporation. Mr. Fred. E. Hilleary, town clerk.

LANCASHIRE.—May 14th.—For the erection of an elementary school, for the Education Committee.—Mr. H. Littler, county architect, 16 Ribblesdale-place, Preston.

WEST SUFFOLK.—May 14th.—For the erection of new infants' school, and alterations to existing buildings, for the Education Committee.—Mr. Fred. R. Hughes, secretary.

ENFIELD LOCK.—May 14th.—For the construction of a pump-house, gas-producer house, coal bays, two cottages, formation of roads, and drainage, for the Metropolitan Water Board.—Mr. A. B. Pilling, clerk, Savoy-court, Strand, W.C.

ESSEX.—May 14th.—For the erection of a school at Leigh-on-Sea, for the Education Committee.—Mr. Herbert Bell, clerk.

HAMMERSMITH.—May 15th.—For cleaning and restoring library building, for the borough council.—Mr. L. Gordon, town clerk.

KINSALE.—May 15th.—For the erection of cottages, for the rural district council.—Mr. J. Murphy, clerk.

LEEDS.—May 15th.—For the erection of residence, two lodges, swimming bath, laundry, games pavilion, and pump-house, for the Education Department.—Mr. J. Graham, secretary, Calverley-street, Leeds.

ASHBOURNE.—May 15th.—For the erection of six cottages, for the rural district council.—Mr. W. R. Holland, clerk.

SHREWSBURY.—May 16th.—For building concrete walls, laying concrete paving, and piling river banks, for the corporation.—Mr. W. Chapple Eddowes, borough surveyor.

GLOUCESTERSHIRE.—May 17th.—For the erection of a handicraft and cookery class-room, for the county council.—Mr. R. S. Phillips, architect, Shire Hall, Gloucester.

COVENTRY.—May 18th—June 17th.—For the erection of municipal buildings, for the corporation.—Mr. G. Sutton, town clerk.

COVENTRY.—May 18th.—For the erection of three branch libraries, for the corporation. — Mr. J. E. Swindlehurst, city surveyor.

ESSEX.—May 18th.—For repairs at council school, for the Education Committee.—Mr. W. Adams, clerk, 14 Church-street, Saffron Walden.

LEEDS.—May 20th.—For constructing market entrance and alterations to shops, for the Markets Committee.—Mr. W. T. Lancashire, city engineer.

WEST RIDING.—May 20th.—For the erection of two schools, for the Education Committee.—Education Architect, County Hall, Wakefield.

RADNORSHIRE.—May 21st.—For the construction of a small bridge, for the county council.—Mr. T. L. Wishlade, surveyor, Penybont.

WALLINGFORD.—May 21st.—For alterations to isolation hospital, for the Joint Hospital Board.—Mr. P. C. A. Slade, clerk, 7 St. Martin's-street, Wallingford.

DURHAM.—May 21st.—For the erection of four schools, for the county council.—Mr. A. J. Dawson, Shire Hall, Durham.

LUTON.—May 21st.—For the erection of a cookery centre, for the corporation.—Borough Engineer.

CHELMSFORD.—May 22nd.—For the construction of a public convenience, for the corporation.—Mr. W. Smith, town clerk.

SOUTHEND-ON-SEA.—May 22nd.—For the erection of a council school at Hamstel, for the Education Committee.—Mr. J. W. Barrow, clerk.

MOGDEN.—May 22nd.—For repairs to hospital, for the Joint Committee.—Mr. F. C. Greville-Smith, clerk, 213 High-street, Hounslow.

WILTS.—May 22nd.—For the erection of a school, for the county council.—Mr. J. George Powell, county surveyor.

ESSEX.—May 23rd.—For alterations at a school, for the Education Committee.—Mr. J. H. Nicholas, secretary, County Offices, Chelmsford.

PEMBROKE.—May 23rd.—For the erection of a school, for the Education Authority. — Mr. O. T. Thomas, education architect, 8 Victoria-place, Haverfordwest.

WEST SUSSEX.—May 28th.—For additions and alterations to school, for the Joint Education Committee.—Mr. Lionel Thompson, secretary, High-street, Worthing.

BRADFORD-ON-AVON.—May 31st.—For the construction of a retaining wall, for the urban district council.—Mr. James Compton, clerk.

CHURCH.—June 3rd.—For the erection of public conveniences, for the urban district council.—Mr. W. Wood, surveyor.

WEST HAM.—June 5th.—For the erection of refuse destructor and steam-raising plant, for the corporation.—Mr. Fred. E. Hilleary, town clerk.

HANWELL.—June 10th.—For the construction of a refuse destructor, for the urban district council.—Mr. Percy Scott, clerk.

## Iron and Steel.

CARRICK-ON-SUIR.—May 11th.—For laying iron pipes and fittings and constructing service reservoir, also supplying cast-iron pipes and valves, for the urban district council.—Mr. James Verrington, clerk.

WINSFORD.—May 14th.—For the supply of cast-iron pipes, spigot and socket joints, bends, and syphon boxes, for the urban district council.—Mr. J. H. Cooke, clerk.

CARDIFF.—May 16th.—For the supply of galvanised coal hods, for the Education Committee.—Mr. J. J. Jackson, director, City Hall, Cardiff.

BELLINGHAM.—May 17th.—For laying cast-iron water mains and incidental works, for the rural district council.—Mr. R. Riddle, clerk, Conheath, Bellingham, Northumberland.

GLASGOW.—May 20th.—For the supply of iron and steel works for turbine foundations and engine-room floor, and erection of steam and water piping at power station, for the corporation.—Mr. J. Lindsay, town clerk.

PONTYPRIDD.—May 20th.—For the supply of steel and cast-iron pipes, for the Joint Water Board.—Mr. W. P. Nicholas, clerk, Gelliwastad-road, Pontypridd.

BISHOP'S STORTFORD.—May 21st.—For the supply of 145 tons of cast-iron pipes and special castings, for the urban district council.—Mr. Cecil J. Hancox, clerk.

ROCHDALE.—May 22nd.—For the supply of materials for an overhead line of electricity, for the Paving Committee.—Mr. W. H. Hickson, town clerk.

## Roads.

WORCESTER.—May 11th.—For the construction of granolithic pavements, for the corporation. — Mr. Thomas Caink, city engineer.

BIRSTALL.—May 11th.—For the making-up of Blackburn-road, for the urban district council.—Mr. G. H. Hailstone, surveyor.

HASTINGS.—May 11th.—For the rolling of certain roads, for the rural district council.—Mr. A. R. Inskipp, clerk.

WORSBOROUGH.—May 11th.—For the supply of broken granite, tarred dross macadam, limestone asphalt and dross screenings, for the urban district council.—Mr. Alfred Clegg, clerk.

PETWORTH.—May 11th.—For the supply of materials and cartage, for the rural district council.—Mr. E. H. Staffurth, clerk.

BRIGG.—May 13th.—For the supply of broken granite, for the urban district council.—Mr. G. S. Sowter, clerk.

GUILDFORD.—May 13th.—For the supply of granite, Bargate stone, flints, and cartage, for the rural district council.—Mr. J. Anstee, surveyor.

SAMFORD.—May 13th.—For the supply of broken granite, for the rural district council.—Mr. Arnold J. Haward, clerk.

WANDSWORTH.—May 13th.—For making up and paving part of Cowick-road, for the borough council.—Mr. D. A. Nicholl, town clerk.

COCKERMOUTH.—May 13th.—For repairs to highways, for the rural district council.—Mr. J. H. Musgrave, clerk.

WANDSWORTH.—May 13th.—For the execution of repairs upon part of Crowbridge-road, for the borough council.—Mr. D. A. Nicholl, town clerk.

ASHINGTON.—May 13th.—For making asphalte roadway, for the urban district council.—Mr. G. Beaty, surveyor.

ILFORD.—May 13th.—For laying granite channelling, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

NEWARK.—May 13th.—For work of road improvement, for the corporation.—Borough Surveyor.

KENSINGTON.—May 13th.—For wood paving works in several streets, for the borough council.—Mr. W. Chambers Leete, town clerk.

WESTMINSTER.—May 13th.—For carrying out paving work, for the borough council.—Town Clerk.

WANDSWORTH.—May 13th.—For works of repair in Prince's-road, Southfields, for the borough council.—Mr. D. A. Nicholl, town clerk.

STOCKTON-ON-TEES.—May 13th.—For flagging and sewering certain streets, for the corporation.—Mr. Arthur B. Crosby, town clerk.

PONTYPRIDD.—May 13th.—For street works, for the Education Committee.—Mr. D. M. Jones, secretary, Municipal Buildings.

WARRINGTON.—May 13th.—For the supply of granite or whinstone cubes, for the corporation.—Borough Surveyor.

SOUTHAMPTON.—May 14th.—For the execution of street improvements, for the corporation.—Mr. R. R. Linthorne, town clerk.

DISLEY.—May 14th.—For making up a road, for the rural district council.—Mr. E. N. Davenport, clerk, Park Chambers, Vernon-street, Stockport.

MOUNTAIN ASH.—May 14th.—For carrying out street works, for the urban district council.—Mr. H. P. Linton, clerk.

LONG CRENDON.—May 14th.—For the supply of broken granite and chippings, for the rural district council.—Mr. Edward N. Purcell, clerk.

LONDON.—May 14th.—For the supply of 3,500 tons of Guernsey granite setts, for the county council.—The Clerk.

TODMORDEN.—May 15th.—For paving work, for the Highways Committee.—Mr. D. Sutcliffe, town clerk.

ISLEWORTH.—May 15th.—For making up portion of a road, for the urban district council.—Mr. H. J. Baker, clerk.

STOKE-ON-TRENT.—May 15th.—For work of making up, for the corporation.—Borough Surveyor.

HAMMERSMITH.—May 15th.—For paving certain streets with creosoted deal blocks, for the borough council.—Mr. H. Mair, borough engineer.

GRANTON-ON-SPEY.—May 16th.—For forming kerbs and footpaths, for the corporation.—Mr. W. Forsyth, town clerk.

DUBLIN.—May 17th.—For the supply of four watering carts, for the corporation.—Mr. Patrick Tobin, City Hall.

SOUTHAMPTON.—May 17th.—For reconstruction of tramways, for the corporation.—Mr. R. R. Linthorne, town clerk.

BOWDON.—May 18th.—For making up Youk-road, for the urban district council.—Mr. W. Paterson, clerk.

HALIFAX.—May 18th.—For carrying out private street works, for the corporation.—Mr. J. Lord, borough engineer.

EAST PRESTON (Sussex).—May 20th.—For the supply of flints, for the rural district council.—Mr. A. Shelley, clerk, Littlehampton.

MONMOUTH.—May 20th.—For the supply of materials and for hauling broken and unbroken stone, for the county council.—Mr. W. Tanner, county surveyor, Newport, Mon.

EPSOM.—May 20th.—For the making-up of Normanroad, for the rural district council.—Mr. T. E. Ware, surveyor of highways.

TOTTENHAM.—May 21st.—For the improvement of St. Ann's road junction with Seven Sisters-road, for the urban district council.—Mr. Edward Crowne, clerk.

ACTON.—May 21st.—For tar-spraying certain roads, for the urban district council.—Mr. W. Hodson, clerk.

GREETLAND.—May 20th.—For the supply of Lancashire setts, broken granite macadam, knotted random flags, and dressed kerb, for the urban district council.—Mr. F. J. Mallinson, surveyor.

LLANTRISANT AND LLANTWIT.—May 29th.—For the completion of the new Ely Valley-road and branch roads, for the rural district council.—Mr. Gomer S. Morgan and Mr. Thomas Saunders, engineers, School-street, Pontyclun, Glam.

CHURCH.—May 30th.—For making up a road, for the urban district council.—Mr. J. R. Reddish, clerk.

WEST RIDING.—For the supply of granite and whinstone setts, for the Yorkshire (West Riding) Electric Tramways Company, Limited.—Mr. H. England, general manager, Belle Isle, Wakefield.

## Sanitary.

BRADFIELD.—May 13th.—For the construction of main sewerage and sewage disposal works at Pangbourne, for the rural district council.—Mr. R. E. Rawstone, clerk, 4 Bridge-street, Caversham, Reading.

GLASTONBURY.—May 13th.—For alteration and additions to sewerage system, with manholes, lamp-holes, flushing tanks, storage tanks, erection of two pumping stations, and storm-water lagoons, for the corporation.—Mr. Reginald T. Gould, town clerk.

ASHINGTON.—May 13th.—For drainage works, for the urban district council.—Mr. G. Beaty, surveyor.

AUCKLAND.—May 13th—June 3rd.—For the construction of sewage disposal works for the rural district council.—Mr. S. Vivian, clerk, Union Offices, Bishop Auckland.

ASHTON-IN-MAKERFIELD.—May 14th.—For the construction of sewers and sewage disposal works, for the urban district council.—Mr. Albert Sykes, clerk.

SOUTHGATE.—May 14th.—For the construction of 12in. sewer pipes with patent watertight joints, and concrete tubes, for the urban district council.—Mr. W. M. Ellenor, clerk, Council Offices, Palmer's Green, N.

STIRLING.—May 14th.—For laying cast-iron sewers, manholes, and flushing chambers, for the Eastern Committee.—Mr. J. H. Burns, district clerk, District Offices, Falkirk.

TETBURY.—May 14th.—For scavenging work, for the rural district council.—Mr. H. S. Tebbutt, surveyor.

EAST GRINSTEAD.—May 15th.—For the construction of sewage disposal works, for the rural district council.—Mr. Francis S. White, clerk.

DURHAM.—May 15th.—For the construction of detritus, storm-water and sedimentation tanks, and filter-beds, for the rural district council.—Mr. Geo. Gregson, surveyor.

FOSDYKE.—May 15th.—For the construction of a slacker door in the Five Towns drain, near the outfall in Fosdyke, for the Commissioners of Sewers.—Mr. M. Stanisland, joint clerk, High-street, Boston, Lincs.

TEDDINGTON.—May 15th.—For the erection of sewage disposal and refuse destructor works, for the urban district council.—Mr. G. H. Salmons, clerk.

BOURNEMOUTH.—May 17th.—For the execution of drainage, for the corporation.—Mr. F. W. Lacey, borough engineer.

BLABY.—May 20th.—For the construction of stoneware and cast-iron pipe sewers, Shone's ejectors, manholes and flushing chambers, for the rural district council.—Mr. B. A. Shires, clerk, 1 Friar-lane, Leicester.

WATFORD.—May 21st.—For works of drainage, for the urban district council.—Mr. W. Hudson, solicitor and clerk.

BRADFORD.—May 21st.—For scavenging work, for the Cleansing Committee.—Mr. F. Stevens, town clerk.

WINCANTON.—May 22nd.—For the reconstruction of sewerage, for the rural district council.—Mr. E. N. Martin, clerk.

ROMFORD.—May 23rd.—For laying surface-water sewer and filling in ditch, for the urban district council.—Mr. G. T. King, clerk.

MACCLESFIELD.—May 27th.—For laying sewers and water mains, for the rural district council.—Mr. Frederick May, solicitor and clerk.

CHESHAM.—June 8th.—For construction of outfall works and laying out additional land for sewage disposal purposes, for the urban district council.—Mr. W. J. Standring, clerk.

## Stores.

SUTTON.—May 15th.—For the supply of broken granite, basalt, flints, gravel, sand, ballast, tar-paving material, paving slabs, kerbing, granite cubes, setts, Portland cement, stoneware pipes, brooms, brushes, oils and ironmongery, for the urban district council.—Mr. W. Hedley Grieves, surveyor.

BRADFORD.—May 21st.—For the supply of iron castings, iron, steel, bolts and nuts, candles, oils, cotton waste, soap, street-sweeping machine brushes, brooms, shovels, nails, lime and iron piping, for the corporation.—Mr. F. Stevens, town clerk.

CHURCH.—June 3rd.—For the supply of flags, kerbs, setts, grit, granite, limestone, pitch, creosote oil, salt-glazed socket pipes, scavenging brooms, manhole covers, lamphole covers, step-irons, street grates and disinfecting powder, for the urban district council.—Mr. J. R. Reddish, clerk.

PAIGNTON.—June 3rd.—For the supply of coal, coke, granite, lamp columns, gully gratings, oil and firewood, for the urban district council.—The Surveyor.

## Miscellaneous.

GLASGOW.—May 14th.—For laying out a recreation ground, for the corporation.—Mr. J. Lindsay, town clerk.

MACCLESFIELD.—May 13th.—For the supply of Buxton lime, for the corporation.—Mr. F. R. Oldfield, clerk.

MACCLESFIELD.—May 13th.—For the purchase of tar and ammoniacal liquor made at the corporation gasworks.—Mr. F. R. Oldfield, clerk.

MANCHESTER.—May 15th.—For the supply of portable steel rails, fish-plates, 1,750 creosoted sleepers, 500 loads of broad bran, 500 quarters (480 lb.) of Indian corn and 300 india-rubber pail rings, also the twelve months' supply of agricultural drain pipes, for the Cleansing Committee.—Mr. Thomas Hudson, town clerk.

HALIFAX.—May 18th.—For the supply of filtering medium, for the Highways Committee.—Mr. J. Lord, borough engineer.

DEVON.—May 23rd.—For general repairs and painting, for the county council.—Mr. F. Bailey, clerk, The Castle, Exeter.

## TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

CAMBERWELL.—For kerbing, channelling, and foundations for asphalte paving, roadwork, in Red Post-hill (part of), between North Dulwich Station and Beckwith road, for the borough council.—Mr. W. Oxtoby, borough surveyor :—

| | |
|---|---|
| Devon Construction Company, Oxford-street | £2,368 |
| F. G. Brunnell, Willesden | 2,015 |
| Mowlem & Co., Westminster | 1,906 |
| T. Adams, Wood green | 1,782 |
| Fry Brothers, Greenwich | 1,774 |
| A. L. Etheridge, London | 1,714 |
| H. Chandler, Belvedere, Kent | 1,709 |
| G. J. Anderson, Poplar | 1,697 |
| W. Pearce, Forest-hill | 1,677 |
| H. Wenham & Sons, Catford | 1,629 |
| E. & E. Iles, Wimbledon | 1,584 |
| W. Manders & Co., Leyton † | 1,453 |

CRANBROOK.—Accepted for the supply of road materials, for the rural district council :—

Hussons, Limited, Brighton.—1,520 yards ragstone on rail, 500 yards ragstone by road and 120 yards border stone, £368.

C. M. Fox, Marden.—1,500 yards ragstone by road, £482.

W. Skinner, Boughton Monchelsea.—460 yards ragstone by road and 160 yards border stone by road, £183; 240 yards ragstone in quarry, £42.

A. & F. Manuelle, London.—330 tons Guernsey granite, £510.

DUBLIN.—For the supply of electrically-driven centrifugal pumps, &c., for the corporation :—

Worthington Pump Company, Limited, London, £1,945, with an additional sum of £17 for each supplementary trial.

EAST DEREHAM.—For the supply of broken granite and granite chippings, for the urban district council.—Mr. F. L. Burch, surveyor :

Sommerfeld & Thomas, King's Lynn.—Budle Crag granite at 11s. 7d. per ton.

HAMMERSMITH.—For carrying out wood paving works in Hammersmith-road, for the borough council.—Mr. H. Mair, borough surveyor :

| | |
|---|---|
| Cook, Starkey & Co. | £6,336 |
| W. Griffiths & Co., Limited | 5,091 |
| G. Wimpey & Co. | 5,048 |
| J. Mowlem & Co., Limited | 4,872 |
| Improved Wood Pavement Company, Limited* | 4,652 |
| Acme Flooring and Paving Company (1904) Limited | 4,527 |

HEBDEN BRIDGE.—Accepted for tar-spraying and laying setts, for the urban district council :—

Paving Works.—D. Brook, Halifax; T. Coates, Bacup.

Tarspraying.—W. & J. Glossop, Hipperholme.

435 tons Granite Setts.—Brookes, Limited, Hipperholme.

200 tons Lancs Setts.—H. Boothman & Sons, Rochdale.

INVERNESS.—For laying a pipe from Loch Asbie to the reservoir, for the corporation :—

G. Pirie & Sons, Aberdeen, £4,391.

LEWISHAM.—The following tenders have been accepted by the borough council :—

J. Mowlem & Co., Limited, kerbing, channelling and making up the roadways of Sangley-road-passage, £112; Phoebeth-street, £385, and Francemary-street, £645.

Gibson & Co., for paving above with artificial stone, 3s. 7½d. per yard super.

LEXDEN AND WINSTREE.—For the erection of a steel girder and concrete bridge, for the rural district council.—J. Ennals, surveyor :—

Fordham Bridge.

| | |
|---|---|
| Beaumont, Lexden | £317 |
| Bruntwant & Kirk, London | 447 |
| J. G. Bratch & Co., Worcester | 429 |
| J. W. Trudgett, Colchester | 366 |
| W. C. Theobald, Chappel | 270 |

Surveyor's estimate, £330.

MUCH WENLOCK.—For works of sewerage and sewage disposal.—Messrs. Willcox & Raikes, engineers :—

| | |
|---|---|
| P. Wilson & Co., Dunstable | £5,745 |
| G. Bell & Sons, Manchester | 5,656 |
| Currall, Lewis & Martin, Birmingham | 5,500 |
| F. Barke & Son, Stoke-on-Trent | 5,408 |
| G. Law, Kidderminster | 5,303 |
| A. Hill & Co., Kidderminster | 5,070 |
| M. A. Boswell, Wolverhampton† | 4,932 |

NOTTINGHAM.—Accepted for the erection of a school, for the Education Committee :—

J. G. Short, Nottingham, £4,894.

PORTSMOUTH.—Tenders for the supply of 1,800 cubic feet of tar and 90 tons of granite chippings were submitted to the rural district council as follows :—

Tars.—Ruberoid Co. and Clay Cross Company, Limited*, crude, 8s. 6d., per 40-42 gallons; Tarmac Syndicate, Limited, distilled, 4½d. per gallon in 4-ton lots; Gas Light & Coke Company, distilled, 12s. per 10 gallons.

Chippings.—W. Griffiths & Co., Limited*, 3s. 8d. to 10s. 3d. per ton; J. Mowlem & Co., Limited, 9s. 2d. to 10s. 9d.; A. & I. Macadie, 9s. net to 10s. 7d.; Fry Brothers, 10s. to 10s. 9d.; London Granite Company, 11s. 10d. to 12s. 7d.

SCUNTHORPE.—Accepted for the supply of spigot and socket pipes and specials, for the Joint Sewerage Board :—

Stanton Ironworks Company, Limited, Nottingham, £2,210.

SCUNTHORPE.—Accepted for the supply of hand-moulded cast-iron and stoneware-pipe sewers, and pile driving, for the Joint Sewerage Board :—

Lowcock & Co., Hull, £2,597.

SHEFFIELD.—For excavation and filling for the new road, for the corporation. Mr. J. Atkinson, borough surveyor :—

J. Briscoe, Stockport.

TRURO.—For rebuilding a bridge, for the rural district council :—

J. H. Marshall, Scorrier, £45.

WIGAN.—Accepted for the supply of stoneware sanitary pipes, bends, and junctions, for the town council :—

Doulton & Co., Limited, 3s. Bristol Schedule.

J. Carmichael & Co., Limited, Boston, Schedule "B."

Mid-Lancs Manufacturing Co., Rainford.

## MEETINGS.

*Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.*

MAY.

11.—Association of Managers of Sewage Disposal Works: Visit to Chadderton Sewage Works. 3 p.m.

11.—Institution of Municipal and County Engineers: Meeting at Nuneaton.

11.—Society of Engineers: Annual Dinner, Criterion Restaurant. 7 p.m.

13.—Surveyors' Institution: Resumed Discussion on Mr. G. Taylor Loban's paper on "Some Principles in the Valuation of Land and Buildings." 8 p.m.

16.—Institution of Electrical Engineers: Annual General Meeting. 7.45 p.m.

17.—Junior Institution of Engineers: Mr. G. C. Allingham on "Storage Battery Engineering." 8 p.m.

20.—Quantity Surveyors' Institution: Annual Dinner, Connaught Rooms, Kingsway. 7 p.m.

22.—Institution of Municipal Engineers: Discussion on "Water Softening," 4 Southampton-row, W.C. 7.30 p.m.

22.—Institution of Municipal Engineers: Council Meeting. 5.30 p.m.

24-29.—Institution of Municipal and County Engineers: Visit to Paris.

24.—Royal Sanitary Institute: Meeting at Blackpool; Mr. A. Hindle, Assoc.M.Inst.C.E., on "The Joint Scheme of Sewerage for Thornton-le-Fylde, Bispham-with-Norbreck and Carleton;" Mr. E. W. Rees Jones on "The Card Index System as Applied to Public Health Work," Town Hall. 7.30 p.m.

30-31.—Surveyors' Institution: Country Meeting at Nottingham.

JUNE.

1.—Institution of Municipal and County Engineers: Council Meeting.

6-8.—Institution of Water Engineers: Summer Meeting at Cheltenham.

7-8.—Institution of Municipal and County Engineers: Meeting at Stirling.

15.—Institution of Municipal and County Engineers: Meeting at East Ham.

22.—Association of Managers of Sewage Disposal Works: Metropolitan District Meeting, Southall-Norwood and Hanwell.

22.—Institution of Municipal and County Engineers: Meeting at Lowestoft.

29.—Institution of Municipal and County Engineers: Meeting at Bridlington.

JULY.

6.—Institution of Municipal and County Engineers: Meeting at Stourbridge.

11-13.—Institution of Municipal and County Engineers: Annual Meeting, London.

## APPOINTMENTS OPEN.

### HORBURY URBAN DISTRICT COUNCIL.

APPOINTMENT OF ENGINEER AND SURVEYOR.

The above Council require the Services of a Competent Engineer and Surveyor, at a commencing salary of £150 per annum.

Candidates must be competent to carry out the duties under the Public Health Acts and the By-laws of the Council, and to prepare Estimates, Specifications and Plans and Reports of Committees; they must also have a practical knowledge of the Construction of Buildings, Sewerage and Sewage Disposal Works, Road Making, Street Improvements, the Making-up of Streets under the Private Street Works Act, 1892, and the general duties of an Urban Council's Engineer.

The person appointed will be required to reside in the district, to devote the whole of his time to the duties of the office, and to give satisfactory security in the sum of £200.

Applications to be made on Forms to be obtained from me (on receipt of stamped addressed foolscap envelope), which must be returned to me filled up (endorsed "Surveyor") not later than 12 noon on the 13th May, 1912.

Canvassing (either directly or indirectly) will be deemed a disqualification.

(By order)

T. BARKER,
Clerk to the Council.

Town Hall, Horbury, Yorks.
May 2, 1912.

### BOROUGH OF ST. IVES, CORNWALL.

Applications are invited for the appointment to the joint offices of Borough Surveyor and Inspector of Nuisances of the Borough of St. Ives, Cornwall.

The appointment will be for 12 months from May 27th, 1912, at a salary of £80 as Surveyor and £70 as Inspector of Nuisances, and will be made subject to the approval of the Local Government Board.

Supervision of the Council's Waterworks is included in the duties of the Borough Surveyor.

The person appointed will be required to devote the whole of his time to the duties, and no emoluments except the salaries stated will be allowed.

Applications, endorsed "Surveyor, &c.," accompanied by copies of testimonials of recent date (which will not be returned) to be sent to the undersigned on or before noon, May 15th, 1912.

EDWARD BOASE,
Town Clerk.

District Town Clerk's Offices,
St. Ives, Cornwall.
May, 1912.

# ODHAMS, LIMITED.

*Incorporated under the Companies (Consolidation) Act, 1908.*

**The above-named Company is issuing a Prospectus dated the Fourth day of May, 1912, which states, among other things :—**

## Authorised Share Capital - - - £100,000,

**Of which £45,000 has been already issued in 45,000 Ordinary Shares of £1 each, and £5,000 in 5,000 Cumulative 6 per cent. Preference Shares of £1 each, which latter it is intended to convert so that they shall rank *pari passu* with the £50,000 Participating Preference Issue now offered. There is an issue of £35,000 Debentures.**

THE COMPANY ARE INVITING APPLICATION FOR AN ISSUE OF

## 50,000 SIX PER CENT. CUMULATIVE PARTICIPATING PREFERENCE SHARES OF £1 EACH.

*These Cumulative Participating Preference Shares are entitled, in addition to the fixed rate of Six per cent., to share in the Surplus of Profits after payment of Six per cent. Dividend upon the Ordinary Shares, the amount of such further Dividend to which each Preference Share will be entitled being ½ per cent. for every One per cent. of Dividend exceeding Six per cent. declared on each Ordinary Share.*

**It is proposed that after Payment of the cumulative dividend of 6 per cent. on the Preference Shares, and before any dividend is paid upon the Ordinary Shares, 25 per cent. of the remaining profits of the Company in each year shall be carried to the Reserve Fund, until £50,000 has been so set aside.**

**The Shares are Payable 2s. 6d. on Application, 7s. 6d. on Allotment, and 10s. on June 30, 1912.**
Calls paid in advance will carry interest at 6 per cent. per annum.

**DIRECTORS.**

WILLIAM J. B. ODHAMS, Cloverly, Wood Lane, Highgate (Managing Director).
J. LYNCH ODHAMS, The Homestead, Southwick, Sussex.
CHAS. J. ODHAMS, Woodlawn, South Norwood, S.E.
J. S. ELIAS, Fairlight, Wood Lane, Highgate (General Manager).
JOHN C. POTTER, Westow, Keswick Road, Putney.
C. E. CURTIS, 120, Cromwell Road, S.W.
PERCIVAL J. NUNN, Eastnor, Sydenham Hill, S.E.

**BANKERS.**

THE CAPITAL & COUNTIES BANK, LTD., 35, King Street, Covent Garden, W.C.
HEAD OFFICE ... Threadneedle Street, E.C., and Branches

**SOLICITORS.**

HICKSON, MOIR & JEAKES, Bloomfield House, New Broad Street, E.C.

**AUDITORS.**

FRANKLIN, WILD & CO., Chartered Accountants, Broad Street Avenue, E.C.

**SECRETARY AND REGISTERED OFFICES.**

ERNEST LYNCH ODHAMS, 93-94, Long Acre, London, W.C.

**WORKS.**

92, 93, 94, LONG ACRE, ENDELL STREET, WILSON STREET, AND ARNE STREET; AND 25, FLORAL STREET, COVENT GARDEN, W.C.

THE Printing Business of WILLIAM ODHAMS was founded in 1847, and was amalgamated with its offshoot, ODHAMS BROTHERS, LIMITED, in 1898 under the present name. In 1906 the Offices and Works were removed to the commanding position at the corner of Long Acre and Endell Street, Covent Garden. Last year the extensive premises running along Wilson Street and Arne Street, at the rear and side, were added in order to cope with the expansion of the business.

The business consists mainly in the production of newspapers and periodicals of every class. While undertaking no editorial control over any of the periodicals concerned—for the Company prints newspapers of very diverse and sometimes opposite views—it has established and built up, in addition to the Printing Business, Publishing and Advertising Departments. Thus, in many cases the entire business management of the Publications, including the Printing, Publishing, and Advertising, is in the hands of the Company. This development has been a source of considerable profit to the Company, and has made them specialists in this kind of work.

### OBJECTS OF ISSUE.

The business has grown so rapidly during recent years that the Directors find it desirable to provide further Working Capital. Other objects of the present issue are to absorb the business of SOUTHWOOD, SMITH & CO., LIMITED, which has been for some time under the control of this Company, and in which this Company already holds a large interest, and to pay off debenture charges.

### SOME OF THE MORE IMPORTANT CONTRACTS.

The following are some of the more important contracts held by the two Companies :—

BRITISH MEDICAL JOURNAL.
BURLINGTON MAGAZINE.
CHURCH EVANGELIST.
COMMON CAUSE.
CONTRACTORS' TRADE JOURNAL.
COX & BUTLER.
DARKEST RUSSIA.
ELECTRICITY.
EMPIRE ILLUSTRATED.
EXPORT WORLD.
FAIRPLAY.
FAMILY DOCTOR.
GOLDSMITHS' REVIEW.
GROCER.
HAIRDRESSERS' WEEKLY JOURNAL.
HARDWARE TRADE JOURNAL.
HEALTH.
HOME HANDICRAFTS.
INVESTOR'S CHRONICLE.
JOHN BULL.
LONDON COUNTY COUNCIL.
LOTINGA'S WEEKLY.
MAYFAIR.
MEDICAL PRESS.
MOTOR BOAT.
MRS. BILL.
PARIS JOURNAL OF FANCY WORK AND FASHION.
PERFORMER.
RAILWAY TIMES.
SATURDAY INFORMATION.
SURVEYOR.
THE FIELD AND COUNTRY.
TRADE WORLD.
WOODWORKER, LTD., ETC.
WESTMINSTER CATHEDRAL CHRONICLE.

### PROGRESS AND PROFITS.

The steady growth of the two businesses is shown by the Turnover during the past ten years, as follows :—

| Year ending June 30. | Printing Department. | Publishing Department. (ODHAMS, LIMITED.) |
|---|---|---|
| 1902 | £62,263 | (First established in 1907). |
| 1903 | 66,047 | |
| 1904 | 70,000 | |
| 1905 | 72,755 | |
| 1906 | 79,057 | |
| 1907 | 77,963 | |
| 1908 | 85,720 .. | £15,618 (9 months) |
| 1909 | 103,852 .. | 56,531 |
| 1910 | 115,100 .. | 93,188 |
| 1911 | 177,100 | 174,100 |

*13 months Odhams, Limited; 12 months Southwood, Smith and Co., Limited.

The Net Profits of ODHAMS, LIMITED, for the three years ending June 30th, 1911, as certified by their Auditors, Messrs. FRANKLIN, WILD & COMPANY, Chartered Accountants, Broad Street Avenue, London, E.C., **after deduction for Depreciation of Plant and Machinery, Debenture Interest and other charges, including Directors' fees, and Management share of profits, are as follows :—**

| | |
|---|---|
| June 30, 1909 .. .. .. | £ 6,[illegible] 10 1 |
| ,, 1910 .. .. .. | 7,[illegible] 7 7 |
| ,, 1911 .. .. .. | 11,[illegible] 3 4 |
| A Total of .. .. .. | £25,[illegible] 17 6 |
| Or an average of .. .. .. | £8,651 5 10 |

The Profits of SOUTHWOOD, SMITH & CO., LIMITED, for the same three years were practically absorbed by the payment of Debenture interest and expenses, interest on loans other than loans by ODHAMS, LIMITED, and Directors' fees. As it is intended to pay off the Debentures and loans referred to, and the Directors of ODHAMS, LIMITED, will conduct the amalgamated businesses without increased fees, the profits of the business of SOUTHWOOD, SMITH & CO., LIMITED, will be received by the Company without deduction in respect of these payments.

The net Profits of SOUTHWOOD, SMITH & CO., LIMITED, for the three years, on the basis mentioned, as certified by their Auditor, Mr. PHILIP H. WILLIAMS, Chartered Accountant, 31, Copthall Avenue, London, E.C., would have been as under :—

| | |
|---|---|
| June 30, 1909 .. .. .. | £[illegible] 0 0 |
| ,, 1910 .. .. .. | 10,[illegible] 0 0 |
| ,, 1911 .. .. .. | 10,[illegible] 0 0 |
| A Total of .. .. .. | £[illegible] 0 0 |
| Or an average of .. .. .. | £[illegible] 0 0 |

*Subject to the Management ½ per cent. Interest provisions, &c., as to the adjustments hereinafter referred to.

The Profits available for Dividend, based on the above figures, should therefore be as follows :—

| | |
|---|---|
| ODHAMS, LIMITED .. .. .. | £8,651 5 10 |
| SOUTHWOOD, SMITH & CO., LIMITED .. .. | 1,[illegible] 0 0 |
| Total .. .. .. | £[illegible] 5 10 |

The net Profits of ODHAMS, LIMITED, for the half-year ended the 31st December, 1911, after all proper charges, bad debts of an exceptional nature, and allowing for all charges other than management share of profits, were £6,700 8s. 8d. Those of SOUTHWOOD, SMITH & CO., LIMITED, calculated on the same basis as before were £1,215. The united profits give a total of £7,915 8s. 8d. for the **half-year**, which total would be subject to a deduction of £791 for management share of profits. These figures have respectively been certified by the Accountants.

### DIVIDENDS AND RESERVE.

In order to form a strong reserve it is proposed that after payment of the cumulative dividend of 6 per cent. on the Preference Shares, 25 per cent. of the remaining profits in each year shall be carried to Reserve Fund until £50,000 has been so set aside.

Assuming the profits in future to be on the average of the last three years, it is estimated that they will permit of the following distribution :—

| | |
|---|---|
| Dividend on Preference Shares of 6 per cent. .. | £3,300 0 0 |
| Reserve, [illegible] per cent. of balance .. | [illegible] 11 3 |
| Dividend [illegible] per cent. on Ordinary Shares .. | [illegible] 0 0 |
| Balance, [illegible] for further distribution .. | [illegible] 18 5 |

**allowing a further 1½ per cent. Dividend, or in all 7½ per cent., to the Preference Shares.**

If, however, the rate of profit earned during the last year be maintained, the amount available for distribution would be as under :—

| | |
|---|---|
| Dividend on Preference Shares of 6 per cent. .. | £3,300 0 0 |
| Reserve, [illegible] per cent. of balance .. | [illegible] 17 1 |
| Dividend [illegible] per cent. on Ordinary Shares .. | [illegible] 0 0 |
| Balance available for further distribution .. | 6,861 11 2 |

**allowing a further 4 per cent. Dividend, or in all 10 per cent., to the Preference Shares.**

It is proposed to pay dividends half-yearly on September 30th and March 31st.

The Ordinary Shares are held almost exclusively by the Director and their friends. There are no Management or Founders' Shares

Copies of the Prospectus, together with Forms of Application, may be obtained at the Offices of the Company or from the Company's Solicitors, Bankers or Auditors

This Notice is not to be regarded as an invitation to subscribe for Shares, but is issued for public information only.

**THE LIST CLOSES ON OR BEFORE THURSDAY, MAY 16TH.**

METROPOLITAN BOROUGH OF BETHNAL GREEN.
GENERAL FOREMAN.

The Council invite applications for the appointment of General Foreman.

Applicants must be between 35 and 42 years of age.

The appointment will be subject to the provisions of the Bethnal Green Borough Council Superannuation Act, 1906, to the successful candidate satisfactorily passing a medical examination, and undertaking to reside in the Borough of Bethnal Green.

The salary will be at the rate of £150 per annum, rising by annual increments of £7 10s. to a maximum of £172 10s. per annum, each increment being subject to a recommendation of the Works and Stores Committee.

Practical experience in the construction, maintenance, and cleansing of roads and sewers is essential.

Applications, on forms to be obtained from the Borough Engineer and Surveyor, must be filled up and returned to the undersigned, with copies of not more than three recent testimonials, by 12 noon on Wednesday, the 22nd May, 1912, endorsed "General Foreman."

Canvassing, directly or indirectly, any Member or Officer of the Council will be a disqualification.

C. G. E. FLETCHER,
Town Clerk.

Town Hall,
Bethnal Green, E.
May, 1912.

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WANTED—a Clerk of Works for Tramway Construction; must have had considerable experience of tramway work, including Thermit Welding.—Apply, stating age, experience, and salary expected, Box 1,152, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

---

WATERWORKS ENGINEER with experience of mechanical filtration, required immediately.—Apply Box 1,153, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

---

BOROUGH ENGINEER AND SURVEYOR (A.M.Inst.C.E.) of large town in the Midlands (40,000) has vacancy for Pupil. Address Box 1,144, office of THE SURVEYOR, 24 Bride-lane, Fleet-street,

## LECTURES.

MUNICIPAL TECHNICAL INSTITUTE, Romford-road, West Ham, E.

A short course of Lectures by Mr. W. T. Creswell, F.S.I., &c., will be given during May and June at the above Institute on Sanitary Science, and also on Reinforced Concrete Construction.—For further particulars apply to the Principal.

## FOR SALE.

FOR SALE—a Sanitary Cart, suitable for Urban, Rural or Parish Councils; holds liquids; cost £21 new 14 years ago; in good condition.—Apply Clerk, Mitford and Launditch R.D.C., East Dereham, Norfolk.

## TENDERS WANTED.

HANWELL URBAN DISTRICT COUNCIL.
DESTRUCTOR.

The Council invite Designs and Estimates for the Construction of a Refuse Destructor.

Further particulars may be obtained on application to the Surveyor, Mr. Sidney W. Barnes, ASSOC.M.INST.C.E., at the Council Offices, Cherington-road, Hanwell, W.

Tenders to be delivered on or before 10th June next.

The Council do not bind themselves to accept the lowest or any Tender.

Any person, firm or company canvassing any Member of the Council will be disqualified for receiving orders or contracts from the Council.

(By order)
PERCY SCOTT,
Clerk

Council Offices, Hanwell, W.
May 7, 1912.

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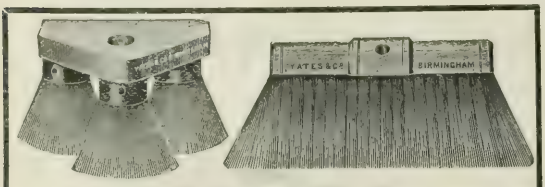
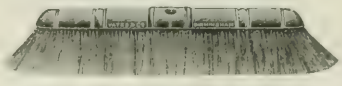



JOHN YATES & CO., Ltd.,

Aston Manor, BIRMINGHAM.

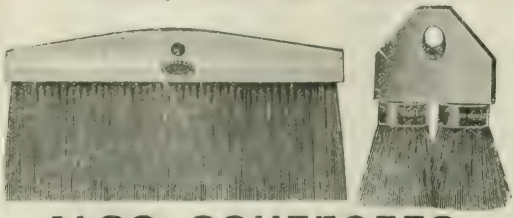
TELEGRAMS: "Yatonian, Birmingham."
PHONES: Birmingham East 400, 401 & 402
(Private Branch Exchange.)

Est. 1804.



Est. 1804.

ALL KINDS OF BROOMS BOTH FOR
TAR & SCAVE WORK
BASS, HAIR and WIRE.



ALSO SQUEEGEES.



"PUDLO"

PATENTED AND REGISTERED.

FOR
Leaking Cisterns,
Damp Walls,
Flooded Basements.
ALSO
Waterproofs Concrete.

Makes Cement Water-proof

Pudlo is a Powder.
Sprinkle it over cement.
Add sand and water.
Render as is usual.

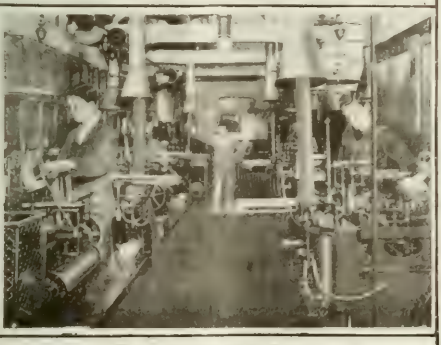
Made in England by
KERNER-GREENWOOD & CO.,
Ann's Gate, King's Lynn.

# Interesting Facts about our Printers

## A Tour through the House of Odhams

*One of the Composing Rooms.*

*Some Type-setting Machines.*



*Type-making Machinery.*

THE reader of this journal is usually too much interested in the contents of his paper to think about the means by which those contents are brought to him and to his many thousand fellow-readers week by week. Of course, he knows the views of the editor well enough, and sees that a good deal of labour must have been expended on the gathering together of the news, but there his interest stops.

Now and again it may be well to look further—beyond the editorial department into the mechanical means by which the written word is multiplied tens and hundreds of thousands of times, and distributed throughout the length and breadth of the land, not only through the medium of the Post Office, but through the large wholesale distributor, working down through the small retail shopkeeper in town and village.

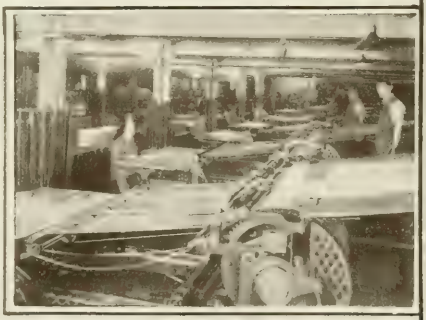
Our best testimonial to the worth of Messrs. Odhams Limited is found in the fact that the proprietors of this journal entrust the care of their paper to this firm, whose premises are situated in Long Acre, London, at the junction of Bow Street and Endell Street, within a stone's throw of the Royal Opera House and Covent Garden Market, for the tide of newspaperdom has for many years set westward, and there is no sign of its turning.

The illustrations on this and other pages give the reader some idea of the size and capability of the premises.

Odhams Premises, Long Acre, London.

*The Counting House.*

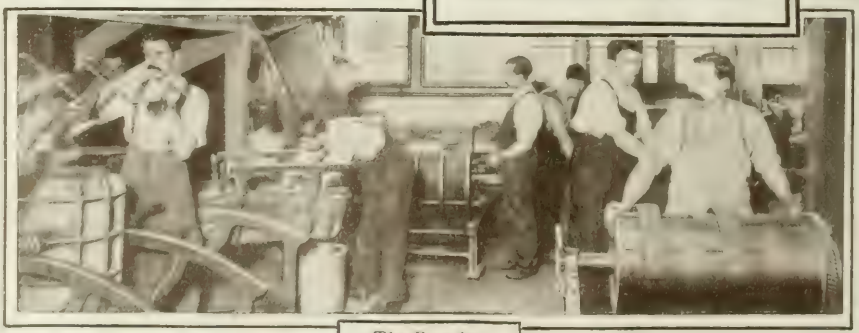
*More Type-setting Machines.*



*Art Printing Machines.*

IN the old days—say in the early fifties — nearly every weekly newspaper and it is of weekly journals we especially treat—had its own separate printer and printing office, the former sometimes merely the servant of the newspaper proprietor, and not an independent contractor. The printing office would consist very often of two or three rooms at the top of a house built for private purposes, with the dividing walls knocked down to form a composing-room. On account of the weight of type it was not unusual to have columns running from basement to roof to support the top-heavy building. The machining was either done in the cellar—it had hardly attained to the dignity of the name of "machine-room"—or the formes of type were sent out to some neighbouring printer, with sufficient machinery at command, for him to work them off. The papers were seldom cut or even folded, the sheets being delivered flat to the wholesaler, who sent them in bulk to the retailer to fold at his shop or bookstall. Obviously this scheme of things involved much waste, for men could not be kept going all the week evenly, when, as everyone knows, news is apt to distribute itself unevenly. Trades Unions had not yet safeguarded their members against waste of time, and hardly taught them to charge for overtime; with the granting of these demands the day of the printer for one small weekly hastened to its close.

In the old days the printer was personally identified with the journal he printed, and the principles for which



*The Foundry.*

*Folding and Binding.*

*Room.*

it stood: to-day, while something of the old sentiment lingers, he is in fact as detached as any other wholesaler dealing in sundry wares—as detached, say, as Messrs. W. H. Smith and Messrs. Wymans from the newspapers they distribute; much more aloof than the barrister who undertakes, for a consideration, to espouse his client's cause in a temporary union.

It was in conditions such as we have sketched that what has grown into the firm of Odhams Limited took root. The printer of *The Guardian*, the late Mr. William Odhams, seeing the advantage of having a week-end as well as a mid-week paper, *The Railway Times* was added. Each paper represented an important development in matters of vast interest—*The Guardian* treating of the many theological issues raised by the Oxford Movement, *The Railway Times* dealing with the enormous impetus given to trade and commerce by that new means of swift locomotion, the railway, its pages re-echoing the fierce contentions of the warriors fighting in Parliament over the competing claims of new railways then being brought forward in every direction.

For some forty years the business was carried on in two large top floors and a basement at Burleigh Street, Strand, but in 1894 additional premises were taken in Floral Street, Covent Garden, and the story of the following years is simply one of continuous growth, until in 1905 the present commanding position in Long Acre was acquired and the business of Southwood, Smith & Co. brought under the same roof.

*Wire-stitching Machines.*

*ded and stitched.*

*Trimming the Edges.*

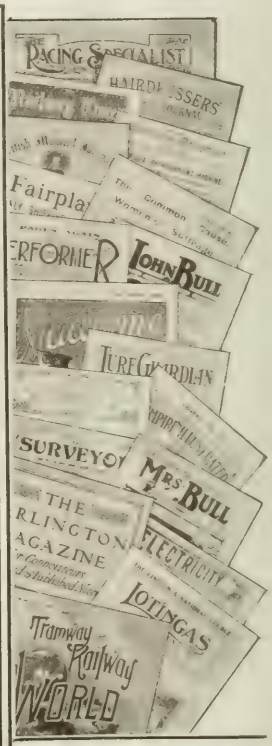
*' Shop.*

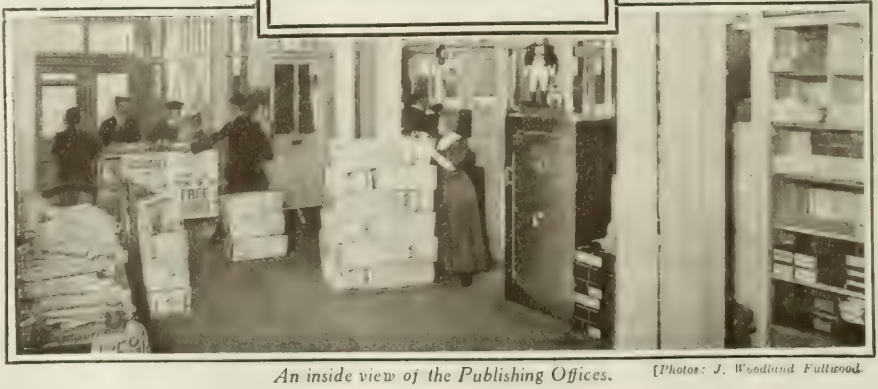
*A Machine Room.*

*The Publishing Offices.*

READING the lesson taught by the extinction of the individual printer, Messrs. Odhams recognised the fact that the existing system of having a separate publishing department for each newspaper was as wasteful and as inefficient as had been the separate printing-office in the old days. Except in the case of very large weekly papers it is impossible for the journal to be individually properly pushed and its interests represented throughout the length and breadth of the land, the expenses of travellers being far too great to be borne by the average weekly newspaper. One step more and Messrs. Odhams were in a position to say that they could manage the entire business side of a newspaper for the proprietors. This step consisted in arranging for the supply of advertisement representatives and the superintendence of their work. The importance of these last two departments—the publishing and the advertising—cannot be over-estimated, because they are the money-getting departments, and their results have to pay editors and sub-editors, printing, paper, all office expenses, and finally, and not least important, the dividends for those whose money has been put into the newspaper venture.

The above facsimile reproductions of some of the publications printed by Messrs. Odhams give an idea of the magnitude of the business of the firm.



*An inside view of the Publishing Offices.* [*Photos: J. Woodland Fullwood.*

*For prospectus see our advertisement pages.*

# The Surveyor

And Municipal and County Engineer.

Vol. XLI. MAY 17, 1912. No. 1,061.

## Minutes of Proceedings.

**Road Tarring and Fish Life.**

In our issue of February 16th we expressed the belief that if suitable precautions are taken when a road is freshly tarred the danger of fish being killed by washings from the tarred road is not great. Our remarks upon that occasion were by way of comment upon a paper read before the Institution of Municipal and County Engineers by Mr. W. J. A. Butterfield, M.A., F.I.C., and were made in the light of the facts and opinions adduced during the discussion of that paper. Since then some further facts and opinions have come to our notice, but though it is clear that the subject of the poisoning of streams cannot be studied piecemeal, but must be looked at as a whole, we believe that, as regards road tarring in particular, the main considerations are fairly presented in the "Minute" in question. It is important that civic engineers who are responsible for the management of roads and of sewage works should be in possession of facts which will enable them to form opinions as to the relative deadliness under different circumstances of pollution which they might prevent or mitigate and pollution for which they cannot in any sense be held responsible, and it must be remembered that the gradual deterioration of fisheries by slow poisoning of the streams and the destruction of fish food is a matter which is, on the whole, quite as important as that of occasional accidents suddenly killing large numbers of fish. In the case of sewage it is much more likely that fish will be poisoned by comparatively small quantities of crude sewage entering streams in very dry weather than that harm should result from a good deal of sewage works effluent discharged in dry weather; or, on the other hand, fairly large quantities of storm water discharged in floods. Again, in the case of roads, it has been suggested that the oil dropped by motor vehicles may be injurious to fisheries in its effects upon the flies and larvæ upon which the fish feed. That this oil is washed from a tarred road somewhat more readily than from a water-bound road is possibly the case, and although we are not inclined to believe that pollution by lubricating oil is a serious matter, it is a point which has been brought up and must be studied for a time and, if possible, disposed of. Probably as motor vehicles are improved less oil will be spilt.

In addition to pollution from public sources, there is the ever-present danger of pollution from various kinds of works. In some cases the evil is chiefly the general debasement of the stream by constant pollution, but now and then, by accident, large quantities of poisonous matter may enter a stream, and the fish may be killed outright. We remember a case of this kind which occurred in the Midlands some years ago. No one was more annoyed by the accident than were the public-spirited owners of the works, and the stream was re-stocked as soon as possible. What surveyors are chiefly concerned with, however, is pollution from sources which are, or are supposed to be, or ought to be, under their control, and it is necessary to take careful note of cases of serious pollution, or alleged serious pollution, by sewage effluents and by the washings from tarred roads. It must not be forgotten that last summer was a severe test of the capacity of streams to deal with pollution. On the other hand, both last summer and the present spring may serve to show us some of the places where pollution is likely to be a serious matter even in shorter droughts. In the annual report, 1911, of Proceedings under the Salmon and Freshwater Fisheries Acts we find the following notes: "Usk District—The pollution from acid from the works on the banks of the rivers Ebbw and Avon Llwyd continues to decrease. The pollution from sewage is not so satisfactory. The river is badly polluted by the sewage from the towns of Brynmawr, Crickhowell, and Newport, and all the towns and villages on the banks of the Avon Llwyd." This is a part of a report which shows that the Ebbw will not be allowed to revert to its state of some fifteen years ago, when it was described by a nobleman resident in the neighbourhood as "always either quite black or quite yellow." Under "Severn District" we read in the report already referred to: "The sewage from Gloucester has killed a great number of fish during the dry summer months." The poisoning of fish is not, however, always incidental or accidental. In the Ayron district, for instance, the report states: "For nearly twenty years the Ayron has been annually limed during summer droughts, and thousands of fish destroyed. The board has spent immense sums of money to catch the culprits, and this year one was caught at 4 a.m. in the very act of liming." As regards the effects of washings from tarred roads, we read: "The circular to local authorities . . . has elicited only expressions of concurrence in the suggested precautionary measures, coupled in most cases with the statement that no instances of suspected poisoning from tarred roads had come to the notice of the county council concerned."

As regards the condition of the trout and grayling in the Itchen at the break-up of the drought: "It does not appear at all certain that this visitation was due either in whole or in part to washings from tarred roads, and it may be remarked that the Hampshire County Council have informed the board that all tar used upon their main roads during the past summer was supplied under a stringent specification, prepared by an expert chemist, with the object of eliminating all substances which might be injurious to fish life or vegetation." On the other hand, one is bound to recognise the importance of opinions such as those expressed by Mr. R. B. Marston in an article which

appeared recently in the *Daily Mail*, and to the evidence therein adduced, that washings from tarred roads have proved injurious to fish. To these matters we hope to give some detailed attention in an approaching issue, and, generally, we should like to be informed of any actual cases of harm done which may come under the notice of our readers. Mr. Runciman stated on Tuesday that the Board of Agriculture is investigating certain of such alleged cases; in the meantime, we would say again exactly what we said in pages 271 and 272 of our issue of February 16th.

* * *

**The Removal of Dust from Country Roads.**

The extent to which sweeping and watering ought to be carried out on roads in rural districts depends mainly upon three considerations which may conveniently be stated as questions. First, to what extent is such sweeping and watering desirable on account of the nearness of houses to the road and their number per mile; secondly, what is the extent of the effect produced in proportion to the cost of the means employed to produce it; and, thirdly, how far, in proportion to the cost—or the cost otherwise not fully justified—does the watering and sweeping help to maintain the crust? The answer to the first question may depend a good deal upon the direction of the road, and, if it lies across the direction of the worst winds, whether the houses are most of them on the windward side or on the lee side. As regards the second matter, a good deal depends on the nature of the crust, and much upon whether it is shaded or exposed. A good deal may depend, too, upon whether the carriageway is exposed to the wind or not. The wind-swept road may dry more quickly than a piece of road between high banks, but the former will often be found relatively clear of dust when the latter has to be swept before it can be watered economically. As regards the value of watering and sweeping in maintaining the crust it is relatively more valuable on roads much used by motor vehicles than it is on roads where such vehicles form a smaller proportion of the whole traffic. The tendency is for watering and sweeping to be more and more worth while. Where there is much motor traffic or any kind of light, fast traffic, the removal of small, loose stones by sweeping reduces wear of the crust, because the wear of driving wheels is, to some extent, increased by the effect of this stuff as an abrading material. If the quantity is sufficient for its replacement to be worth while it may be put back into depressions in wet weather.

Now the use of water to "lay" dust by turning it into mud is wasteful. The way to keep down dust is to pick it up, not only in Ireland, but in any part of the United Kingdom. If the quantity of dust is very small a fairly copious watering may sometimes be the best available means of preventing a road from becoming dusty, but in most cases a much smaller quantity of water will suffice, or the effect will last much longer, if the dust be first removed with *soft* brooms or brushes. Hard brushing is to be avoided. The stiff brush is to be used for the removal of mud, but the soft brush is the better tool for the removal of dust, unless, as may be the case on a tarred road, it is desired at the same time to remove a film of dirt which lies under the dust. On some road surfaces a somewhat worn brush, though of the stiff kind, may serve the purpose well enough, but in many cases small stones are brushed out from the surface unless the brush is quite a soft one. When the roller—or a light roller which will probably be used for constant maintenance in the future—is employed at the same time as the broom and the watering cart, more vigorous brushing may be done if it be desired to remove the dust from between the surface stones and to replace it, before the water cart and roller reach the place, with larger grained material.

**Shovelling up the Dust.**

The foregoing remarks are intended to define, by circumlocution, the main subject of this note, which has so far not been touched upon. The sweeping of a country road is not the same thing as the removal of dust from that road. When the road is swept, either with watering or as a separate matter, the dust should, of course, be put somewhere whence it will not be blown back into the carriageway—though this is not always done; but a large amount of useful work may be done by shovelling up the dust which has been blown by winds to one or both edges of the carriageway or, in calm weather, concentrated at the sides by swift motor vehicles. A brush may be used to concentrate the dust a little more and to help in shovelling it up, but it is often so deep up against the edges of the turf that most of it can be removed by simple shovelling. If it is not worth while to take it away it may be worth while to shovel it up and put it in the ditches, whence it will be removed by the next heavy rain. There would be other ways of dealing with it if the surveyor had, as he ought to have, some control over a lateral strip of sufficient width. However, the main point is this: After the wind has been blowing across a road and has concentrated the dust at one or both sides, the dust should be removed before the wind scatters it again by blowing along the road. Such work is not costly, relatively to the amount of nuisance abated; it saves in the cost of watering, if that be done also, and where there are houses alongside the road it reduces the annual cost of maintenance of the houses. The principle applies to roads which have been tarred and, which is a matter of importance, to the interval before tarring, and it depends not only upon the effects of winds, but also upon the persistent effects of swift motor traffic. Advantage may be taken of it to reduce the average cost of a consistent policy of sweeping and watering, for there will be some days when it is not necessary to sweep the whole width of the carriageway.

* * *

**The Nuneaton Meeting.**

At the Midland District meeting of the Institution of Municipal and County Engineers held at Nuneaton on Saturday, Mr. F. C. Cook, ASSOC.M.INST.C.E., the borough engineer and surveyor, read a very interesting paper in which he traced the development of municipal engineering work in that town since he succeeded Mr. Pickering ten years ago. The general development of Nuneaton during the past decade has been very rapid, as is shown by the fact that both the population and rateable value have increased by nearly 50 per cent during that period. This growth has naturally entailed a large amount of work upon the borough engineer's department of both a routine and special character. The works which have been undertaken since Mr. Cook took office include the erection of slaughter-houses, the building of a small-pox hospital, the execution of flood prevention works, the extension of the electricity works, the sinking of an additional well, and the construction of a high service reservoir in connection with the water supply, the erection of a duplicate dust destructor, and the extension of the sewage disposal works. For full details of these works we must refer our readers to the paper itself. We may, however, here refer specially to the flood prevention works. As the result of its geographical position, the town of Nuneaton has always been regarded as liable to flood, and the works which have been carried out with a view to mitigating this evil involved the reconstruction of two obstructive masonry bridges, the straightening of the river course, and the cleansing and grading of the river bed. It is very satisfactory to record that the works have been completely successful in achieving the object for which they were carried out. Mr. Cook is to be congratulated on ten years of substantial achievement.

**Surveyor or Road Foreman?**

Two further instances have recently been under our notice of the refusal of a rural district council to face the expense of appointing a properly qualified highway surveyor. In one case a committee had been appointed to consider and report as to the extra cost of employing a properly qualified surveyor for the whole district. Of course, the committee were obliged to come to the conclusion that a properly qualified man would cost considerably more than one without technical training, and on this ground they recommended that the existing system of highway administration should remain unchanged. It is encouraging to find that there was at least one member of this particular council who saw the folly of such false economy. Nevertheless, the report of the committee was adopted. In the other case to which we refer (that of the Clare Rural District Council) the surveyor had resigned owing to his having secured a better appointment, and the council appointed the road foreman to act as surveyor, in the first instance until October 31st next. We can only repeat what we have often said before, that in the light of such incongruous decisions as those just referred to it would appear to be desirable that there should be some central control over the appointment, as well as (for other reasons) over the dismissal of surveyors to local authorities.

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**Housing Reform.**

Alderman Thompson, the chairman of the National Housing and Town Planning Council, is such an authority on all questions relating to housing that anything he has to say on such matters is worthy of the greatest attention. In a letter which he has issued to the Press he says: "The summary destruction of the principal clauses of the Housing Bill in Standing Committee is a matter which is strongly and rightly deplored by a large number of earnest men and women who have given the greater part of their lives to the work of trying to secure the better housing of the working classes, and I cannot help thinking that if the House of Commons and the Government realised the gravity of the evils arising from bad housing conditions, and the extent to which they cripple all measures of social reform, some real effort would yet be made, at the earliest possible moment, to bring about the necessary improvements in housing legislation and administration." We quite agree as to the urgency of the problem, and as to the necessity of putting forth every effort for the mitigation of the evils of bad housing. Pending further legislation, however, a great deal can be done by local authorities by the conscientious exercise of their powers under the existing Acts.

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**The Fylde Water Scheme.**

With the withdrawal of the Blackburn opposition, and the reservation of the Croasdale Valley as neutral ground, the prospects of the Bill promoted by the Fylde Water Board almost instantly brightened, and the Select Committee of the House of Commons had eventually little difficulty or hesitation in finding the preamble proved. The scheme, which is estimated to cost nearly two millions sterling, has for its object the supplementing of the present gathering grounds on the Grizedale Fells, which are insufficient to supply the demands made upon them even with the greater storage accommodation which the district will possess when the large new reservoir is completed. The intention is to tap the Hodder watershed, an area not already appropriated, and from this it is hoped to obtain an abundant supply of excellent water sufficient to meet the local requirements for the next hundred years. Naturally centres like Blackpool, which is within the sphere of influence of the Fylde Water Board, are jubilant at the result of the Select Committee's deliberations, and congratulations are due to the promoters of the scheme in successfully overcoming a series of obstacles which at first sight loomed ominously in the path of the Bill.

* * *

**Horse or Motor Haulage?**

The report which has been prepared by Mr. C. H. Cooper, M.INST.C.E., the borough engineer and surveyor of Wimbledon, on the possibility of economically using motor haulage for municipal purposes, shows conclusively that at present this form of traction cannot compete with horse haulage. Inquiries from fifty-eight authorities (the results of which we reproduced last week) elicited the information that eight of the districts have adopted motors for the haulage of goods, three for the haulage of house refuse, two for slop and scavenging, six for road watering, and four for other purposes. The general opinion appears to be summed up in the observation by Mr. O. Claude Robson, M.INST.C.E. (Willesden), that motor traction only pays with heavy loads carted over long distances, but not with intermittent work such as watering, dusting and slopping. This view entirely coincides with the advice which Mr. Cooper gave his council before the inquiries were made. He will have the satisfaction of knowing, however, that the labour expended in the collection and tabulation of a great deal of useful information has resulted in a "Comparative Report" which will no doubt be widely appreciated.

* * *

**Tramway Congestion in London.**

The London County Council has now issued an official reply to the memorial which was addressed to the Board of Trade by the Roads Improvement Association last January complaining of alleged congestion and obstruction of streets by the tramcars. Part of the reply is not very convincing, inasmuch as it merely gives the result of observations, which show that motor-omnibuses are equally bad offenders. It appears to us to be far more pertinent to point out (as the reply does later) that a large proportion of the surface of the streets over which the cars run has been provided specially in connection with the tramway scheme. Moreover, the tramway undertaking is heavily rated, and also has to bear the expense of maintaining the paving of the track. As we pointed out at the time when the memorial was presented to the Board of Trade, a considerable improvement as regards obstruction could be effected by the simple devices of not bringing successive cars close together in case of a temporary stoppage, and of not stopping cars opposite each other on the up and down tracks. These practices alone are responsible for not a little obstruction which is easily preventable.

* * *

**The Conference: For Whose Benefit?**

The attitude of local authorities towards conferences which their chief officials are invited to attend varies widely. In some cases they are referred to as "holidays," and the assumption is frequently made that any benefit which may be derived from attendance at such conferences is obtained by the official personally, and not by his authority. From this view we entirely dissent. The value of a well-organised conference as a means of broadening the official outlook, and enabling the best and latest ideas to be at the disposal of local authorities generally, would be difficult to over-estimate. It is pleasing, therefore, to note that, as stated in our issue last week, in one case at least (that of Loughborough) the expenses of the surveyor in attending the forthcoming visit of the Institution of Municipal and County Engineers to Paris are to be paid by his council. We venture to hope that many other authorities may be induced to follow the excellent lead given by the Corporation of Loughborough in this matter.

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# Institution of Municipal and County Engineers.

## MIDLAND DISTRICT MEETING AT NUNEATON.

In the absence of the president, Mr. A. D. Greatorex, Mr. R. J. Thomas, the senior vice-president, occupied the chair at Saturday's meeting of the Institution of Municipal and County Engineers at Nuneaton. The members assembled shortly before mid-day at the Law Courts, where His Worship the Mayor (Councillor Thomas Horton, J.P.) extended a hearty welcome on behalf of the town, and after the transaction of the usual routine business a discussion took place on a paper by Mr. F. C. Cook, ASSOC.M.INST.C.E., the borough surveyor, entitled "Ten Years of Municipal Work in Nuneaton." The attendance at the meeting was as follows: Messrs. R. W. Blanchard (Cannock), F. E. G. Bradshaw (Tamworth), W. B. Chancellor (Lichfield), W. G. J. Clark (Wigston Magna), H. J.

MR. F. C. COOK.

*[From photo by Clare Speight, Nuneaton.]*

[Mr. Cook is a Sussex man, and was articled to the late Mr. Miles Aspinall, A.M.I.C.E., then borough surveyor of Worthing, in 1891. In 1895 he was appointed engineering assistant to the borough surveyor of Hove, and in 1897 took up his first appointment at Nuneaton as chief assistant to Mr. J. S. Pickering, M.I.C.E., then engineer and surveyor to the urban district council. Three years later he obtained the post of surveyor and water engineer to the neighbouring town of Hinckley, and in 1903 returned to Nuneaton in succession to Mr. Pickering on that gentleman's removal to Cheltenham. The town was incorporated in 1907, when Mr. Cook became the borough engineer. Mr. Cook obtained the diploma of the Institution of Municipal and County Engineers in 1897. He is an Associate Member of the Institution of Civil Engineers, a Member of the Institution of Water Engineers and of the Royal Sanitary Institute, and a Professional Associate of the Surveyors' Institution.]

Clarson (Tamworth), H. J. Coleby (Atherstone), F. C. Cook (Nuneaton), E. H. Crump (Hinckley), N. H. Dawson (Banbury), A. J. Dickinson (Redditch), S. Douglas (Kenilworth), E. J. Elford (Southend-on-Sea), J. Gammage (Dudley), E. Y. Harrison (Wellingborough), G. W. Lacey (Oswestry), W. B. Madin (Rushden), W. Plant (Stafford), T. Reader Smith (Kettering), F. Richardson (Birmingham), H. Richardson (Handsworth), N. Scorgie (Hackney), H. E. Stilgoe (Birmingham), W. I. Tait (Sudbury, Suffolk), W. H. Taylor (Aylesbury), R. J. Thomas (Bucks County), S. Turner (Ashby-de-la-Zouch), A. H. Walker (Loughborough), and F. Woodward (Stourbridge), members; W. H. Court (Leicester), D. Ellison (West Bromwich), E. J. Goodacre (Nuneaton), R. C. Moon (Nuneaton), and P. H. A. Smith (Leicester), associate members; the Mayor of Nuneaton (Councillor Thos. Horton, J.P.), G. W. Andrew (Nuneaton), H. J. Ash (Nuneaton), G. W. A. Bagworth (London), P. A. Benn (Loughborough), A. Bryan (Birmingham), A. C. Buckler (Stockingford), W. Buckler (Nuneaton), G. W. J. Clark (Wigston Magna), F. S. Clay (Nuneaton), J. C. Clay (Nuneaton), T. Cooke (Nuneaton), H. Cranage (Leicester), A. Eyles (Lichfield), W. A. Fitch (Nuneaton), S. C. Gibson (Nuneaton), W. Granger (Nuneaton), G. Haynes (Lichfield), G. Helps (Nuneaton), J. F. Johnson (Nuneaton), W. Keay (Leicester), F. Lee (Hinckley), D. R. Mackie (West Bromwich), V. G. Maitland (Nuneaton), N. W. Morton (Kenilworth), G. Orton (Nuneaton), A. Rayner (Nuneaton), C. Reader (Nuneaton), J. Robinson (Aylesbury), S. S. Sherwin (Ashby-de-la-Zouch), T. Varnam (Ashby-de-la-Zouch), F. Voce (Nuneaton), J. Wheway (Nuneaton), and H. W. Wilson (Nuneaton), visitors.

In his speech of welcome the MAYOR said he sincerely hoped that the visit of the institution to the town might be both pleasant and instructive. He believed it was about eleven years since they visited Nuneaton, and he was sure they would agree with him that during the intervening period many important changes had taken place. They would remember that on the occasion of their previous visit the town was governed by an urban district council, and that in the absence of the chairman he had the privilege, as vice-chairman, of receiving them. He need hardly say that that pleasure was further enhanced to-day when, as mayor of the borough, he again extended a welcome to them. He was personally very much in favour of these meetings of engineering societies, and he was pleased to say that his colleagues on the council recognised the beneficial results, both to themselves and the authorities they represented, which accrued from the renewal of old friendships and the interchange of ideas.

Mr. R. J. THOMAS, vice-president, said he had to express regret for the absence of the president, Mr. Greatorex, adding that they knew the lamentable cause of it. Mr. Greatorex was paying his last tribute of respect to Mr. Eayrs—an old member of the institution, and one who had the confidence and esteem of the members. (Hear, hear.) Proceeding, Mr. Thomas said he had to propose a hearty vote of thanks to the Mayor and Corporation of Nuneaton for receiving them there, and particularly to his Worship for the admirable address he had given them. It was a source of pleasure to officials to find that councils appreciated the fact that they were not self-seekers, but that the object of their meetings was the improvement of their knowledge and the desire to be better able to serve the communities they represented. He hoped that that feeling would long continue, and that public authorities would give increased facilities in the future for their officials attending these conferences.

Mr. H. RICHARDSON (Handsworth) seconded, and the vote of thanks was carried.

### THE DEATH OF MR. J. T. EAYRS.

The HON. DISTRICT SECRETARY read the following letter, which he had received from the president, Mr. A. D. Greatorex, dated May 10th: "I regret to inform you that Mr. Eayrs, one of our esteemed past-presidents, died last night. As the funeral is fixed for Saturday noon, it will be impossible for me to attend the Nuneaton meeting. I have therefore asked Mr. Thomas, as senior vice-president, to be present and take my place. Mr. Eayrs will be very much missed by his professional brethren in this district, and by the members of the institution, whose interests he had so much at heart. His sound advice and genial disposition endeared him to all who knew him. Kindly remember me to all at the meeting, which I trust will be highly successful."

Mr. THOMAS moved a vote of condolence with the family of the late Mr. Eayrs, and paid a warm tribute to his professional ability, his personal work and the kindly help which he had always given to the younger members of the profession.

Mr. H. J. CLARSON (Tamworth), who seconded the vote, said it had been his privilege and pleasure to know Mr. Eayrs for about thirty years. Possessing unbounded energy, he was an ornament to the institution, and a man who took a most active part in all its proceedings, and he (Mr. Clarson) thought he voiced the opinion of all present when he said that they had lost an able engineer and a dear old friend.

The vote was passed in silence, the members upstanding.

The minutes of the last district meeting—held at

Handsworth—having been read and confirmed, the following paper was submitted for consideration:—

## TEN YEARS OF MUNICIPAL WORK IN NUNEATON.

By F. C. COOK, ASSOC.M.INST.C.E.,
Borough Engineer and Surveyor.

A district meeting was held at Nuneaton in October, 1901, at which a paper descriptive of public works was read by the author's old chief and predecessor, Mr. J. S. Pickering. It is therefore only necessary to refer in detail to recent developments and to works which have been carried out in the intervening ten years.

Although the name Nuneaton is derived in part from a nunnery founded here by Robert Earl of Leicester in King Stephen's time, the town is essentially of modern growth. Geologically it is situated close to the outcrop of the coal measures forming the Warwickshire coalfield, and this, coupled with excellent railway facilities, which have led to the establishment of many and varying works and factories, mainly accounts for the commercial importance of the town to-day.

Nuneaton was incorporated in 1907. In point of area it is one of the largest boroughs in the kingdom; but more than one-third is comprised within the Arbury Hall Estate—the "Cheverel Manor" of George Eliot's "Scenes of Clerical Life."

### STATISTICS.

| | | | |
|---|---|---|---|
| Area of the borough... ... ... ... | | | 10,596 acres |
| Population ... ... | 1901, 24,996 | 1911, | 37,083 |
| Rateable value ... | 1901, £108,011 | 1911, | £152,157 |
| Number of inhabited houses | 1901, 5,122 | 1911, | 7,704 |
| Persons per house ... | 1901, 4·88 | 1911, | 4·81 |
| Birth rate ... ... ... ... | 31·2 | | |
| Death rate from zymotic diseases, | 2·00 | | |
| " " other causes ... | 9·80 | | |
| Total | 11·80 | | |

Penny rate produces £580 to the Borough Fund and £480 to the General District Fund.
Average rainfall for last ten years, 22·74 in.
Levels above ordnance datum: 530 ft. to 262 ft.

### HIGHWAYS.

There are 42¼ miles of public highways within the borough, of which 10¾ miles are main roads, in respect of which the county council pay the corporation the sum of £2,109 per annum. The surfaces of all roads over railway and canal bridges, and the approaches thereto, are also maintained by the corporation under agreements with the various companies concerned.

*Stone Quarry.* The stone used for highway purposes is a quartzite, obtained from the Corporation Quarry at Tuttle Hill. The plant comprises a Broadbent 16-in. by 8-in. breaker and 22-in. by 12-in. roller mill, with the necessary elevators and screens, driven by a 12 n.h.p. high-pressure semi-portable steam engine. The annual output is about 12,000 tons and the cost of production of all material is about 2s. 3d. per ton, exclusive of establishment charges.

*Construction and Tar Spraying.*—Tar-macadam has been used to a certain extent, and trial has been made of other compounds, such as "Rocmac" and "Glutrin."

Tar spraying has been carried out successfully, and last year the length of roads treated was eight miles. Two hand-spraying machines were used, and the cost was as follows:—

| T. | C. | Q. | | £ | s. | d. |
|---|---|---|---|---|---|---|
| 100 | 15 | 2 | Crude gas tar at 29s. 6d. ... | 148 | 12 | 10 |
| 18 | 9 | 2 | " " 30s. ... | 27 | 14 | 3 |
| 359 | 13 | 0 | Granite chippings, 2s. 9d. ... | 49 | 9 | 0 |
| | | | Labour ... ... ... | 95 | 15 | 9 |
| | | | Cartage ... ... ... | 73 | 19 | 0 |
| | | | Sundries ... ... ... | 2 | 8 | 11 |
| | | | | 397 | 19 | 9 |
| | | | Add 10 per cent. for supervision, use of plant, &c. ... ... ... | 39 | 16 | 0 |
| | | | | £437 | 15 | 9 |

Total length treated—13,962 lin. yds. = 7·53d. per lin. yd.
" area " 107,692 sq. yds. = 0·97d. " sq. yd.

The author has found tar-spraying successful as a dust preventive under almost all conditions; and in the case of outlying roads, where the traffic is light and the surface has the full influence of sun and wind, it fulfils an added purpose in prolonging the life of the road.

Other palliatives for dust, such as chloride of calcium and "Akonia," are used on streets in the centre of the town which it is not considered advisable to tar-spray.

Monetary considerations render it almost impracticable to take in hand the reconstruction of the highways in such a manner as to fit them for the requirements of present-day traffic; but an expenditure of something like £40 a mile year after year, with the sole object of dust prevention, and without any prospect of effecting permanent improvement to the highway, appears a particularly uneconomical way of dealing with the matter.

*Concrete Slab-making.*—Nearly the whole of the concrete slabs required for footpath paving are manufactured at the depot, washed granite chippings, from the corporation quarry, being used for the purpose. They are all made 2½ in. in thickness, and cost about 2s. 1d. per square yard, exclusive of establishment charges.

*Street Improvements.*—Nuneaton is obviously a town laid out with no regard to future development. The sum of £15,000 has been spent within the last ten years in street widenings largely in improving the approaches to the Market-place, and important improvement schemes are still in hand. Every opportunity is taken to widen and improve arterial roads through land likely to be developed for building, and in this connection it is gratifying to record the reasonable manner in which, generally speaking, property owners receive the proposals of the corporation.

### PUBLIC SLAUGHTER-HOUSES.

Public slaughter-houses were erected in 1909 as the outcome of a refusal of the council to grant licences for private premises in the town proper. The project was strongly opposed by the local Master Butchers' Association; but upon the scheme receiving the sanction of the Local Government Board, these gentlemen placed their experience at the disposal of the Sanitary Committee, and gave valuable advice as to the construction and equipment of the buildings.

The site selected is midway between the London and North-Western and Midland Railway stations, and possesses the advantages that it is possible to lay on steam to the buildings from the boilers at the sewage pumping station, and to utilise an adjacent railway siding. It was decided to construct the buildings in complete and distinct sets comprising lairage, yard, and slaughter-house, and to let each set to separate tenants, rather than to adopt the usual type of a common slaughter-hall. The former method is doubtless less convenient from the meat inspector's point of view; but it ensures privacy as between different butchers, and fulfils generally the objects of the local authority.

The lair for each set is 18 ft. by 18 ft., with wrought-iron fencing for sheep and cattle; the intervening open yard is 12 ft. in width, and the slaughter-house is also 18 ft. by 18 ft., and 16 ft. in height to the wall plate, with hoisting tackle and other necessary fittings. The buildings are all paved with cement concrete *in situ*, with herring-bone grooves to the drainage channels. There is a covered way, 18 ft. in width, on the outlet side of the slaughter-houses common to all the buildings.

The site is large enough to accommodate eight sets of buildings. Three sets were erected in the first place at a cost, including all fittings, of £1,703. Each set is let at a rental of £21 per annum, with a separate charge for electric light, the tenants being held responsible for the cleanliness of the buildings.

### SMALL-POX HOSPITAL.

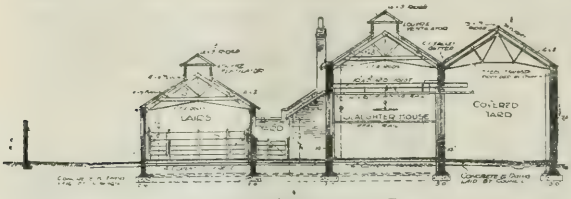
The Nuneaton and District Joint Hospital District comprises the Borough, the Urban District Council of Bulkington, and the Rural Districts of Atherstone, Foleshill, and Nuneaton, and was formed for the purpose of providing a small-pox hospital. A site was purchased at Bramcote, just outside the borough boundary, and the buildings were erected from the author's designs in 1907.

The cost was as follows:—

| | £ | s. | d. |
|---|---|---|---|
| Administration block ... ... ... | 1,203 | 16 | 2 |
| Ward block (16 beds)... ... ... | 1,437 | 19 | 3 |
| Observation ward (4 beds) ... ... | 642 | 15 | 0 |
| Laundry block and machinery ... | 969 | 19 | 7 |
| Caretaker's lodge ... ... ... | 376 | 0 | 0 |
| Fencing... ... ... ... ... | 259 | 0 | 0 |
| Water supply and drainage ... ... | 417 | 15 | 5 |
| Roadmaking and laying out grounds | 256 | 14 | 7 |
| Legal expenses, clerk of works, &c. | 369 | 16 | 7 |
| | £5,933 | 16 | 7 |

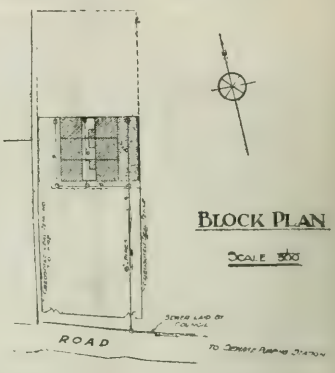
In designing the hospital administrative provision was made for forty beds.

There is nothing noteworthy in the design of the buildings, except that the discharge block, comprising undressing-room, bath-room, and dressing-room, is part



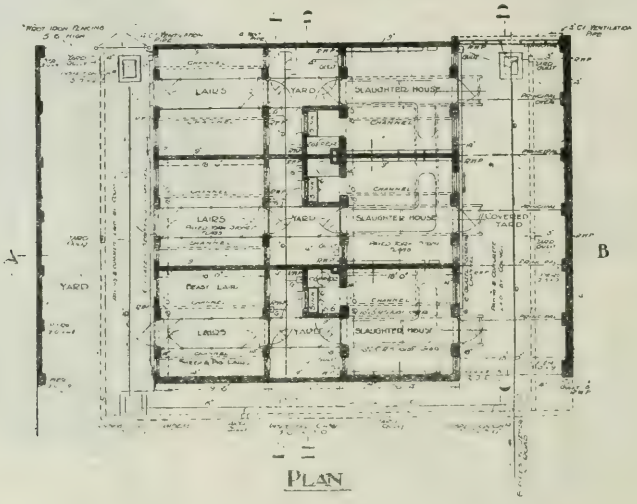

SECTION AB

SOUTH ELEVATION



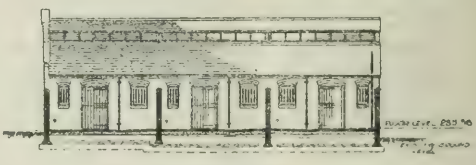

BLOCK PLAN

SCALE 1/500

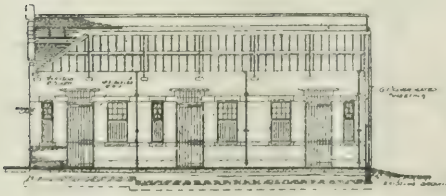



PLAN

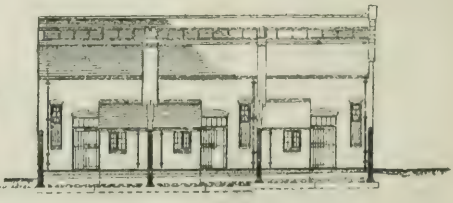
WEST ELEVATION



SECTION EF



SECTION CD.



SECTION GH.

NUNEATON SLAUGHTER-HOUSES.

(Plate 1.)

and parcel of the administration block, although provided with separate entrances. The buildings generally are of local red bricks, with artificial stone dressings and tiled roofs. The infected buildings have maple floors, with a glazed brick cove at the junction with the floor, and all angles are rounded. Town water is laid on to the buildings, but sewage is treated on the site, by means of a small circular percolating filter fitted with a water wheel distributor.

No case of small-pox has occurred since the erection of the hospital. The Sanitary Committee of the town council are desirous of utilising the buildings as a sanatorium for phthisis cases; but there appears to be some objection to this course on the part of other members of the Joint Committee.

PUBLIC BATHS.

On account of the expense of maintenance no steps have been taken to provide permanent swimming baths; but the needs of the public in this direction have been supplied in a reasonably effective and less expensive manner.

A set of slipper baths, nine in number, has been installed in an unused building belonging to the Electric Committee. The partitions are of deal, with the framework let into cast-iron sockets fixed in the tiled floor, and the baths are of enamelled cast-iron, with hot and cold water laid on. The electric department supply the steam required for heating the water at a charge of £16 per annum. Last year the baths were used by 11,367 persons; the charge for admission is 3d. each, and the loss on the year's working was £28 8s. 3d.

First and second class open-air swimming baths have been formed by the conversion of two disused circular sewage precipitation tanks, 80 ft. in diameter. The floor is formed of cement concrete, sloped to give a depth varying from 3 ft. 6 in. to 6 ft. The first-class bath is provided with dressing-boxes, fifty-four in number. The water for filling the baths is pumped from the river; a constant circulation is maintained, and each bath is emptied and cleaned once weekly. The water is heated by an injection of steam from the boilers at the adjacent sewage pumping station. The baths were open last year for a period of twenty-one weeks, the admissions numbered 16,339, at a charge of 3d. and 1d. (with a reduction for children) for the first and second class baths respectively, and the loss on the year's working was £17 18s. 2d. The cost of construction was defrayed from revenue, and amounted to £550.

FLOOD PREVENTION.

The river Anker, which passes through Nuneaton, is a tributary of the river Tame, and joins the latter river, after pursuing an extremely tortuous course, at a point twelve miles north-west of the town. The area of the watershed above the town is 29¼ square miles, and the subsoil is mainly a stiff marl, so that the proportion of rainfall reaching the watercourse is unusually high. As the result of its geographical position, the town has always been regarded as liable to flood; but probably nothing so disastrous has occurred as on the last day of the last century, when, as the result of a rainfall of 2·83 in. in twenty-four hours, the centre of the town was under water to a depth of nearly 3 ft., and the area of the built-on portion submerged was 200 acres.

Various remedial measures were considered, including the improvement of the existing watercourse, the construction of an impounding reservoir, and the formation of a relief channel to the river from above to below the town. In order to test the legal position of the council, application was made to the Local Government Board for sanction to a loan for improving a short length of the river. The application was refused on the grounds that no statutory authority existed empowering expenditure for such a matter; the council at that time were unwilling to incur the expense of obtaining a private Act, and the question remained in abeyance.

However, on October 28, 1903, the matter was again forced to the front. On this occasion, 0·95 in. of rain fell between midnight and eight o'clock in the morning, following three previous wet days, bringing the total rainfall to 1·81 in. The river rose to such a height as to touch the under side of a girder footbridge in the centre of the town, and there were fears that a flood was imminent.

This rainfall was in no way abnormal. From records made at Coventry, 9 miles south-west of Nuneaton, it appeared that on forty-nine previous occasions since 1880 a rainfall of 1 in. in twenty hours had been exceeded, while on twenty-two occasions it had exceeded 1¼in. in twenty hours.

The council thereupon resolved to promote a Bill in Parliament authorising the execution of works of flood prevention. The scheme adopted involved the reconstruction of two obstructive masonry bridges, the straightening of the river course, and the cleansing and grading of the river bed, the object being to increase the velocity of flow through the town by improving the hydraulic gradient, and prevent backing up from below. The length of river affected was 3 miles.

The Act constituted the council conservators of the river, and the work was put in hand immediately Royal Assent was given. It was the original intention to increase the sectional area of the river channel throughout to 272 sq. ft.; but this was afterwards modified to coincide with the sectional area of the existing channel in the town—*viz.*, 206 sq. ft.—which it was calculated would effect a reduction of the surface level, as compared with that of the river when running full under the old conditions, of 3 ft.

The construction of a relief arch to an existing masonry bridge carrying a main road was carried out by and at the expense of the county council. The cleansing and grading of the river bed was undertaken by Messrs. Bomford & Evershed, of Evesham, who utilised a steel scoop about 8 ft. by 3 ft., which was drawn from side to side of the channel by means of a traction engine on one bank, working round a pulley wheel fixed on the other. The remainder of the work was carried out by administration.

The cost of the work executed amounted to £4,000, while the expense of obtaining the Act (to which all opposition was withdrawn before the hearing by Committee) was £1,155. Having regard to the fact that the works sanctioned were entirely unconnected with a profit-earning undertaking, the Parliamentary expenses appear out of all proportion to the authorised expenditure on the scheme itself—*viz.*, £10,000. Such a condition of things is an unpleasing commentary on our methods of local government, and must tend to retard the execution by small authorities of work, very necessary of itself, but which may not happen to come within the purview of the Public Health Acts.

So far as one can judge, the work executed has achieved the object in view. Thus on November 28, 1910, the water in the river rose considerably and flowed through the town in exactly the same volume as on October 28, 1903 (prior to the execution of the work), but with a reduction in surface level of 2 ft. 10½ in.—practically the result aimed at. Also on the latter date, as the result of 1·67 in. in three days, the river rose 3 ft. during thirteen hours after rain had ceased to fall; while in November, 1906, under practically similar conditions as to rainfall, the river continued to rise for two hours only, and then to a height of but a few inches.

Every effort is made to collate reliable data with respect to the effect on the river of varying conditions as to rainfall, and the existence of a mill weir, 40 ft. in width across the stream just above the centre of the town, affords excellent opportunities for the purpose. The depth of water flowing over the weir is automatically recorded, and compared with the rainfall diagrams, the results tabulated, and sections plotted showing the maximum height of water in the river under abnormal conditions. It seems impossible, however, to set up any definite relation between the rainfall and the flow of water in the river. It is obvious, for instance, that an inch of rain falling upon a frost-bound surface or already saturated subsoil would have a very different effect to a similar rainfall in the summer months, and that the whole question depends in a great measure upon pre-existing conditions, which cannot always be taken into account, such as the degree of saturation of the subsoil, the condition of the river channel and its tributary streams, and so on.

The observations recorded tend to show very little, but that a given rainfall which on one occasion gives rise to no apprehension may on another almost cause a flood.

ELECTRICITY WORKS.

The undertaking was purchased from a private company in 1900. The plant then consisted of two 75 kw. steam dynamos and two Davey Paxman loco-type boilers, and the supply was given on the two-wire system with overhead mains at 220 volts.

The capacity of the present plant totals 750 kilowatts, made up as follows:—

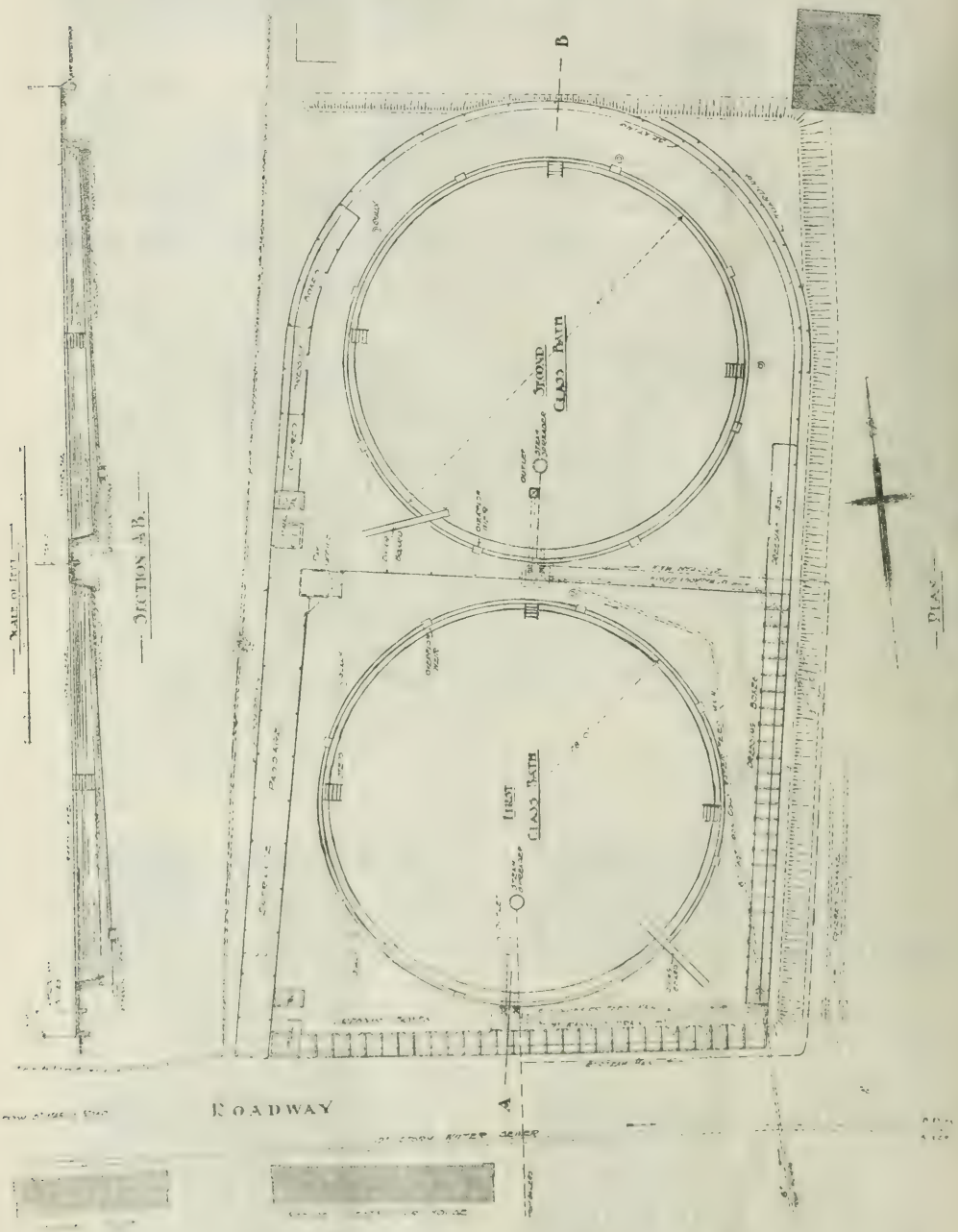
One 200 kw. Willans-Siemens steam dynamo.
One 200 kw. Willans-Phœnix steam dynamo.

One 150 kw. Willans-Johnson and Phillips steam dynamo.

One 200 kw. Bellis-Parker steam dynamo.

There is also a chloride battery of 250 cells, having a discharge capacity of 600 ampere hours at the 10-hour rate. A new balancer by the British Thompson-Houston Company, Limited, and a new booster by the

Extensions are now being carried out at an estimated cost of £10,000. These comprise extensions of the present engine-room and boiler-house, one new water-tube boiler and feed pump, one 500 kw. mixed pressure turbo-generator with surface condensing plant, new main switchboard, one new feeder and several mains extensions.




OPEN-AIR SWIMMING BATHS, NUNEATON.
(Plate 2.)

Electric Construction Company, Limited, were installed last summer.

The boiler-house plant comprises three Babcock & Wilcox and one Danks water-tube boiler, with a Green economiser of 192 tubes.

The water for boiler-feed purposes is drawn from the river by an electrically-driven Gwynne centrifugal pump, and is first treated by means of a softener, the hardness being reduced from about 20 deg. to 6 deg.

The most interesting feature of the extensions now in hand is the installation of the mixed-pressure turbine.

This turbine will be arranged to run either with the exhaust steam from the present reciprocating engines or with high-pressure steam from the boilers, or with a mixture of both. It is guaranteed to give 1 kilowatt hour with about 40 lb. of exhaust steam, or 21 lb. of high-pressure steam. With a load of 100 kw. on the

reciprocating engines it would then be possible to obtain an additional 70 kw. on the turbine without making any further call on the boilers.

A "Lea" water recorder will be installed in conjunction with the turbine in order to measure the steam consumption of the turbine itself or of any of the reciprocating engines exhausting into it.

It is interesting to note that since the purchase of the undertaking the number of customers has increased from 50 to 740, the maximum load on the mains from 70 kw. to 500 kw., and the number of units sold per annum from 100,000 to 750,000.

The total running cost per unit sold for the last complete year's working was 0·76d.

The borough electrical engineer is Mr. S. Cameron Gibson, ASSOC.M.INST.E.E., to whom the author is indebted for the above information.

WATER SUPPLY.

Within the last ten years the average daily consumption of water has increased from 400,000 to 628,000 gallons. The main source of supply is at Whittleford, from two wells sunk 360 ft. in the permian, acquired by the council in 1900 after they had been abandoned by a colliery company on account of an inrush of water. The pumping plant (which was fully described in Mr. Pickering's paper) comprises compound horizontal condensing engines with ram-and-plunger pumps, and delivers the water to the filter-beds through 1,620 yds. of 12-in. pipes, against a total head (excluding friction) of 445 ft.

The pumps were originally fixed at the then water-level, which was 180 ft. below the surface; but as the demand for water increased the pumps were gradually lowered in the well until they are at present at a depth of 315 ft. below the surface. The yield from the wells is now 500,000 gallons per day, and is evidently nearing its maximum.

The corporation own a second pumping station, at Robinson's End, which formed the original works of the East Warwickshire Waterworks Company, from whom the council purchased the undertaking in 1897. There are two wells also sunk in the permian, but farther from the outcrop 300 ft. and 630 ft. in depth respectively; the total yield is only about 80,000 gallons per day, and the station is merely used as a stand-by.

In addition, the corporation purchase water in bulk from two extraneous sources—one a colliery shaft and the other a granite quarry. The total quantity thus obtained is about 26,000,000 gallons yearly, and the cost, pumped to the filters, is 2¼d. and 3d. per 1,000 gallons respectively.

*Pumping Cost.*—The cost of pumping at Whittleford pumping station, including maintenance of buildings, &c., is as follows:—

| | £ | s. | d. | | Pence per 1,000 gallons. |
|---|---|---|---|---|---|
| Labour ... ... ... | 517 | 18 | 11 | ... | 0·68 |
| Fuel ... ... ... | 271 | 18 | 5 | ... | 0·36 |
| Oils, waste, and packing | 65 | 6 | 4 | ... | 0·09 |
| Repairs and renewals ... | 77 | 2 | 5 | ... | 0·10 |
| Sundries... ... ... | 22 | 12 | 8 | ... | 0·03 |
| | £954 | 18 | 9 | | 1·26 |

This works out at 0·28d. per 1,000 gallons raised 100 ft.

*New Supply.*—In seeking for an additional supply the action of the corporation was limited by the knowledge that there are no unappropriated sources of supply within reasonable distance of Nuneaton, and that practically the only water-bearing rock worth considering within the borough is what is known locally as the 100-ft. sandstone, in the coal measures, whence is derived the bulk of the present supply. A site was acquired at Griff, to the extreme south of the borough, near to a shaft of the Griff Colliery Company, who proved water here in abundance at a sinking carried out in 1891. Mr. W. Whittaker, F.R.S., the eminent geologist, was called in by the council, and reported in favour of the scheme.

Possession of the site was obtained in January of last year. A chimney shaft, 100 ft. by 5 ft. diameter, was erected, two 30 ft. by 8 ft. by 120 lb. Lancashire boilers fixed; the well, 14 ft. in diameter, taken down a depth of 270 ft., and headings driven a total length of 36 yds. The average yield of the well is about 16,000 gallons per hour, and it is hoped that this will be augmented by extending the headings at a later date. The total estimated cost of the works is £15,000, including the provision and equipment of the pumping station and the laying of the necessary pumping main. The expenditure incurred up to the present amounts to £5,800.

*Subsidence of Site.*—Waterworks construction in Nuneaton is rendered peculiarly interesting by reason of the fact that the pumping stations, filter-beds, and reservoirs are all situated on land subject to subsidence as the result of coal mining.

At Whittleford pumping station the owners of the mines (Messrs. Stanley Bros., Limited) have carefully packed one seam which has been already worked, with the consequence that, despite a surface subsidence of 4 ft., there has been very little damage done to the pumping plant.

The reservoirs have been subjected to exceptionally severe stresses, owing to the fact that the coal workings on the east side, which are about 400 yds. deep from the surface, were stopped within a few yards, horizontally, of the reservoir walls, with the result that the brickwork and concrete of the existing reservoirs were fractured in all directions. In 1906 it became necessary to construct an additional reservoir of 500,000 gallons capacity; in view of the circumstances, it was decided to utilise ferro-concrete (Hennebique system), and, as an additional precaution, the tank was surrounded with clay puddle, 18 in. in thickness. The cost was £3,470. It is satisfactory to note that the ferro-concrete reservoir is perfectly sound and watertight, notwithstanding that the fractures to the adjacent structure have given repeated trouble until quite recently.

The same conditions as to liability to subsidence applies to the filter-beds, which are 200 yds. distant from the reservoirs. In this case arrangements were made with the mine owners to pack the workings likely to affect the site. The work of packing the one already worked seam is completed, and up to the present no damage has resulted at the surface. An additional filter-bed, 450 sq. yds. in area, was constructed in 1908, also in ferro-concrete. The filtering medium is mainly composed of Leighton Buzzard sand, and is 3 ft. 3 in. in depth. The rate of filtration is about 500 gallons per square yard per day, and oxide of iron, which renders the water very turbid in appearance in its raw state, is quite successfully removed.

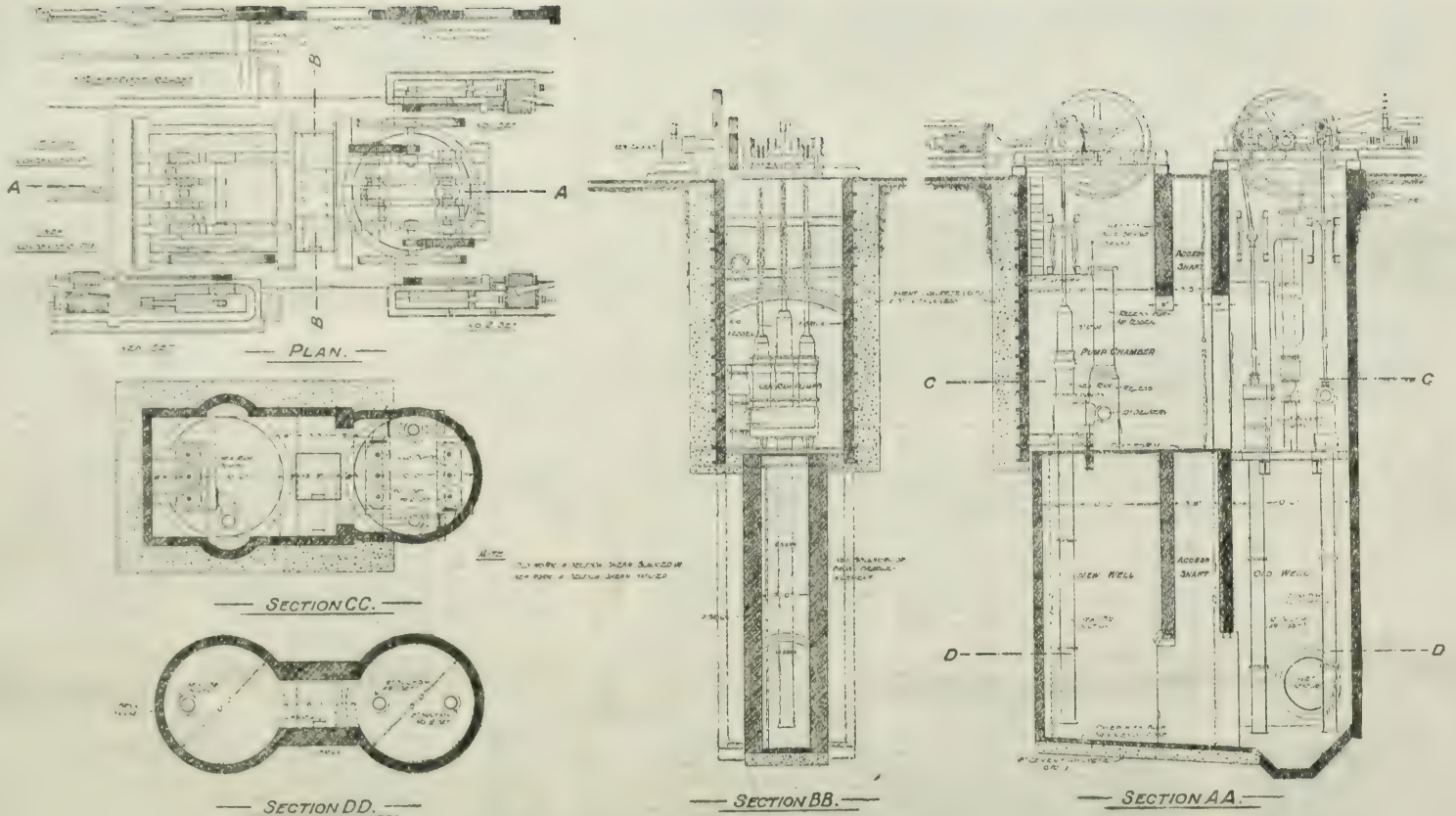
*High-level Area.*—In 1906 a high-level area was constituted for a portion of the borough which was formerly only intermittently supplied from the existing service reservoirs. A reservoir, 50,000 gallons capacity, was constructed in ferro-concrete on a mound formed of material excavated from a railway tunnel, the floor of the reservoir being fixed 12 ft. above the level of the solid ground. The pipe connections were of flexible steel tubing, in order to guard against fracture due to settlement. The reservoir has remained quite sound and watertight. Filtered water is pumped to the reservoir by a 5 b.h.p. oil engine, and the mains are 4 in. and 5 in. in diameter, 2 miles in length. The whole of the borough is now assured of a constant supply of water at a pressure varying, according to level, from 35 lb. to 90 lb.

*Daily Consumption.*—The following figures, relating to last year, show that the consumption of water is kept within reasonable limits. All meters are read monthly, house-to-house inspection is made at least twice yearly, and all taps found or reported to be leaking are rewashered free of charge.

| Purpose for which used. | Consumption in gallons. | |
|---|---|---|
| | Total for year. | Per head per day. |
| Domestic ... ... ... | 159,137,000 | 12·283 |
| Trade ... ... ... | 60,943,000 | 4·705 |
| Municipal ... ... | 9,197,000 | 0·701 |
| | 229,277,000 | 17·689 |

*New Mains.*—Seventeen miles of new mains have been laid during the past ten years. In 1910 it became necessary to lay a duplicate 12-in. delivery main from the reservoirs to the town. The greater part of the main was of spigot and socket cast-iron pipes; but a length of 1,134 yds., subject to subsidence owing to mining operations, was of Mannesmann steel tubes, with a special "rigid" joint, caulked in the ordinary way with lead and yarn. The steel tubes cost 3s. 8d. per yard (laid complete) above the cast-iron pipes, and the Local Government Board only allowed a period of twenty years for the loan; but they have remained perfectly tight, whereas the joints of the old 10-in. cast-iron main, laid alongside, are still giving trouble.

*Reduction in Charge.*—It is of interest to record that




Sewage Pumping Plant, Nuneaton.

(Plate 3.)

during the last few years reductions have been made in charges amounting in the aggregate to £3,637 18s. 8d., which, in the case of a privately owned undertaking, would presumably have gone in dividends to shareholders.

| | | £ | s. | d. |
|---|---|---|---|---|
| 1905. | Extra charge for more than one water-closet abolished ... ... | 427 | 12 | 6 |
| 1907. | Reduction of 10 per cent in water rates | 2,157 | 6 | 1 |
| | Reduction of 10 per cent in meter charges | 784 | 16 | 1 |
| 1908. | Charges for baths reduced from 10s. to 5s. | 268 | 4 | 0 |

The public further benefit by the fact that all water used for municipal purposes is charged for at the flat rate of 3d. per 1,000 gallons.

SEWAGE PUMPING STATION.

*Old Plant.*—The old plant, completed in 1898, comprised two horizontal compound-condensing engines, with cylinders 10 in. and 18 in. in diameter by 2-ft. stroke, each working three-throw 15-in. bucket and plunger pumps. They were put down to raise together 130,000 gallons per hour from the bottom of the pump well to the delivery chamber at the pumping station, a height of 55 ft., but were subsequently utilised for pumping the sewage through 2¼ miles of 16-in. main to the new outfall works at Hartshill.

*New Plant.*—The new plant will be capable of raising 100,000 gallons per hour to Hartshill, against a total head, including friction, of 125 ft. The cylinders are 12 in. and 21 in. in diameter by 2-ft. 6-in. stroke. The pumps are of the three-throw ram type, 15 in. diameter by 3-ft. stroke, and the spur wheels driving the pump shaft have "Citroen" cut gears. The steam consumption is guaranteed at 16 lb. of dry steam per 1 h.p., or alternately 21½ lb. of steam per p.h.p. at a boiler pressure of 120 lb. per square inch. The makers are Messrs. Galloway, Limited, of Manchester, and the amount of their contract was £1,748.

*Pump Well.*—The enlargement of the existing pump well presented some difficulties. The well is 10 ft. in diameter by 50 ft. deep, and carried all the girders and other ironwork for the two sets of three-throw pumps, so that care had to be taken to cut away as little as possible of the supporting brickwork in order to avoid interfering with the stability of the structure. It was therefore decided to form a new pump chamber 15 ft. 6 in. by 10 ft., taken down 23 ft. below the engine-house floor, and to sink a well 10 ft. in diameter, for the suction pipes, a further depth of 24 ft. The horizontal distance from centre to centre of the two wells is 16 ft.; the brickwork of each is cut away for a height of 9 ft. from the bottom so as to form a continuous sump, and the intervening space is utilised as an access shaft carried up to the floor level.

*Extension of Engine-House.*—The engine-house was extended a length of 30 ft. 6 in., so as to form a building 70 ft. 6 in. by 29 ft. In connection with the extension it was necessary to raise the roof of the old engine-house a height of 2 ft. 6 in. The roof was of timber purlins and rafters covered by slates, and supported on four steel principals, 29-ft. span, and was jacked up in position from the walls on either side quite easily, and without breaking a slate.

The steam for the engines is generated by the refuse destructor plant.

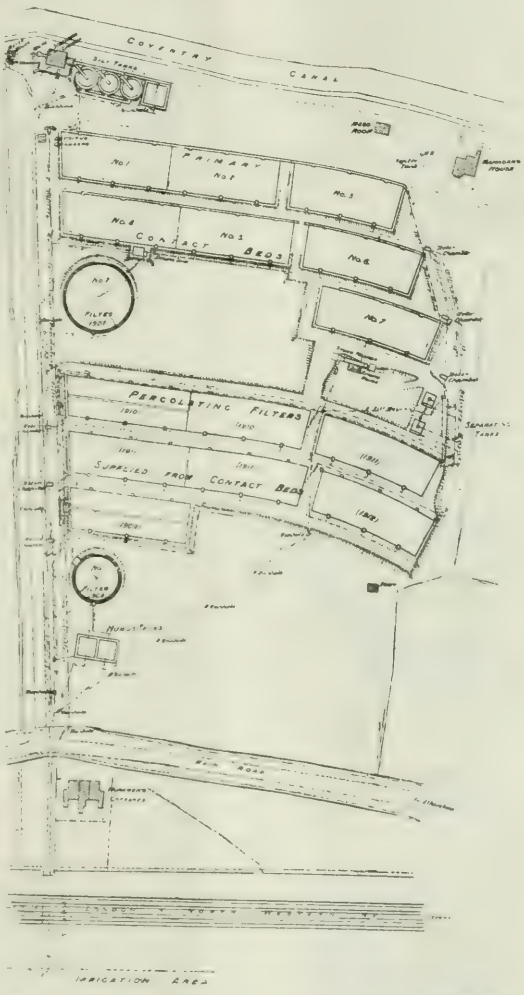
*Screening Chamber.*—A new screening plant was provided in lieu of an old fixed screen in 1907. The screen is of Stott's make, and is 7 ft. 6 in. in width by 6 ft. 6 in. in height, fixed at an angle of 30°, and is composed of 2½-in. by ½-in. tapering steel bars placed ½ in. apart. At the rear of the screening chamber is a detritus pit, fitted with bucket elevators. The raking apparatus for the screens and the bucket elevators are actuated by a small horizontal steam engine, formerly used in connection with the abandoned sludge-pressing plant.

The screening chamber is 18 ft. in depth, so that the screen itself is necessarily submerged under certain conditions of flow.

REFUSE DESTRUCTOR.

The first refuse destructor was put down by Mr. Pickering in 1901. It comprised a Meldrum front-feed three-gate furnace, with a total grate area of 70 sq. ft., and capable of dealing with 30 tons of refuse per day of twenty-four hours. The destructor was coupled up to an existing 27-ft. by 7-ft. Lancashire boiler, working at a pressure of 80 lb. per square inch. The chimney was 100 ft. in height by 5 ft. square at the top.

Test figures of refuse destructors usually relate to new plants working under ideal conditions for a few hours only. The following figures of a test made of the above-mentioned plant in March of last year may therefore be of interest.

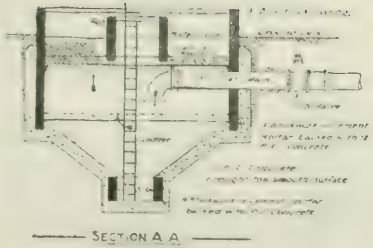


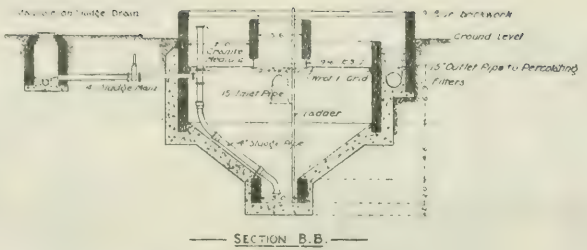

GENERAL PLAN OF HARTSHILL SEWAGE WORKS, NUNEATON.

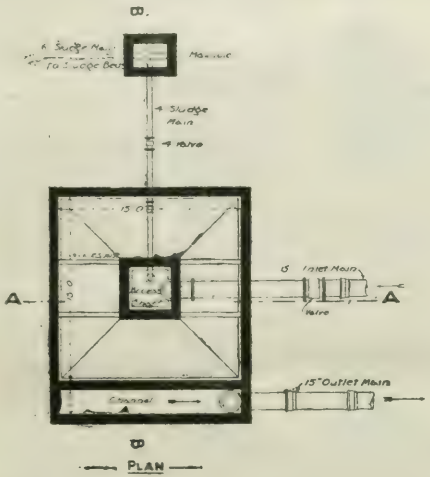
(Plate 4.)

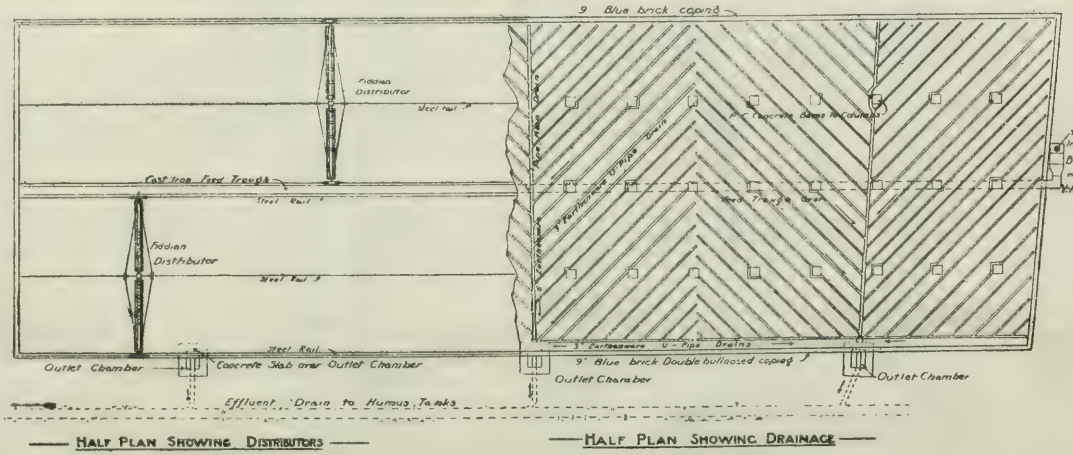
It should be mentioned that the destructor was erected ten years ago, and had been in use for forty-two consecutive days prior to the test being carried out:—

| | |
|---|---|
| Duration of test ... | 37½ hours. |
| Time taken cleaning fires ... ... | 6½ hours. |
| Refuse consumed ... ... ... | 63,868 lb. |
| ,, ,, per hour... ... | 1703·1 lb. |
| ,, ,, per square foot of grate per hour... ... ... ... | 24·33 lb. |
| Percentage of clinker ... ... ... | 32·65 per cent. |
| Average steam pressure maintained ... | 60 lb. per sq. in. |






HARTSHILL SEWAGE WORKS, NUNEATON: SEPARATING TANKS AND PERCOLATING FILTERS.

(Plate 5.)

| | |
|---|---|
| Temperature of feed water... ... ... | 94 deg. Fahr. |
| Water evaporated ... ... ... ... | 90,000 lb. |
| ,, ,, per hour ... ... | 2,400 lb. |
| ,, ,, per lb. of refuse (actual) | 1·409 lb. |
| ,, ,, ,, at and from 212 deg. Fahr. ... ... ... ... | 1·627 lb. |

The refuse destructor and a coal-fired boiler were utilised alternately in periods of six weeks, so that it was practicable to obtain accurate figures of the cost of destroying the refuse. The gross cost of labour is somewhat high, owing to the fact that the plant only deals at present with 18 tons of refuse daily, and worked out at 1s. 8·83d. per ton. The total nett cost (excluding capital charges), taking into consideration the saving in coal, was 4·9d. per ton. The fuel used in the coal-fired boiler was coal dust, which cost last year 2s. 10d. per ton in the fire-hole.

A duplicate destructor, of similar type, has recently been constructed by Messrs. Heenan & Froude, of Manchester, so that the plant in future will work continuously. The three grates have a total area of 75 sq. ft., and will be capable of consuming 45 tons of refuse per twenty-four hours.

Two new Lancashire boilers, each 28 ft. by 7 ft. 6 in. by 120 lb., have been installed in connection with the destructor furnaces, and one of the old boilers has been re-erected for firing with coal as a stand-by. Steam from the destructors is utilised for pumping sewage, steam disinfector, and pumping and heating water for open-air swimming baths. The flue to the chimney has been covered with cast-iron plates, to serve as a drying floor for tar-macadam.

SEWAGE DISPOSAL WORKS.

*Original Works.*—The sewage disposal works at Hartshill were designed by Mr. Pickering to treat a dry-weather flow of 500,000 gallons per day, and were first brought into operation in March, 1902.

The original plant comprised the following:—

Meter-house, with "Venturi" meter, fixed on the outlet of the 16-in. pumping main.

Two of Smith's revolving screens, each 5 ft. 6 in.

DETERIORATION IN CAPACITY OF CONTACT BEDS.

| Year. | Primary. | | | Secondary. | | |
|---|---|---|---|---|---|---|
| | Total fillings. | Average per day. | Percentage capacity. | Total fillings. | Average per day. | Percentage capacity. |
| 1904 | 4,641 | 1·86 | 77·96 | 4,285 | 1·83 | 87·16 |
| 1905 | 4,608 | 1·80 | 69·00 | 4,233 | 1·62 | 72·17 |
| 1906 | 5,218 | 2·04 | 69·19 | 5,940 | 2·32 | 57·35 |
| 1907 | 4,408 | 1·72 | 79·88 | 5,984 | 2·34 | 45·96 |
| 1908 | 3,849 | 1·51 | 77·77 | 6,356 | 2·49 | 34·77 |
| 1909 | 4,811 | 1·88 | 71·08 | Conversion of secondary beds into percolating filters taken in hand. | | |
| 1910 | 5,613 | 2·20 | 61·54 | | | |

in width, actuated by a water-wheel, which is worked by the flow of sewage.

Three "Dortmund" silt tanks, circular on plan, 24 ft. in diameter, with walls taken down vertically 11 ft. below water level, and finished as an inverted cone at an angle of 60 deg. Capacity of each, 50,000 gallons.

Seven primary contact beds, each 1,000 sq. yds. in area and 4 ft. in depth, filled with granite broken to 3-in. gauge.

Seven secondary contact beds, each 1,000 sq. yds. in area and 4 ft. in depth, but filled as follows: Three with coke-breeze, one with unscreened coke dust, one with ½-in. engine ashes, one with ½-in. washed granite chippings, and one with ¾-in. unwashed granite chippings.

Irrigation area of 29 acres, with under-drains 2 chains apart and 5 ft. 6 in. deep, and outfall channels to the river Anker.

*Present Dry-Weather Flow.*—The town is sewered on the partially separate system, rain water from roads and the front roofs of houses being taken into a storm-water system. The present daily dry-weather flow is about 900,000 gallons, of which about 25 per cent is trade water, consisting of waste liquor from wool works and dye water from factories. The daily dry-weather flow of the river just above the outfall channels is 1,600,000 gallons.

*Deterioration in Capacity of Contact Beds.*—Owing to the rapid growth of the town on the one hand, and the gradual deterioration in the capacity of the contact beds on the other, the desirability of further extensions of the works soon became apparent.

In connection with this loss of capacity, the above figures may be of interest. The measurements were all made by means of a 6-in. "Siemens" meter fixed on the outlet main from each bed. The beds were first utilised in March, 1902.

Commencing in 1906 the broken granite in the primary beds was roughly screened, the intention being to deal similarly with two of the seven beds in each year; but this was obviously an imperfect method of cleansing the media, and in 1910 a start was made with washing as described hereafter.

The material in three of the secondary beds (one containing engine ashes and two granite chippings) was thoroughly washed after five years' work; but it was impossible to deal in this way with the coke-breeze and dust with which the four remaining beds were filled, and these materials, together with the engine ashes, were replaced by washed granite chippings at the time the beds were converted into percolating filters.

*New Work.* A percolating filter, 60 ft. in diameter and 7 ft. in depth, was constructed in 1904, in order to determine the advantages of this form of bacterial treatment, as compared with contact beds. The satisfactory results obtained left no doubt as to the policy to be adopted in future extensions.

The new work carried out since the completion of the original scheme comprises the construction of an additional silt tank, two circular percolating filters, the conversion of the seven secondary contact beds into percolating filters, humus tanks, sludge filters, the duplication of the existing system of underdrains, and further under-drainage, bringing the area available for irrigation up to 42 acres. The expenditure on new work amounts to £11,000.

*Silt Tank.*—The new silt tank is square on plan, 28 ft. by 28 ft. The walls are vertical for a depth of 10½ ft. below water level, and are finished as an inverted pyramid, at an angle of 45°; they are brought up to form a continuous sill, over which the sewage flows in a thin stream to the collecting channels. The capacity is 75,000 gallons, thus bringing the total capacity of the four silt tanks to 225,000 gallons.

The silt tanks can be worked either in series or parallel. The heavy silt is removed under a head of 3½ ft., and conveyed through 450 yds. of 9-in. pipes for treatment as described. Since questions are often asked as to the working of deep tanks, it is of interest to record that no difficulty whatever has been experienced in the removal of silt, and that the original tanks have only been emptied once since the date of their construction, and then mainly with the object of painting the ironwork.

By reason of the situation of the works, and with a view to preventing aërial nuisance, the Local Government Board required that the original silt tanks should be covered over. The author is of opinion that there are circumstances under which the covering in of tanks and channels may aggravate rather than minimise the nuisance it is sought to abate. At any rate, the roof of one of the existing silt tanks has been removed, with good effect, and the new tank has not been covered in, although provision has been made for this to be done if considered desirable in the future.

The capacity of the silt tanks—one-fourth only of the dry-weather flow—is below the usual standard; but so far as the elimination of suspended matter is concerned, the form of tank adopted is a prime consideration. At Hartshill the interposition of a long length of pumping main is an additional factor, and the results fully achieve the objects aimed at—*viz.*, the preparation of the sewage for final treatment in the percolating filters, without the risk of carrying septic action too far.

*Contact Beds.*—The seven primary contact beds are retained as originally constructed. In addition to the part they play in sewage treatment, these beds act as balancing tanks for the percolating filters.

*Separating Tanks.*—After leaving the contact beds the sewage passes through separating tanks, in order to further eliminate suspended matter prior to treatment in the percolating filters. These tanks are each 15 ft. by 15 ft. square on plan, with the walls carried down vertically for 7 ft. below the water level, and finished as an inverted pyramid, similar to the new silt tank. The tank is provided with a wrought-iron grid supporting 18 in. of stone broken to 1-in. to 2-in. gauge through which the sewage passes in an upward direction, and the mineral matter which would otherwise tend to choke the percolating filters is effectually intercepted. The rate of flow adopted is 37,500 gallons per square yard of roughing filter per day. The silt is removed from the tank, under pressure, every second day, and the broken stone is roughly cleansed, in position, once weekly.

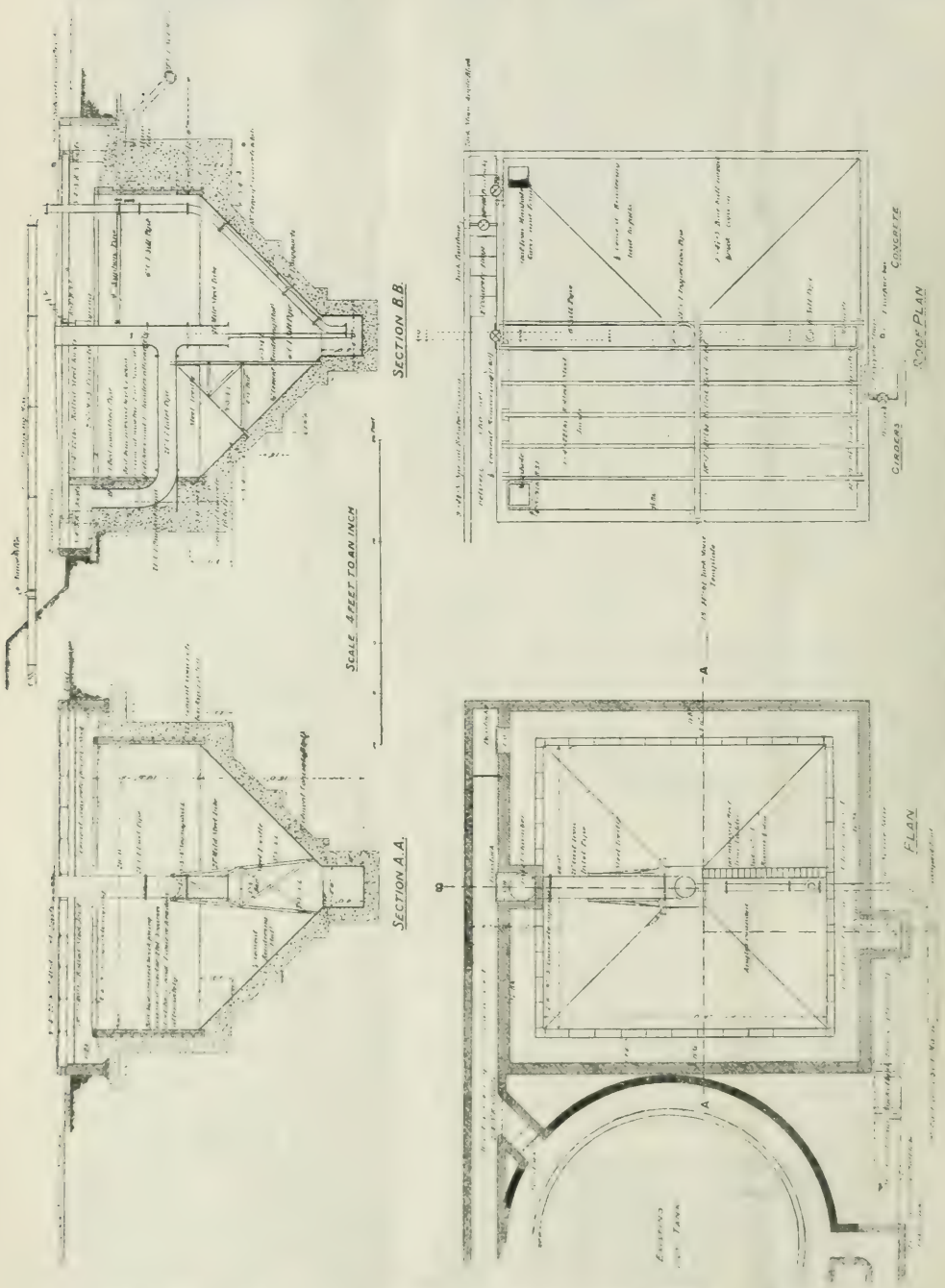
The author has found these tanks an economical and efficient means of removing suspended matter, and attributes to their action, in a large measure, the maintained capacity of the percolating filters.

*Percolating Filters.*—There are two percolating filters, originally constructed as such, one 60 ft. diameter (1904), and the other 90 ft. diameter (1906), each 7 ft. in depth and fitted with rotary distributors. These filters receive sewage in intermittent doses direct from the silt tanks; they have been working practically continuously since their installation, and no expense (other than for painting) has been incurred in respect of maintenance of the distributors.

The remaining percolating filters, seven in number, were converted from the original secondary contact beds.

Five of the beds were built with straight parallel walls, and these were conveniently carried up to form supports for the outer track of travelling distributors. The area of each is 1,000 sq. yds., and the dimensions vary, but are approximately 163½ ft. by 55 ft. The depth of media is 5 ft. 6 in. Two machines are provided for each filter, fed from a cast-iron trough fixed along the centre, to which the sewage is admitted over a V-notch.

The remaining two of these beds were built with curved walls, in order to follow the contour of the land. It was therefore resolved to adopt a distributor of the "mono-rail" type, made by Messrs. Jones &




Additional Silt Tank at Hartshill Sewage Works, Nuneaton. (Plate 6.)

Attwood, of Stourbridge. The weight of the distributor is almost wholly carried on the single rail, the outer end being slightly weighted, in order to give a bearing to the inner end on the underside of the central-feed trough. The radii of the rail vary from 706 ft. at the centre to 13 ft. at each end, and the distribution of sewage is evenly maintained, notwithstanding the varying radii of the track, by an ingenious arrangement of weir plates governing the flow to the revolving drum.

Unlike the circular filters, the filters fitted with travelling distributors deal with a sewage which has already received treatment in contact beds. The distributors are arranged so as to give a rate of distribution variable at will from 50 to 200 gallons per square yard; but in practice distribution is maintained at the rate of 150 gallons per square yard per day. The rate per day at which sewage is applied to a filter is not necessarily a criterion of the quantity with which the filter will deal throughout twelve months. It may therefore be interesting to state that the percolating filters at work at the end of 1911 (two of which were constructed in 1904 and 1906 respectively) dealt with sewage applied at the rate of 151 gallons per square yard per twenty-four hours, and that the average daily quantity treated throughout the year was 136 gallons per square yard, or a reduction in efficiency, allowing for occasional periods of rest (sometimes due to shortage of sewage) of only 9 per cent.

Trials have been made with granite chippings varying from 1½-in. to ¼-in. gauge as media, and the conclusion has been arrived at that, under the conditions appertaining at Hartshill, the most satisfactory results are obtained with filters (5 ft. 6 in. in depth) filled as follows:—

2 ft. 6 in. ½ in. gauge.
2 ft. ¼ ,,
6 in. 1¼ ,,
6 in. 2 in. to 3 in. gauge.

It is found that under these conditions, and worked at a rate of 150 gallons per square yard per day, the medium keeps clean, and that there is no ponding on the surface.

*Washing Plant.*—The author is strongly of opinion that whatever material is used as a medium, either for contact beds or percolating filters, it should be one capable of being cleansed by washing. The stone-washing plant at Hartshill was erected in 1908. It comprises a 30-ft. by 18-in. trough washer and elevator, actuated by a 10 b.h.p. "Dudbridge" oil engine. It is capable of effectually washing broken granite up to a gauge of 1½ in. at a cost, including loading carts, haulage to washer and back to filters, labour and oils, of 13d. per cubic yard.

The broken granite in the primary contact beds is too large to be washed in the trough washer, and the operation is necessarily performed by hand. The stone is washed with crude sewage in the open delivery channels running alongside the beds. When a sufficient area is available for the purpose, the sewage, after being used for washing the stone, is run direct to the land; otherwise it is intercepted in a specially constructed catchpit and pumped back to the silt tanks for further treatment on the works. The average cost works out at 14d. per cubic yard, with an additional 3d. for pumping back to the silt tanks when this is necessary.

*Humus Tanks.*—Two humus tanks have recently been constructed, square on plan, 25 ft. by 25 ft. The walls are vertical for 7 ft. below water level, and the construction is similar to that of No. 4 silt tank. The tanks were designed for a maximum upward flow of 12 ft. per hour.

Fish are maintained in the collecting channel, and furnish a practical test of the condition of the effluent.

*Sludge Treatment.*—In the wet winter months the sludge is applied to the land; but when weather conditions are suitable, it is dealt with in sludge filters.

Three of these (1904) are of brickwork, 40 ft. square. A false floor is formed of perforated glazed tiles, the intermediate space filled in with rubble, and provided with underdrains leading to the outlet chamber, and thence to a specially prepared area of land.

Three additional filters, each 400 sq. yds. in area, have since been formed by merely excavating in the ground, with the sides battered to form the walls of the tanks. The bottoms are underdrained with 4-in. earthenware pipes packed with rubble, and covered with a few inches of ashes to receive the sludge. This

Expressed in parts per 100,000.

| Description. | Free and saline ammonia. | Organic ammonia. | Chlorine. | Nitrogen in nitrates and nitrites. | Oxygen absorbed in 4 hours at 80 deg. Fahr. | Total solid matter. | Suspended solids. | |
|---|---|---|---|---|---|---|---|---|
| October, 1911. | | | | | | | | |
| Crude sewage ... | 4·08 | 0·704 | 24·5 | 0 | 9·69 | 170 | 54 | |
| Effluents from | | | | | | | | |
| Silt tanks ... ... ... ... | 6·70 | 0·288 | 24·8 | 0 | 10·37 | 133 | 14 | |
| Primary contact beds ... ... ... | 6·38 | 0·232 | 26·4 | 0 | 6·23 | 126 | 4 | |
| Circular percolating filters (direct from silt tanks) | 0·040 | 0·125 | 28·4 | 3·96 | 1·17 | 138 | Incubation satisfactory. | |
| Rectangular percolating filters (after primary contact beds) | 0·060 | 0·125 | 28·0 | 4·73 | 1·30 | 138 | ,, | |
| Humus tanks ... ... ... | 0·165 | 0·117 | 27·5 | 4·4 | 1·29 | 128 | ,, | |
| March, 1912. | | | | | | | | |
| Crude sewage . | 3·220 | 0·916 | 9·7 | 0 | 5·74 | 129 | 42 | |
| Effluents from | | | | | | | | |
| Silt tank ... ... | 2·260 | 0·212 | 8·7 | 0 | 2·40 | 89 | 5 | |
| Primary contact beds . ... | 2·200 | 0·176 | 8·1 | 0 | 1·79 | 81 | 5 | |
| Separating tanks ... . . ... | 2·130 | 0·128 | 8·4 | 0 | 1·75 | 80 | — | |
| Circular percolating filters (direct from silt tanks) | 0·013 | 0·221 | 8·9 | 1·98 | 1·52 | 82·5 | 0·5 | Incubation satisfactory |
| Rectangular percolating filters (after primary contact beds) | 0·018 | 0·119 | 10·6 | 2·53 | 1·01 | 93 | 1 | |
| Humus tanks ... ... ... | 0·276 | 0·103 | 12·4 | 2·31 | 0·810 | 85 | trace | |

type of sludge filter is obviously cheaper, and rather more effective, than one constructed of permanent materials.

In dry weather the liquid sludge is treated in the sludge filters. In about ten days the sludge is reduced to about one-third of its original bulk, when it is sufficiently dry to load into barrows for removal. A ready sale is obtained at 1s. per load.

*Sewage Analyses.*—The results of analyses made by the county analysts, Messrs. Bostock Hill and Rugby, are shown above.

*(To be concluded.)*

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In the course of the proceedings on Saturday at Nuneaton the following letter, dated May 10th, was received from Mr. A. T. Davis (Salop): "I regret to say that I am on sick leave, and therefore unable to attend the district meeting to-morrow. Will you kindly apologise for me, and at the same time express my sincere thanks for the honour the members of the district have conferred upon me in electing me to the office of chairman? I greatly appreciate the honour, and shall do all that lies in my power to further the best interests of the members. With all good wishes for an instructive and enjoyable meeting."

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At the recent meeting of the Institution at Exmouth Mr. H. T. Chapman, county surveyor of Somerset, put an inquiry as to what size the aggregate of beach gravel used for reinforced concrete was broken to. It has been pointed out to us that in our account of his remarks the word "reinforcement" was substituted for "reinforced concrete," and we have pleasure in making the necessary correction.

# Mansfield's New Sewage Disposal Works.

## £40,000 SCHEME.

New sewage disposal works at Mansfield, involving an expenditure of about £40,000, were opened by the Duke of Portland on Friday last.

At one time the primitive method of turning the sewage into the river Mann was regarded as sufficient, but with the rapid growth of the borough it became necessary to carry out an adequate scheme. Since 1892 several temporary expedients have been adopted, but as the population increased the land near the outfall of the sewer became sewage sick, and at length, in response to urgent representations of the Duke of Portland's agent, the council had to take drastic action, and the result was the scheme which was inaugurated on Friday.

The works are constructed on 28 acres of land between Bath-lane and Old Mill-lane, purchased from the Duke of Portland. The works are designed for a population of 40,000, and a dry-weather flow of 1,000,000 gallons. The scheme provides for screening and arresting the detritus, precipitating the solids in sedimentation tanks, and the purification of the effluent on continuous flow or percolating filter-beds.

The sewage is delivered at the works through a 3-ft. by 2-ft. main outfall sewer, which was constructed in 1899, to a new storm overflow chamber designed so as to pass three times the normal dry-weather flow to the filters and the excess above this amount to overflow a weir to the storm detritus chamber and stand-by tanks. A new length of egg-shaped sewer has been constructed to the normal flow detritus tanks and screening chamber. These tanks are in duplicate, side by side, and are designed that one can be out of action for cleansing purposes while the other is in use. The screens are 7 ft. wide by 7 ft. deep with 2½-in. by ½-in. bars, fixed ½ in. apart, and are kept clean by revolving rakes. After passing the screens the sewage flows along an open carrier 8 ft. wide, and thence through six covered sedimentation tanks. These tanks are 110 ft. long, 36 ft. wide and 7 ft. deep from the water level, and have a capacity of 1,039,500 gallons, equal to one day's dry weather flow. The sewage enters the tanks from the channel and flows over a weir extending the whole width of the tanks, passes under scum boards and over another weir into a feed channel 5 ft. wide at such an elevation to provide pressure for working the sprinklers. These tanks are constructed with thick walls of solid concrete with sloping floors and floating arms for emptying, and sludge valves for gravitating the sludge to the sludge well.

There are six circular continuous flow filter-beds, each 120 ft. in diameter and 7 ft. deep, which contain 17,566 cub. yds. of hard clinker varying in size from ½ in. at the top to 4 in. at the bottom. The surrounding walls are built with local stone having open joints, and the floors are formed with concrete having a fall of 6 in. from the centre to the side. Aërating tiles are laid on the floors for the purpose of maintaining a space between the concrete floor and the filtering medium. This space enables air to penetrate along the bottom of the beds and provides a free passage for humus matter to escape, and tends to disperse the gases generated in the beds. The sewage is evenly distributed on the top of the beds by Messrs. Adams' revolving sprinklers in a thin film which is oxygenised and passed through the beds to the main outlet carrier. This carrier is 5 ft. wide, and extends from the filters to Old Mill-lane, where it connects with two 24-in. pipes, which pass under the road and along the bank above the Sheepwash, where the effluent discharges into the flood dykes.

Mansfield Sewage Works.

The storm water is passed through a storm detritus chamber and screens, and afterwards flows under the main distributing channel to the sedimentation tanks. It then flows along the low-level carrier, which is 4 ft. wide, to the storm-water stand-by tanks, having a total capacity of 297,000 gallons. The water from these tanks is then passed over the storm beds 3 ft. deep, having an area of 1,695 sq. yds., and afterwards collected in the main effluent channel. The effluent, after discharging into the Old Flood Dyke, is irrigated over the Duke of Portland's flood meadows, which have an area of 320 acres.

The sludge from all these tanks is conveyed in a sludge main commencing at the detritus chamber and discharging into the sludge well, near Old Mill lane whence it is pumped on to a high-level sludge field and allowed to settle before being carted away.

The scheme was designed by the late borough surveyor (Mr. R. Frank Vallance, F.R.I.B.A., F.S.I.), and has been carried out under the supervision of the present borough surveyor (Mr. T. P. Collinge, A.M.INST.C.E.).

# Law Notes.

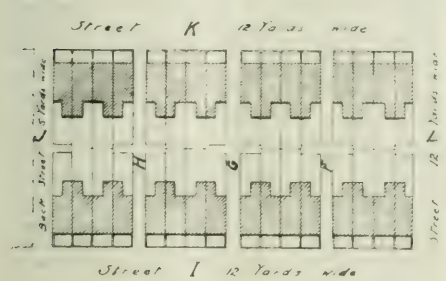
EDITED BY J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

*The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

## QUERIES AND REPLIES.

*In order to avoid confusion querists are requested to use distinctive words as* noms de plume. *The letter* X, *combinations such as* X.Y.Z., *and words such as* "engineer" *and* "surveyor," *should never be used.*

BY-LAWS: BACK STREETS.—"Acme" writes: The accompanying sketch is a block plan of certain property intended to be erected in this borough. You will notice that instead of a back street being provided as a secondary means of access, passages are proposed, as shown F, G and H, in order to gain access to the dust-bins at the rear of the houses. Will you inform me whether the local authority can insist upon the owners making a 15-ft. street at the rear, as




required by by-law 6 (copy forwarded), or whether by-law 9 (copy forwarded) will apply, as the owners state that they do not intend to lay out any streets but I, J, K and L? I may add that the owners propose if the local authority refuse to pass their plans to put the blocks together and make one back street serve the whole lot. This the local authority wish to avoid if possible, and I would like your opinion as to whether the owners' proposals comply with the by-laws.

[COPIES OF BY-LAWS REFERRED TO.]

BY-LAW NO. 6.

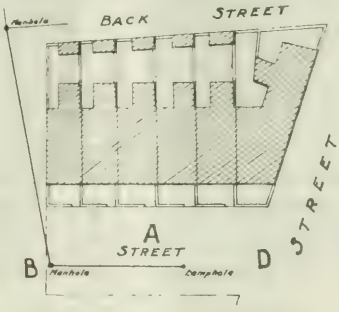
Width of Back Streets. Every person who shall lay out a new street which shall not be intended to form the principal approach or means of access to any building, but shall be intended for use as a secondary means of access to any premises for the purpose of the removal therefrom of house refuse and other matters, shall so lay out such street that the width thereof shall be fifteen feet at the least. He shall construct such street in a suitable manner and of suitable materials.

BY-LAW NO. 9.

Provision of Back Streets. Every person who shall lay out a new street which shall be intended for use as the principal approach or means of access to any building, shall provide in connection with such street and communicating therewith or with some other street a secondary means of access to such building where necessary for the purpose of the removal of house refuse and other matters.

If necessary for the purpose of the removal of house refuse and other matters a secondary means of access must be provided under by-law 9. This by-law it is true does not in terms state that such secondary means of access must be a street, and it might be possible in some instances to provide such access without laying out a street. In the present case, however, the passages F, G and H appear to me to be streets to all intents and purposes. They are certainly streets within the meaning of the Public Health Act, 1875, and I think they would also be held to be streets within the meaning of the by-laws. Therefore, in my opinion, the plan does not comply with the by-laws inasmuch as F, G and H are less than 15ft. wide.

SEWERING STREET.—"Acme" writes: The accompanying sketch is of a street A which has been sewered and paved under section 150 of the Public Health Act, 1875. In order to sewer this street it was necessary to lay a sewer B—C through private land to connect the existing sewer at C, the street falling rapidly from D to B, the sewer could not be laid to fall to the D end of the street. Notices under sec. 16 of the Public Health Act, 1875, were served on the owners of the land between B and C before the sewer was laid. Can the corporation charge the cost of the sewer B—C, including wayleave, &c., upon the owners of the property in street A, the existing sewer at C being less than 100 ft. from the street? Notices were




served upon all the owners in the street, under sec. 150 of the Public Health Act, 1875, and the plans and estimates showed and included the above sewer B—C.

In my opinion the cost of the sewer B C cannot be charged against the frontagers on street B D. Those frontagers can only be charged with sewering that street, and not with the cost of providing another sewer to connect with the street sewer.

PRIVATE STREET WORKS: ADOPTION OF STREET.—"H. F." writes: I should be glad of any information you may be able to supply on the following: (1) A private street having been made up under sec. 150 of the Public Health Act, 1875, was recently taken over by the council on the completion of the works. Have the council done right in adopting the street before the frontagers have paid their respective apportionments? (2) Also, if the contractor is under an agreement to maintain the carriageway for a period of three years from the time of completion of the works, can the council scavenge the street during the three years without adopting it as a public highway?

(1) The council have undoubtedly power, under sec. 152, to declare the street to be a highway as soon as the works have been completed to their satisfaction (unless the majority of proprietors object within the time and in manner mentioned in the section). The power is not in any way contingent upon the frontagers having paid their apportionments, and its exercise in no way prejudices the right of the authority to enforce payment. (2) Yes, the power given to local authorities by sec. 42 to undertake or contract for the cleansing of streets applies to all streets whether taken over or not.

PRIVY ACCOMMODATION.—"Consistency" writes: A type of privy in use in my district has below the seat an open chamber, covered with a wooden floor, and when the chamber is full of solid matter it is emptied and disposed of in the garden. There are a number of such privies in the district, some single chamber one privy, some single chamber two and more privies. A new system of drainage has been provided throughout the district. Can the owners of this property be called upon to provide proper water-closets and drainage and connect to the main sewer, which is within the prescribed distance?

The local authority cannot lay down any general rule for the conversion of privies into water-closets (*Tinkler v. Wandsworth District Board of Works*, 29 J.P., 52). But if, on the report of their surveyor, they consider the existing privy accommodation of any house insufficient, they can, under sec. 36 of the Public Health Act, 1875, require the provision of a water-closet in place of the privy, subject to the right of the owner to appeal to the Local Government Board (*Nicholl v. Epping Urban District Council*, 1899, 1 Ch., 844). If sec. 39 of the Public Health, &c., Act, 1907, is in force, and if there are a sufficient water supply and sewer, the conversion can be enforced under that section, but in that case the local authority would have to bear half the cost.

**We have to draw the attention of querists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6 in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.**

# Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

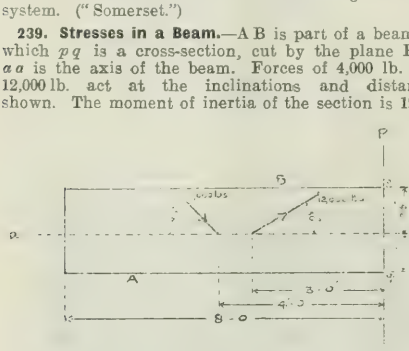
*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top, left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

## QUESTIONS.

This week answers are invited to the following questions:—

**238. Small Sewage Disposal Installation.**—Sketch and describe an installation consisting of a septic tank and filters for dealing with the soil sewage of about 750 persons, showing all the calculations for size of filters, &c. The filters are to be arranged so as to be capable of being enlarged if required. It is possible to have land treatment afterwards on about ½ acre to ¾ acre of land. The effluent is to discharge into a ditch, and must be kept to a high standard. The scheme is not meant to be permanent, and is only required for a period of about six years, until sufficient assessable value is created to apply for a sewer loan to connect to a now existing sewerage system. ("Somerset.")

**239. Stresses in a Beam.**—A B is part of a beam, of which *p q* is a cross-section, cut by the plane P Q; *a a* is the axis of the beam. Forces of 4,000 lb. and 12,000 lb. act at the inclinations and distances shown. The moment of inertia of the section is 12-in.




units, and its area is 4½ sq. in. Find the total compressive and tensile stresses in the section *p q*. (E. A. B., *Leicester.*)

**245. Pumping.**—What is the discharge in gallons per hour from a single-acting pump, 6 in. in diameter, working thirty strokes per minute, length of stroke being 12 in.? Allow 10 per cent for loss due to friction, leakage, &c. (B. M. R.)

**246. Reinforced Concrete.** — A reinforced concrete beam 10 in. deep by 5 in. broad carries a load of 3 tons, distributed over a span of 12 ft. The two reinforcing rods have a united area of 1·2 sq. in., and the centre of them is 1 in. from the bottom of the beam; find the unit stresses in the concrete and in the steel rods at the centre of the beam. Do you consider either of the ascertained stresses excessive. (M.R.S.I.)

**247. Statics.**—Prove that if three forces acting on a particle keep it in equilibrium, each is proportional to the sine of the angle between the other two. (T. R.)

## REPLIES TO QUESTIONS.

**243. Water Supply.** What kind of water acts upon lead? State the risk attendant upon its use and the means you would adopt for avoiding or reducing such risk. (M. C. E.)

As a very general rule, it may be stated that the softer the water the greater the tendency it has to dissolve lead. Moorland waters, especially waters draining peat and bog lands, rain and snow water have been found liable under certain conditions to attack lead with which they come in contact to a marked degree.

Waters draining from peat and bog lands are distinctly acid, due to the presence of certain organisms in the moist peat. This acidity is only present in moist peat. It has been found that the amount of acidity in dry peat is nil.

Peat, however, always regains its acidity on being moistened, even after being thoroughly dried, and is capable, with successive dryings and moistenings, of containing many times its weight of water.

Waters from coal and other mineral washings may contain acids liable to attack and dissolve lead.

It has been found that peaty acids have a greater effect on lead than mineral acids, but these mineral acids in conjunction with the peaty acids materially increase the plumbo-solvency of the water, and are less easily neutralised than the peaty acids alone.

Rain and snow water take up acids from the air; the liability to do so is increased with proximity to towns and manufacturing districts, on account of the greater amount of smoke dispersed in the air.

The risk attendant on the use of a plumbo-solvent water is the serious risk of lead poisoning.

Lead being a cumulative poison, minute quantities taken day by day will cause one or more of the many forms of lead poisoning, as lead "colic," &c., and in the end will prove fatal. The first means of reducing the risk, if the supply cannot be dispensed with, is care of the gathering grounds. The peat lands should be well drained so as to exclude the surface washing from the intakes, and all hollows where water can stagnate must be drained, as these hollows are really "brewing vats"—so to speak—of strong acids, waiting to be carried down to the intakes by the first downpour of rain.

As the first washings are more acid and more dangerous than the later supply, they may be diverted by leap weirs, and the peat *débris* caught and disposed of by means of a series of raised weirs and traps.

The water should, if possible, be obtained from deeper sources, as an admixture of suspected and unsuspected water may result in an innocuous supply.

Filtration has been found only partially successful, owing to the clogging with vegetable growths. Filters have been constructed of limestone, marble, &c., with a preliminary mechanical filtration through asbestos, coke, &c., to arrest the growths. The effective life of the filter has in each case been short and the results far from satisfactory.

A filter constructed with a layer of granulated chalk under a top layer of sand has been effective for a considerable period, but the chalk must be stirred and kept fresh, so that it may readily pass into solution.

Neutralisation of the acids by alkaline solutions as sodium carbonate, and lime water, as for softening water, have been found very effectual. At Sheffield the trouble was overcome by the addition of ½ to 3 grains of powdered chalk per gallon of water. As a further precaution, minimise the action of the water by lessening the amount of lead upon which the acids can act, lead pipes in houses, and lead joints in other metal work, can be dispensed with and other pipes and joints utilised in their place. (J. H. N. P.)

**244. Illumination.**—The intensities of two sources of light are in the ratio 4:9. Find the ratio of the distances at which they must be placed from a screen in order to produce on it the same intensity of illumination. ("Luminous.")

The intensity of illumination produced by a given source of light on a given surface is the quantity of light received per unit of such surface, and depends upon the illuminating power of the source and the distance of the surface from the source.

Now, it is evident from common observation that the intensity of illumination on a given surface diminishes when the distance of that surface from the source of light is increased.

Let P represent a source of light, which for this proof is assumed to be a bright point, and let A be a square plane of unit area illuminated by the source of light P and at unit distance away, as shown in Fig. 1.

Then, if this surface (A) be moved two units distance from P, as at B, it will be observed that the same intensity of illumination received by A is now diffused over a larger surface; or, as previously stated, the intensity of illumination on the surface is diminished.

Since light travels in straight lines, the rays passing through the edges of the square plane A can be

The Surveyor
And Municipal and County Engineer.

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represented by straight lines, of which four are shown in Fig. 1.

If these radial lines be produced to the surface B, the figure enclosed will represent the area over which the illumination previously received by A due to source P is now diffused.

By proportional figures B can be proved to be a square exactly four times the area of A.

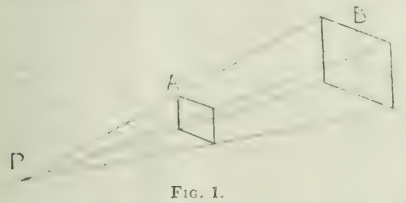


FIG. 1.

So that the intensities of illumination are in the ratio of 1 to 4, and the ratio of the distances is 1 to 2.

This result is a fundamental principle of illumination, and termed the law of inverse squares—namely, that the intensity diminishes in the same proportion as the square of the distance increases.

This is the principle used to compare the intensities of different sources of light, and enables the question given to be considered. This process is termed photometry.

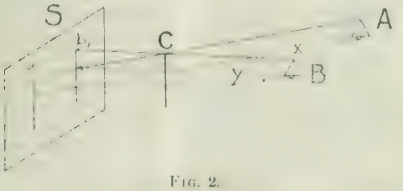


FIG. 2.

Let a source of light A be placed $x$ units distance from a screen S, and another source of light B at $y$ units distance away, as in Fig. 2. The screen is preferably placed perpendicular to the rays of light.

Insert a rod C and adjust one source of light until the shadows $a$ and $b$ have the same intensity, showing that the screen is equally illuminated by the two sources A and B.

By the law of inverse squares the intensity of illumination produced by A at a distance of $x$ units is proportional to $\frac{A}{x^2}$, and similarly that produced by B at $y$ units is proportional to $\frac{B}{y^2}$.

Since the surface is equally illuminated it follows that

$$\frac{A}{x^2} = \frac{B}{y^2}$$

$$\text{or} \quad \frac{A}{B} = \frac{x^2}{y^2}$$

This result proves that the illuminating powers of two sources of light are *directly* proportional to the squares of their distances from a given surface.

The question states that the intensities of two sources of light are in the ratio 4 : 9.

Let their distances from the given screen be $p$ and $q$ respectively.

Since it is required to produce the same intensity of illumination the ratios can be equated

$$\frac{4}{9} = \frac{p^2}{q^2}$$

$$\text{Take square root} \quad \frac{2}{3} = \frac{p}{q}$$

But $\frac{p}{q}$ is the ratio of the distances between the sources of light and the screen.

Therefore 2 : 3 is the ratio of the distances required. (E. F. S. = B.)

## SURFACE TARRING IN SOMERSET.

### COUNTY SURVEYOR AND THE DANGER TO FISH LIFE.

On Friday last the following letter, signed by the county surveyor, Mr. H. T. Chapman, was addressed to the surveyors of all districts in Somerset where surface tarring is being carried out:—

"I must draw your attention to the necessity of taking all possible precautions to prevent pollution of water in streams, ponds and reservoirs in the carrying out of surface tarring on main roads. Should you be notified of the probability of danger to fish life by the pollution of water in the vicinity of main roads which it is proposed to tar, I think it would be as well to defer the work and satisfy yourself as to the advisability of proceeding with it. I cannot advise the County Works Committee to admit liability for any claims for compensation in respect of pollution of water in consequence of surface tarring of main roads."

**Dust Prevention on Military Roads.**—We are informed that the military authorities at Aldershot are trying Akonia for dust prevention on their roads. The dust on the military roads is an important problem, and in view of the satisfactory results obtained on the roads of the Aldershot Urban District Council, there is little doubt that Akonia will be also much appreciated in the camp.

**Cheap Gas in St. Helens.**—The St. Helens Gas Committee have decided to reduce the price of gas in the borough by 2d. per 1,000 ft. The nett profits for last year were £11,500. The price of gas for some years has been 2s. 2d. per 1,000 cub. ft., and 1s. 8d. for power purposes. Meters and gas stoves are supplied free to customers, and the price, with the exception of Widnes, is much lower than in any other borough in the country. The committee decided to give £5,000 of their profits to the relief of the rates.

**The Aggressive Thistle.**—A tar-macadam pavement stretching from the School of Gunnery at Shoeburyness to the sea is at present in a state of violent, if silent, eruption. About a fortnight ago (says "H. F." in the *Scotsman*) the surface became covered with what may be called "blisters," raised a little above the common level, which much attracted my wondering attention. From each of these, in a few days, a series of cracks appeared, extending themselves in rays from a centre. Finally came up a broad, soft shoot, looking extremely well pleased with itself and its work, which proved to be so old and well-known a friend as the thistle. At this moment there are hundreds of those bold intruders showing defiantly through the pavement, affording a most interesting illustration of the power of vegetable growth.

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Bishop's Stortford U.D.C.** (April 23rd. Mr. M. K. North).—£1,650 for the purpose of a local water supply.—The clerk, Mr. C. J. Hancox, stated that it was proposed to construct a duplicate main 7 in. in diameter from the waterworks to the top of Hockerill-street, and this main would not be tapped in the lower levels at all. The engineer and surveyor, Mr. R. S. Scott, proceeded to explain the plans. He stated that the existing 6-in. main came from the waterworks to the centre of the town, where it divided, and Hockerill was now supplied by a 4-in. pipe only. At Hockerill the supply, which was short in the winter, was even considerably lower in the summer.

**Derby T.C.** (May 3rd. Mr. Edgar Dudley).—£2,125 for the purchase and fencing of land on the Ryknield Estate, Burton-road, for the purpose of a recreation ground.—The town clerk, Mr. G. T. Lee, stated that the proposal was to purchase 11 acres at £150 per acre. There was no opposition to the scheme.

**East Barnet U.D.C.** (April 26th. Mr. M. K. North).—£3,380 for works of private street improvement.—The clerk, Mr. A. T. Buckley, stated that the council sought permission to borrow the sum stated to make up the roads and paths of Alverstone-avenue, Oakhurst-avenue, and Roslyn-avenue (Oakleigh Park), and Cromer-road (Barnet Vale). The surveyor, Mr. H. York, supplied details of the proposed works.

**Halstead R.D.C.** (May 3rd. Major Norton).—£400 for experimental works in connection with a water supply for Earls Colne.—Mr. R. L. Hughes, clerk to the council, stated that last year an intimation was received from the Essex County Council to the effect that if steps were not taken to provide a public water supply they would make use of their powers and provide it themselves. Mr. H. Sands, of Messrs. Sands & Walker, said he considered they would get a good supply at a depth of from 250 ft. to 300 ft. The bore and test pumping would cost nearly £400. The public works would cost £4,200, but that sum did not include his fees or the purchase of the land, which would amount to about £500. The inspector said the loan of £400, if sanctioned, would be spread over five years, but if the experimental works were satisfactory, the balance could be added to the entire cost of the scheme and spread over a period of thirty years. There was no opposition.

**New Malden U.D.C.** (May 13th. Mr. M. K. North).—£400 for the purchase of land in Kings-avenue, New Malden, for the extension of their highway depot.—The clerk, Mr. J. W. Johnson, explaining the grounds for the application, said that the present depot was altogether inadequate to accommodate and protect the council's property and materials. The surveyor (Mr. R. H. Jeffes) said there was at present not sufficient room to accommodate properly the various appliances which the council had, and the land involved in this scheme would be most convenient.

**Saffron Walden T.C.** (April 24th. Mr. M. K. North).—£2,500 for the purpose of house connections with the new sewers.—The town clerk, Mr. W. Adams, stated that the loan was required in consequence of the town having been re-sewered and new disposal works installed. That work had just been completed, and it was now necessary to put the whole of the houses connected with the old sewers on to the new system of drainage. They asked for the repayment of the loan to be extended over a period of thirty years. The old sewers had been left in and were being used for surface water, so that it was essential to disconnect them. The inspector inquired if any part of the work of house connections had been anticipated. The surveyor, Mr. A. H. Forbes, answered that between 50 and 60 connections had been done out of the 949. The inspector asked why the board's sanction of the loan had been anticipated. The town clerk replied that the engineers were anxious to try the new sewerage works. They could not give their certificate until the work had been tested. The surveyor, in reply to the inspector, further stated that the council were undertaking the connection work themselves by employing a special gang of workmen for the purpose. Further questioned, the surveyor said the street gullies would remain connected with the old brick sewers as at present. There were a number of the old sewers which would now be used as surface-water drains, and there were 9 miles of new sewers. It was thought that £2,500 would be sufficient to carry out the connections which the council would have to undertake, but it was very uncertain.

**South Shields T.C.** (May 13th. Mr. R. H. Bicknell).—£6,655 for paving work.—The town clerk (Mr. J. Moore Hayton) stated that the money was required for re-paving eight old streets. It was proposed that they should be paved with granite setts on concrete foundations.

**Sunderland T.C.** (May 3rd. Mr. Courtenay Clifton).—£4,500 for works of street improvement in that portion of Stockton-road between Grange Church Bridge and Christ Church.—Mr. G. D. Duncan, the assistant town clerk, supported the application, and stated that the application was for powers to borrow £4,500 to enable the corporation to carry out the paving of a portion of Stockton-road in wood blocks. They asked that the loan might extend over a period of ten years. The borough surveyor, Mr. J. W. Moncur, gave evidence as to the proposed construction of the road and footpaths, mentioning that the paving had already been done in wood blocks from Borough-road up to Grange Church Bridge, and it was now proposed to complete the work to the commencement of the road near Christ Church. The inspector: Why do you select wood? The surveyor: We prefer wood as a means of reducing the noise from the traffic. The inspector: Wood does not last as long as granite. The surveyor: That is so, but we are only asking for a loan for ten years.

**Warrington T.C.** (April 24th. Mr. W. O. E. Meade-King).—£5,600 for the provision of pumping plant at Houghton Green waterworks.—The deputy town clerk stated that it was desired that the loan should be for a period of thirty years. The Winwick station was capable of pumping 2,600,000 gallons per day, and the figures seemed to prove abundantly that, in the event of a breakdown at Houghton Green, the Winwick station could not supply the demand. The pumps there were old ones and could not be worked to their full capacity. The inspector: Then why are they not to be renewed? The deputy town clerk said that was a question of policy which was not for him to deal with. Evidence as to the proposed additional plant and the extent of the present undertaking was given by Mr. Gray, the water engineer.

**Winchester T.C.** (April 30th. Mr. F. H. Tulloch).—£1,200 for the purposes of a bandstand, a shelter, and lodge with public conveniences, on the Recreation Ground.—The town clerk mentioned that the Recreation Ground, 35 acres in extent, was acquired in 1901. A caretaker's cottage of brick and flint was necessary in order that the grounds might be better supervised, and a shelter and dressing-rooms for those using the tennis courts and bowling greens were required. He asked that there should be a loan for fifty years for the lodge and shelter, and twenty-five years for the bandstand. The cost of the bandstand would be £306, the shelter £206, and lodge and conveniences £693. Objection having been taken by a city alderman to the proposal to have cesspools in connection with the conveniences, the inspector observed that the site chosen for the lodge was most suitable in the opinion of the city engineer, Mr. W. V. Anderson, and that there could be no alteration unless the lodge were raised considerably above the level proposed, which entailed great expense. The city engineer observed that the fall of the ground was also the wrong way for the laying of sewers.

### APPLICATIONS FOR LOANS.

**Billericay R.D.C.**—£6,213 for the provision of an isolation hospital.

**Brighton T.C.**—£1,000 for sea defence works.

**Bromsgrove U.D.C.**—£7,393 for a sewerage scheme.

**Cardiff T.C.** £25,660 for waterworks.

**Derby T.C.**—£1,700 for fire brigade station extensions.

**Dewsbury T.C.**—£250 for road widening, £1,065 for concreting, £622 for York setts, and £120 for drains.

**Gravesend T.C.**—£10,000 for the development of the electricity works.

**Herts C.C.**—£10,049 for graniting main roads.

**Leatherhead U.D.C.**—£1,600 for the provision of a recreation ground.

**Nelson T.C.**—£1,500 for the purchase of a site for a public abbatoir.

**Ogmore and Garw (Glam.) U.D.C.**—£21,000 for the purchase of the waterworks.

**Poole T.C.**—£300 for the provision of a public convenience, and £3,027 for surface-water drainage works.

**Rochdale T.C.**—£5,000 for electricity plant, and £10,000 for cables and transformers.

**Saddleworth U.D.C.** — £16,000 for the provision of workmen's dwellings.

**Stone U.D.C.**—£592 for the purchase of property for a street improvement.

**Wallsall T.C.**—£10,000 for electricity meters, house services, mains, and additional plant.

**Wenlock T.C.**—£6,000 for the completion of the sewerage scheme.

**West Sussex C.C.**—£2,160 for the purchase of a site for a girls' secondary school.

### LOANS SANCTIONED.

**Clitheroe U.D.C.**—£1,100 for a water supply scheme.

**Darlington T.C.**—£2,610 for school sites, and £300 for the provision of spray baths at the public baths.

**Failsworth U.D.C.**—£5,239 for private street works.

**Ilkley U.D.C.**—£3,000 for an annexe to the town hall and public conveniences.

**Romford U.D.C.**—£1,100 for road improvement purposes.

**Rutland C.C.**—£2,145 for the improvement of the Great North Road.

**Weston-super-Mare U.D.C.**—£1,500 for a period of thirty years for new mains and connections, and £500 for a period of ten years for meters, in connection with the scheme for supplying Worle with water.

**Whickham (Durham) U.D.C.**—£2,725 for the provision of a cemetery.

### FORTHCOMING INQUIRIES.

MAY.

| | | £ |
|---|---|---|
| 20. | **Clay Cross.** | For allotments and a refuse tip (Mr. Edgar Dudley) ... ... ... 1,150 |
| 20. | **Towcester.** | For the provision of workmen's dwellings (Mr. Courtenay Clifton) 3,000 |
| 21. | **Chesterfield.** | For the purchase of property for a police station (Mr. Edgar Dudley) 800 |
| 21. | **Farnham.** | For burial ground purposes (Mr. W. O. E. Meade-King) ... ... ... 3,100 |
| 21. | **Leicester.** | For street widening purposes (Mr. Courtenay Clifton) ... ... 945 |
| 21. | **Mossley.** | For the provision of a fire station (Mr. F. H. Tulloch) ... 3,600 |
| 21. | **Sheffield.** | For works of street improvement (Mr. M. K. North) ... ... 1,215 |
| 21. | **Stamford.** | For the provision of a bath (Mr. R. H. Bicknell) ... ... 850 |
| 21. | **Wombwell.** | For allotment and refuse purposes (Mr. R. H. Bicknell) ... ... 520 |
| 22. | **Dewsbury.** | For infectious hospital purposes (Mr. H. A. MacEwen) ... ... 2,090 |
| 22. | **Mansfield.** | For the provision of a recreation ground (Mr. Edgar Dudley) ... ... 1,000 |
| 22. | **Runcorn.** | For the conversion of privies into water-closets (Mr. M. K. North) ... 1,664 |
| 22. | **Warrington.** | For street improvement purposes (Mr. F. H. Tulloch) ... 546 |
| 23. | **Cambridge.** | For the provision of workmen's dwellings (Mr. Edward Leonard) ... 1,600 |
| 23. | **Lancaster.** | For water filtration and quarry purposes (Mr. M. K. North) 1,200 |
| 23. | **Portsmouth.** | For surface-water drainage works (Mr. W. O. E. Meade-King) ... 20,000 |
| 23. | **Sale.** | For the provision of public baths (Mr. F. H. Tulloch) ... ... ... ... 6,877 |
| 23. | **Wembley.** | For street improvement purposes (Mr. Courtenay Clifton) ... ... 2,150 |
| 24. | **Easington.** | For the provision of sewers (Major C. E. Norton) ... ... ... ... — |
| 24. | **Friern Barnet.** | For street improvement purposes (Mr. Courtenay Clifton) ... 2,859 |
| 24. | **Margate.** | For the purchase of land (Mr. Edgar Dudley) ... ... ... ... ... 13,000 |
| 24. | **Penrith.** | For the provision of pleasure grounds (Mr. M. K. North) ... ... ... 2,000 |
| 24. | **Sandown.** | For sewerage and lavatory purposes (Mr. W. O. E. Meade King) ... 385 |

## CARDIFF WESTERN OUTFALL SEWER DISPUTE.

### ARBITRATION AWARD.

Mr. H. Percy Boulnois, M.INST.C.E., has given his award in the case of Whyte & Co., Ltd., *v.* Cardiff Corporation in respect of a dispute which arose between the parties after the completion of the western outfall sewer. Messrs. Whyte & Co., the contractors, claimed over £53,000 extra on their contract. Several counsel were employed in the case, and a considerable number of expert witnesses were called on both sides. The arbitration began last year, and the sittings extended over forty-two days. The case bristled with legal points and much technical difference of opinion.

At a meeting of the Public Works Committee of the corporation, on Thursday of last week, the town clerk submitted the following summary of awards by the arbitrator:—

(1) Subject to the opinion of the Court, I award in respect of delay the sum of £6,361 3s. 8d.

(2) Subject to the opinion of the Court, I award in respect of trial borings the sum of £2,774 7s. 6d.

(3) Subject to the opinion of the Court, I make no award in respect of foreshore.

(4) Subject to the opinion of the Court, I award in respect of tunnelling the sum of £26,742 10s. 2d.

(5) In respect of the miscellaneous items, I award the sum of £47,334 17s. 7d.

These sums amount to a total of £83,212 18s. 11d., which I find to be the total amount due to the contractors under the contract and claim.

The contractors have already been paid £68,050. I therefore award that the corporation pay to the contractors the sum of £15,162 18s. 11d. (in addition to the said sum of £68,050 already paid), subject (so far as concerns items to which the special case refers) to the opinion of the Court.

With regard to costs, I find and award that the corporation pay to the contractors one-third of the taxed costs of and incidental to the arbitration, and that the corporation bear their own costs thereof. And I further award that my costs and charges in respect of this arbitration (paid by the party taking up this award, pursuant to my notice of publication thereof) be borne between the contractors and the corporation in equal shares.

The chairman, Mr. J. Mander, said it ought to be made known that there were other contracts, amounting to £123,000, in respect of the western sewer, outside Messrs. Whyte's contract, and on those other contracts they were £5,640 to the good, below the estimate, so that that £5,640 could be set against the extra £13,000 to be paid to Messrs. Whyte, thus bringing the excess down to £8,000 all, of course, subject to appeal.

#### QUESTION OF APPEAL.

The town clerk was instructed to lay the award before counsel without delay, with the view of getting their advice as to the points, if any, in the award against which the corporation should appeal.

#### FIGURES OF THE CLAIM AND THE COSTS.

The following figures from the *Western Mail* show at a glance the financial position in which the ratepayers of the city are involved as a result of the award.

| | |
|---|---|
| Messrs. Whyte's accepted tender ... | £70,368 |
| Messrs. Whyte's original claim ... | 123,000 |
| Claim subsequently amended during arbitration ... ... ... ... | 121,198 |
| Claim over and above accepted tender ... ... ... | 52,000 |
| Award over and above accepted tender ... ... ... ... ... | 12,844 |
| Contractors' claim reduced by ... | 39,000 |

Subject to the result of any appeal against any item that may be entered in the High Court, the extra cost to the ratepayers, over and above the original contract figure of £70,368, will be as follows, approximately

| | |
|---|---|
| Extra sum awarded to contractor ... | £12,844 |
| Costs incurred by corporation ... | 5,800 |
| Third of contractors' costs (estimated) | 1,900 |
| Half of arbitrators' charges and costs | 600 |
| Total extra ... ... | £21,144 |

# Municipal Work in Progress and Projected.

*The Editor invites the co-operation of* Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Arnold, Birmingham £7,000, East Riding £14,000, Elgin £3,000, Paddington; housing and town planning—Sheffield; roads and materials—Bath, Blackpool; sewerage and sewage disposal—Helmsley, Manchester £60,513, Redruth £28,105; water, gas and electricity—Dunfermline, Mayfield; miscellaneous—Durham, Hucknall, Walsall.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

## ADMINISTRATION.

**East Sussex C.C.**—Approval has been given to the report of a committee which recommended that the office of assistant county surveyor be abolished, and that the county surveyor, Mr. F. J. Wood, be authorised to appoint, on behalf of the council, with the approval of the chairman of the Roads and Bridges Committee, a chief assistant, at a salary of £180 per annum, rising by annual increments of £10 per annum to £200 per annum. It has been agreed to allow the county surveyor a sum not exceeding £1,150 per annum to cover the salaries of the whole of the staff under his control.

## BUILDINGS.

**Aberdeen T.C.**—Steps are to be taken to provide additional accommodation at the fish market.

**Arnold (Notts) U.D.C.**—A committee has been appointed to consider the provision of public baths, the land for which has been already set aside.

**Birmingham T.C.**—The Watch Committee recommend the provision of a fire station between Ettington and Prestbury roads, at an estimated cost of £7,000 for the building.

**Brighton T.C.**—A new tramway shelter is to be erected in North-road, between Grand-parade and Marlborough-place.

**Cardiff T.C.**—The Parliamentary Committee have decided to reopen negotiations with the Great Western Railway Company in regard to the proposed construction of a bridge over the railway to give an improved approach to the sanatorium. The question of an additional bridge over the Taff (the *South Wales Daily News* states) has already engaged the attention of the Llandaff and Dinas Powis Rural District Council. A bridge, 40 ft. or 50 ft. wide, suitable for vehicular traffic, together with the approaches, could be constructed for about £7,000 or £8,000, and the question arises whether the Cardiff Corporation would not be better advised in spending the money on such a bridge than in spending £10,000 on a bridge over the railway to the sanatorium, especially if, as seems likely to be the case, the parish of Llandaff will ere long be included within the city boundary.

**East Riding C.C.**—A draft scheme has been adopted for the provision of an isolation hospital, subject to the exclusion of Bridlington. The cost will be approximately £14,000.—Hull Bridge is to be reconstructed, at an estimated cost of £960.

**Elgin T.C.**—A scheme is under consideration for the erection of public baths, for a sum not to exceed £3,000.

**Hampton U.D.C.**—Tenders have been accepted for painting works at the isolation hospital from Mr. W. Tickner, at £64; at the sewage disposal works from Mr. R. O. Roberts, at £16, and at the cemetery, at £32.

**Lurgan R.D.C.**—A committee has been appointed to consider the rebuilding of Knock Bridge, at an estimated cost of £400.

**Newport (Mon.) T.C.**—The Electricity Committee have approved of plans for the erection of new electrical and tramway offices and stores near the Corporation-road power station, at a cost of £6,500.

**Oulton Broad U.D.C.**—At a recent meeting of the General Purposes Committee a letter was submitted from the Local Government Board relative to the desire of the council to permit the erection of buildings constructed of such materials as steel, corrugated iron and ferro-concrete. The board stated that the buildings in question did not fall within the exemptions of the existing by-laws, and that they had not prepared any model by-laws relating to buildings of this kind, as they were advised that their construction could not very suitably be regulated in detail by means of by-laws. The board had, however, caused a short draft series to be prepared on the lines usually adopted when it was desired to provide in the by-laws for steel, iron-framed or reinforced-concrete buildings, and they enclosed it for the council's consideration. If this was accepted by the council a series agreeing strictly therewith might be submitted to the board for confirmation after the preliminary requirements of sec. 114 of the Public Health Act, 1875, had been complied with.

**Paddington B.C.**—The council have instructed a joint committee to report as to the cost of establishing and maintaining small subsidiary baths and wash-houses in the districts of Hall Park and Clarendon-street, together with a central establishment for baths and a public hall. The council have £82,000 in hand for the purpose, this sum having been realised by the sale of the Queen's-road baths to Messrs. Whiteley for their new emporium.

**Seaford (Sussex) U.D.C.**—The surveyor, Mr. B. A. Miller, has been instructed to prepare plans and estimate for a dwarf retaining wall about 100 yds. in length on the Western-parade to prevent the wash of the sea on the road, and to form a footpath on the south side of Claremount-road, west of the railway bridge, at an estimated cost of £50.

**Sheffield T.C.**—It has been decided to complete the town hall buildings. The present building, which was opened in 1897 by Queen Victoria, faces Pinstone-street, Surrey-street and Norfolk-street. The extension will front Cheney-row and complete the square. The plans have been prepared by Mr. F. E. P. Edwards, city architect.

## HOUSING AND TOWN PLANNING.

**Battle U.D.C.**—It has been decided to purchase land at Netherfield Hill for the erection of six working-class dwellings.

**Chelmsford R.D.C.**—A sum of £235 is to be spent on the purchase of a site for the erection of fourteen cottages.

**Coventry T.C.**—A tender, at £6,873, has been accepted for the erection of the first section of additional houses (136 in all) in Narrow-lane. It has been found necessary to increase the rents from 5s. 6d. to 6s. weekly.

**Glasgow T.C.**—By resolution of the council, the Health Committee have been asked to consider the recommendations of a report on the housing question issued by the Glasgow Municipal Commission on the Housing of the Poor in 1904.

**Kingstown U.D.C.**—The tender of Mr. J. O'Brien, of Summerhill, at £6,698, has been accepted for building forty-six cottages.

**Lurgan U.D.C.**—Plans for the erection of fifty-four houses in Wellington-street, under the council's artisans' dwellings improvement scheme, have been submitted by the architect, Mr. Jas. Hunter, Lisburn. His estimate of the cost is £7,965, exclusive of the cost of the purchase of the land required.

**Rhymney (Mon.) U.D.C.**—Plans and specifications of thirty workmen's houses, proposed to be erected under the Town Planning Act, have been approved and forwarded to the Local Government Board for their sanction.

**Sheffield T.C.**—The Finance Consultative Committee have approved the Estates Committee's proposal to spend £9,060 on further houses on the Wincobank estate.

**Thetford T.C.**—The tender of Mr. Ernest Clarke, of Melton Mowbray, at £6,666, has been accepted for the erection of fifty workmen's dwellings.

## PARKS AND OPEN SPACES.

**Cardiff T.C.** The Parks Committee have accepted the tender of Mr. R. E. J. Haines for two bowling green pavilions—one for Roath Park and one for Victoria Park—at £115 each.

## REFUSE COLLECTION AND DISPOSAL.

**Aberdeen T.C.**—Following on negotiations that have been proceeding for the acquisition of a refuse destructor for the city, the Cleansing Committee have been asked to report as to whether a suitable site or sites could be got within a reasonable distance outside the city boundary as a tip for the disposal of city refuse and the probable cost, including expense of transit.

**Wallsend T.C.**—It has been agreed to remove the refuse of the town to sea.

**Westhampnett (Sussex) R.D.C.**—The tender of Mr. E. J. Lunn, at £80, has been accepted for the collection of the house refuse at Feltham and the Golf Links Avenue estate.

## ROADS AND MATERIALS.

**Abingdon T.C.**—All the roads are again under treatment with Akonia. It may be remembered that Mr. Winship was one of the first surveyors in the kingdom to use Akonia.

**Argyllshire C.C.**—The Pass of Branden-road is to be repaired at an estimated cost of £1,590. Of that sum the Road Board have given £790 as a grant and a loan of £800 payable in five years free of interest.

**Bath T.C.**—The surveyor, Mr. C. R. Fortune, has been authorised by the Surveying Committee to purchase 20,000 elm blocks.

**Blackpool T.C.**—It is now proposed to extend the promenade from South Shore to Squire's Gateway, and thus provide an excellent parade and carriageway in front of the existing pleasure beacon and sand dunes. The work will be less costly than any portion of the present promenade, as there are no engineering difficulties. The construction of an esplanade, garden and recreation ground is one of the features suggested by the South Shore Council, who are strongly pressing the project. It is anticipated that in the near future there will be a continuous promenade along the coast from Blackpool northerly boundary to Lytham, a distance of ten miles.

**Brighton T.C.**—The tender of Messrs. J. Mowlem & Co., Limited, of Grosvenor Wharf, Westminster, has been accepted for laying wood paving in North-street, Duke-street, West-street, and St. James's-street, and Lithofalt block paving in Middle-street and Boyces-street, at a total cost of £5,219.

**Cardiff T.C.**—The question of the proper cleansing of the streets, with the view to the prevention of dust, has been referred to the city engineer, Mr. W. Harpur, and the medical officer of health, Dr. E. Walford, for a report.

**Carnarvon C.C.**—The Road Board have promised to make a grant of £800 for tar-spraying the roads in the county next year, provided the council spend a certain amount for the same purpose. The contribution of the Road Board will be from 50 to 75 per cent of the actual cost.

**Coventry T.C.**—For the proposed widening of Leicester-street certain properties are to be acquired for £9,093.

**Darlington R.D.C.**—The surveyor, Mr. John Robinson, has repaired a length of the Morton Palms-road, leading from Darlington to Middleton-one-Row, by laying a very heavy foundation and surfacing it with grouted slag, at a cost of £477, or about 2s. per square yard. Application towards the cost has been made to the Road Board. To complete the whole length of the road will entail an expenditure of £2,000.

**Durham C.C.**—A letter has been received from the Road Board stating that they were prepared to allow the £10,000 which was allocated last year to the county of Durham, together with any allocation that may be made this year, to accumulate until the council were ready to submit for the board's approval a large scheme of road improvements in the county.

**East Sussex C.C.**—After the general approval of the Road Board has been obtained to the scheme it has been agreed to incur liabilities to the extent of £3,500 for the acquisition of land for the proposed improvements of the Lewes to Newhaven road.

**Exeter T.C.**—Messrs. Fothergill Bros. have been engaged to carry out tar-spraying during the year at fifteen-sixteenths of a penny per super. yard.

**Falkirk T.C.**—Consideration is being given to a proposal to acquire some property in the High-street for the purpose of the formation of a street running from the High-street to the residential property to the south of the town.

**Hampton U.D.C.**—The tender of the Hampton Court Gas Company for 1,500 gallons of gas-tar at 2¾d. per gallon has been accepted.

**Lewisham B.C.**—The borough engineer, Mr. E. van Putten, is trying Akonia on several roads in his district.

**Merioneth C.C.**—The Road Board has given a grant of £2,000 to the council for tar-macadam roads at Harlech, Dyffryn, Penrhyn, and Trawsfynydd.

**Okehampton R.D.C.**—The surveyor of highways, Mr. G. Smale, has forwarded by request to the Road Board an estimate of £2,600 as the cost of a section of road near Whiddon Down. A discussion took place at the meeting on Saturday last regarding the day work done on the roads, and the means of checking it. Eventually the two surveyors were directed that the men employed under them should be required to send in time sheets.

**Shrewsbury T.C.**—A sum of £1,862 has been paid for the purchase of the necessary land for the construction of a new road.

**Spennymoor U.D.C.** — The tender of Messrs. J. Crombie & Son, Limited, at £165, has been accepted for laying a concrete footpath in Barnfield-road.

**Westbury (Wilts) U.D.C.**—With regard to a proposal to re-name certain streets, the General Purposes Committee recommend that the name plates supplied by the London Sand Blast Company, at an average cost of 8s. per plate, be purchased for the more important streets, and that the enamel plates supplied by the Imperial Enamel Company, at an average cost of 2s. 8d. per plate, be used for the subsidiary streets.

**Willesden U.D.C.**—The total length of streets now provided with trees, says the engineer, Mr. O. Claude Robson, in a report to the council, is 37½ miles, a no mean proportion of the entire length of highways under the jurisdiction of the council. Indeed, in few towns will be found so great a length of "boulevards" created as in Willesden, boulevards which, it is suggested, are in many instances worthy of a Continental city. It is, however, doubtful, Mr. Robson remarks, if their existence is universally appreciated, as it is by no means an unusual occurrence for complaint to be received as to obstruction and nuisance being caused by a tree, handsome in itself, but out of place in a road 40 ft. in width with houses close to the pathway.

## SEWERAGE AND SEWAGE DISPOSAL.

**Chingford U.D.C.**—The tender of Messrs. W. & C. French, at £4,426, has been accepted for works of sewerage.

**Carforth (Yorks) U.D.C.**—As the result of a recent survey, the chief sanitary inspector to the West Riding County Council makes complaint in detail of the sanitation of Garforth since it was given urban status.

**Helmsley R.D.C.**—The surveyor, Mr. W. Hunton, has received instructions to prepare a drainage scheme.

**Maidenhead T.C.**—The surveyor, Mr. P. Johns, has been instructed to prepare plans for surface-water drainage works in the High-street.

**Manchester T.C.**—An expenditure of £60,513 upon drainage works has been sanctioned by the council.

**Mitford and Launditch (Norfolk) R.D.C.**—The Local Government Board are pressing the council to effect an improvement in the sewerage system of Litcham, and the council, in reply, state that a good deal has been done to improve the sewerage of that district, adding that they could not see their way to place a charge of £500 upon it for further works.

**Redruth R.D.C.**—The report of Messrs. C. Nicholson Lailey, H. Tulloch, and H. J. Weaver (engineers), on the suggested joint sewage scheme for Redruth, Ilogan, and Portreath has been submitted. The total estimated cost is £28,105. The suggested work includes the laying of an 18-in. sewer from Redruth through the Bridge Valley to Portreath, joining there two sewers draining Ilogan, these passing through a tunnel in the cliffs to Gooden Heane Point, and discharging into the sea. The scheme provides for dealing with Portreath sewage by means of ejectors driven by compressed air, pumping into the tunnel. The engineers do not approve a scheme of purification by means of tanks and filters.

**Tenby T.C.**—The council have adopted Mr. J. Preece James's scheme for the reconstruction and extension

of the western outfall, and have requested the Local Government Board to receive a deputation on the subject.

**Willesden U.D.C.**—The engineer, Mr. O. Claude Robson, in a report, writes: "I would again call the attention of the council to the necessity of giving some consideration to the extension of the surface-water drainage of the district. At the present time the area of Willesden is divided into two sections for this, as well as for general drainage purposes, the whole of the rain waters falling upon the roads within the metropolitan area draining with the foul sewage through the sewerage system of London, while a separate and distinct system is provided within the Brent drainage area for the reception of rainfall only from the road surfaces of that district. Thus within the Brent area a dual system of drainage is provided, the surface-water sewers discharging into the natural watercourses and thence direct into the river Brent. Steps should be taken at an early date to enlarge the drainage area of surface waters, while several of the present open ditches should be filled in, and culverts substituted, to avoid flooding and nuisance arising therefrom."

**Worcester T.C.**—The tender of Mr. G. Percy Trentham, of Birmingham and Handsworth, at £1,206, has been accepted for alteration to the tanks at the sewage disposal works.

## WATER, GAS, AND ELECTRICITY.

**Banbridge (Co. Down) U.D.C.**—A scheme for the electric lighting of the town has been adopted, the capital account on which will amount to £3,200.

**Batley T.C.**—The water-pipe scraping machine of the Eric (Patent) Water-Main Scraper Company, Limited, Chepstow, Mon., recently scraped a length of 15-in. main from Staincliffe to Mill Bridge, Liversedge. Hatch-boxes having been fixed in the main at these points by the waterworks engineer, the scraper was inserted at Staincliffe, and arrived at Mill Bridge in about two and a-half hours, the length being 2,600 yds. The scraper was again conveyed to Staincliffe, and placed in the main, performing the journey to Mill Bridge this time in a little under two hours. In the case of this main, the incrustation was about ¾ in. thick all round the inside of the pipe, and very rough. Considering that only 10 lb. per square inch pressure was available at Staincliffe hatchbox, and that the length selected by the waterworks engineer was considered one of the most difficult to deal with, the result was deemed highly satisfactory; and the efficiency of the work was indicated by the quantity of material washed out of the main, and the appearance of a section of the main when cut out after scraping. Between 20 and 25 tons of corrosion were cleared out in five hours, without hitch of any kind.

**Carnarvon T.C.**—The nett profit of the year from the gas undertaking amounted to £490. The price of gas is 3s. 3d. per 1,000 cub. ft. for lighting, and 2s. 9d. for power.

**Chelmsford T.C.**—The council have by resolution recorded their appreciation of the services rendered by the borough engineer, Mr. P. T. Harrison, and the waterworks foreman, in connection with the completion of the new rising main and pump barrel.

**Dunfermline T.C.**—The question of providing a new water supply will have to be considered by the council in view of the increased requirements necessitated by the Rosyth naval base. Should the corporation consider it in their interest to increase the capacity of their water supply an enlargement of the reservoir at Glensherup would be necessary. The gathering ground there is well adapted for extension. However, it would be necessary also to provide a new pipe from the reservoir to the burgh. A proposal suggested is that the mains of the District Committee could be utilised by mutual arrangement. This summer the debt on the Glensherup waterworks will be fully paid up. The council could thus be financially able to take a new scheme.

**Leeds T.C.**—A scheme for lighting the Kirkgate Market-square with high-pressure gas lamps has been approved, and a deputation has been appointed to visit other markets to inspect the lighting.

**Llandovery T.C.**—Plans are being discussed for the improvement of the town's water supply.

**Mayfield R.D.C.**—The tender of Messrs. Firth & Co., at £2,807, has been accepted for the water supply scheme.

**Newry No. 1 R.D.C.**—The Local Government Board have written intimating that they had made a provisional order empowering the council to put in force the powers of the Lands Clauses Acts in respect to the purchase and taking, otherwise than by agreement, of certain lands, water and rights required for the purpose of providing a supply of water for Rathfriland and neighbourhood.

**Saddleworth (Yorks) U.D.C.**—The water supply of Saddleworth is again occupying the attention of the authorities. The county medical officer declares that it is plumbo-solvent.

**Southwark B.C.**—It has been agreed to take up a loan of £4,456 for electric lighting purposes.

## MISCELLANEOUS.

**Belfast T.C.**—The corporation have decided to inaugurate a system of profit sharing with the employees of the municipal tramways, and this has been received with great satisfaction by the staff. The first distribution will, it is said, be equal to about £4 per head.

**Brighton T.C.**—The borough surveyor, Mr. H. Tillstone, has submitted a further estimate for laying a new floor to the music-room of the Royal Pavilion, the floor to be laid with grooved and tongued oak in narrow widths and secret nailed on the present joists. He estimated the cost of carrying out the work, including the necessary alterations to the heating apparatus and fixing eight radiators, and assuming the present joists, &c., are in good condition, at £300, and it has been agreed to carry out the work.

**Durham T.C.**—It has been referred to committee to consider the question of providing an up-to-date fire engine.

**Hucknall U.D.C.**—The Sanitary Committee strongly advise the council to purchase a steam disinfector at once.

**Leamington T.C.**—The Highways Committee on Monday last reported the receipt of a memorial from the corporation dustmen asking for an increase in their wages to 24s. per week, and for payment on Bank Holidays, but as the men were paid the standard rate of wages the committee could not recommend any alteration. The council approved the view of the committee.

**Penzance T.C.**—With respect to the council's proposal for the acquisition of Battery-square for the improvement of the bathing place, the Local Government Board have written stating that the scheme is too costly for the purpose in view. The council are invited to submit another scheme.

**Walsall T.C.**—Seven new tramcars are to be purchased, at a cost of £5,336.

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**Economy of the Motor Car.**—Newport (Mon.) Corporation Works Committee have decided upon the purchase, at a cost of £200, of a 15-horse power motor car, for the use of the borough engineer. The cost of cab hire has been such that to obtain and maintain a motor car will effect a saving.

**Royal Institute of British Architects.**—An extra general meeting of this body will be held on June 3rd for the reading of a paper prepared for the Practice Standing Committee by Mr. Wm. Woodward, and entitled "The Responsibilities of Architects and the case of Minter *v.* Waldstein."

**Risks of Tar-Spraying.**—About mid-day on Saturday, while tar-spraying operations were in progress in the Cainscross-road, Stroud, a quantity of tar in a caldron boiled over and ignited. The flames quickly spread to the roadway, and the fire extended for at least 30 yds. of uncovered tar on the ground. A horse engaged in the tar-spraying operations was very badly burned.

**Mr. G. P. Knowles's Classes.**—We learn that Mr. G. P. Knowles, of 39 Victoria-street, Westminster, S.W., has lately taken into partnership Mr. K. D. D. Grazebrook, son of Mr. H. Durley Grazebrook, the well-known barrister, and the firm now consists of Messrs. G. P. Knowles, B.SC.(HONS.), ASSOC.M.INST.C.E., F.S.I., &c., J. B. Knowles, F.S.I., and K. D. D. Grazebrook. It appears that the very successful courses of preparation for the Surveyors' Institution examinations conducted by Mr. Knowles are maintaining their popularity and success, as the pass list just issued contains 97 per cent of Mr. Knowles's pupils, one of whom is the winner of the "Penfold Gold Medal" for highest marks in the final examination.

## PERSONAL.

Mr. Griffith Davies, of Beaumaris, has been appointed surveyor to the Beaumaris Town Council.

Mr. W. E. Lloyd, ASSOC.M.INST.C.E., has been appointed assistant borough surveyor of Guildford, at a salary of £150 a year.

Mr. Stewart F. Bywaters, pupil to Mr. E. M. Bate, council surveyor, Frinton-on-Sea, has passed the intermediate examination of the Surveyors' Institution.

Mr. William Bennett, surveyor to the Barnoldswick Urban District Council, who has retired, was recently presented by his fellow officials with a smoker's cabinet.

Mr. H. W. Marsden, borough surveyor of Richmond (Yorks), has been granted a substantial increase of salary, this being the second increase since taking up his duties in May, 1910.

Mr. F. Reginald Phipps, ASSOC.M.INST.C.E., borough surveyor and waterworks engineer of Basingstoke, has passed the recent final examination of the Surveyors' Institution in the Valuations Sub-division.

Mr. Herbert Vickery, surveyor of highways to the Kingsbridge Rural District Council, has resigned, and the council have advertised the vacancy at £100 a year, a suggestion that it should be increased by £5 annually to a maximum of £125 being negatived.

Mr. E. Montagu Bate, surveyor to the Urban District Council of Frinton-on-Sea, has passed the Direct Fellowship Examination (Valuation Sub-division) of the Surveyors' Institution. Previous to being at Frinton, Mr. Bate held appointments at Islington, Ilkeston and Dover.

Mr. Jas. B. Newton, engineering assistant in the York city surveyor's drawing office, has submitted, and the Streets and Buildings Committee have accepted, his resignation, he having obtained an appointment abroad. The council are to be recommended to appoint Mr. H. Anderson, of Sunderland, and Mr. H. S. Thorpe, of York, assistants in the city surveyor's drawing office, at a salary of £100 per annum each, to fill the vacancies caused by the resignation of Mr. Marshall and Mr. Newton.

East Molesey Urban District Council last week received a report from a committee to the effect that forty-three applications had been received for the post of assistant surveyor vacated by Mr. R. A. Webb, and they considered it best to offer the appointment to Mr. G. Barker, who had previously satisfactorily filled the appointment temporarily for a period of twelve months. Mr. Barker had, however, secured a better appointment, and it was left to the General Purposes Committee to submit another selection.

Mr. S. A. Hill-Willis, engineer and surveyor to the Orsett Rural District Council for the past seven years, has been appointed out of nearly 200 applicants engineer and surveyor to the Tilbury Urban District Council. Mr. Hill-Willis is a member of the Institution of Municipal and County Engineers, and prior to his appointment at Orsett was for three years assistant to Mr. T. J. Duquemin, ASSOC.M.INST.C.E., the States Engineer of Guernsey; he also served four years' articles under Mr. W. B. G. Bennett, M.INST.C.E., when the latter was borough engineer of Southampton.

Mr. John T. Eayrs, M.INST.C.E., whose death was announced in THE SURVEYOR last week, was buried on Saturday last at All Saints', West Bromwich, a service being held previously at Christ Church. Those present, in addition to the chief mourners, included Messrs. A. D. Greatorex, J. S. Pickering and H. A. Giles, president, vice-president and assistant secretary respectively of the Institution of Municipal and County Engineers. Mrs. Eayrs and family desire to return their sincere thanks for kind enquiries and sympathy shown to them in their sorrow and bereavement.

Mr. J. H. Drew, surveyor and engineer to the Horbury Urban District Council, who (as announced in THE SURVEYOR of April 26th) has been appointed surveyor to the Wath-upon-Dearne Urban District Council, was granted unanimously a testimonial by the Horbury Council at the meeting held last week, a councillor remarking that Mr. Drew had been one of the best surveyors they had ever had in the township. It should be added that the Wath-upon-Dearne Council have agreed to allow the Horbury Council to retain Mr. Drew's services in the capacity of engineer for the completion of the Horbury sewage scheme, which is being carried out from drawings and specifications prepared by him.


## FOR OTHER ADVERTISEMENTS

See End of Paper.

METROPOLITAN BOROUGH OF WOOLWICH.

SANITARY CONVENIENCE FOR WOMEN, BERESFORD-SQUARE, WOOLWICH.

The Council of the Metropolitan Borough of Woolwich invite Tenders for the Construction of an Underground Sanitary Convenience for Women in Beresford-square, Woolwich.

Persons or firms desirous of tendering may, upon depositing the sum of £1 1s., obtain a copy of the Drawing, Specification and Form of Tender at the Office of Mr. J. Rush Dixon, M.INST.C.E., Borough Engineer, Town Hall, Woolwich. The deposit will be returned upon receipt of a *bonâ-fide* Tender and return of the copies of Drawing and Specification.

The person or firm whose Tender is accepted will be required to pay Trades Union Rates of Wages, to observe Trades Union Hours of Labour, and to enter into a formal contract.

Sealed Tenders, properly filled in, on the official form provided, must be sent to me at the Town Hall, Woolwich, not later than 12 noon on Wednesday, the 5th June, 1912, in envelope endorsed "Tender for Sanitary Convenience."

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
ARTHUR B. BRYCESON,
Town Clerk.

Town Hall, Woolwich.
May 16, 1912.

BOROUGH OF ROYAL LEAMINGTON SPA.

APPOINTMENT OF CLERK IN BOROUGH SURVEYOR'S OFFICE.

The Town Council require the services of a Senior Clerk in the Borough Surveyor's Office, competent to keep a prime cost account and stock book. Candidates must be good shorthand writers and typists, and previous experience in a municipal office is desirable.

Commencing salary, 35s. per week.

Applications, in candidate's own handwriting, with copies of three recent testimonials, to be sent to me not later than noon on Tuesday, May 28th, endorsed "Appointment of Clerk."

LEO. RAWLINSON,
Town Clerk.

Town Hall.
May 15, 1912.

BOROUGH OF NEWBURY.

TO MAKERS OF GAS PLANTS.

Schemes and Tenders are invited for a complete Gas Plant to run 3 existing Crossley Gas Engines (2·12 h.p. and 1·7 h.p. nominal).

Full particulars may be obtained from the undersigned.

S. J. L. VINCENT, ASSOC.M.INST.C.E.,
Borough Surveyor.

Newbury.
May 15, 1912.

ASSISTANT (20), Student Surveyors' Institute, seeks berth. Certificated for Building Construction, Machine Construction, Quantities. Three years' articles. Experience in Sewerage, Sewage Disposal, Water Supply, Building, &c. Good surveyor and leveller, neat draughtsman. Abroad if necessary.—"Worker," c/o THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

HORSHAM RURAL DISTRICT COUNCIL. Private Street Works, Crawley.—Wanted, about June 3rd, Clerk of the Works, with practical experience in Levelling, Setting Out and Making Up of Private Streets. Applications, stating age and salary required, with copies of three testimonials, to reach me not later than Friday, May 31st next.—Wm. Dengate, Surveyor to the Council, 58 Park-street, Horsham.

WANTED, Good Experienced Working Foremen, used to Laying Tar-macadam Roads, Footpath and Tar-spraying Work.—Apply by letter, stating experience, to "Foreman," c/o Lake, Sison & Brown, Dacre-street, S.W.

TWO Furnished Offices at one guinea per week each. Use of Board and large Committee Rooms. Clerical staff, telephone, &c., can be arranged if desired.—Apply 116 Victoria-street, S.W.

## CONCRETE INSTITUTE.

### ANNUAL GENERAL MEETING.

On Thursday of last week the annual general meeting of the Concrete Institute took place in the institute's lecture hall at Denison House, 296 Vauxhall Bridge-road, Westminster, S.W., Sir Henry Tanner, C.B., I.S.O., F.R.I.B.A., presiding.

New Members.

The following were elected members of the institute *viz.*: Messrs. C. W. Ballenden, engineer on South African Railways; S. Edwards, architect and quantity surveyor, Barnstaple; C. T. Lewis, Ilford; H. Lingard, engineer on Madras and Southern Mahratta Railway; J. P. Pike, Southend; A. R. Sage, assistant principal of London County Council School of Building, Brixton, S.W.; I. M. Sutherland, Victoria, Australia; A. Graham, A.R.I.B.A., London, W.

Annual Report.

The annual report of the council, from which it appeared that in April last there were 881 members, 24 students, and 11 special subscribers, having been read by the secretary, Mr. H. Kempton Dyson, its adoption was moved by the chairman, and seconded by Mr. Edwin O. Sachs, vice-president. The report was adopted unanimously.

Election of Council.

The chairman then read the report of the scrutineers on the annual election of members of council. This resulted as follows: Major R. Napier Harvey, R.E.; Messrs. H. K. G. Bamber, F.C.S.; H. Percy Boulnois, M.INST.C.E., F.R.SAN.I., past-president of the Institution of Municipal and County Engineers; Alexander Drew, M.I.MECH.E.; Matt. Garbutt, F.R.I.B.A., A.M.INST.C.E.; John Munro; A. Alban H. Scott, M.S.A., F.I.SAN.E.; H. D. Searles Wood, F.R.I.B.A., F.R.SAN.I; L. Serraillier; T. B. Shore; R. W. Vawdrey, ASSOC.M.INST.C.E.

The above form only a portion of the council of the institute, the total number of which is thirty-two, only a small number being due to retire each year.

The auditors of the accounts were appointed, and the chairman then presented the medal which is awarded annually for the best paper read in each session. This is the first occasion on which the medal has been awarded, and it was presented to Prof. Pite for his paper entitled "The Æsthetic Treatment of Concrete," which was read in the 1910-11 session.

The Architectural Aspects of Concrete Construction.

Sir Henry Tanner, in presenting the medal, said that Prof. Pite's paper was a most interesting contribution to the literature of the subject treated, and it gave rise to some little discussion. He was glad that the Professor did not altogether object to what had been done and advocate something entirely new, because he thought they should have got into very much trouble. Prof. Pite said they ought to start from the existing styles of architecture, and that seemed really to be the most satisfactory way of meeting the difficulty. Nobody had developed anything yet which when it was new was satisfactory. Perhaps when it was old it was better, but still not what one would expect from the treatment of reinforced concrete. However, there was no doubt that something would develop shortly, and the Professor had given a start in that direction. Perhaps the Royal Institute of British Architects might develop a discussion itself, and so make some greater effort than had been done hitherto. It rather sat upon that sort of thing. He asked the Professor's acceptance of the small memento of their regard for him and his lecture.

Prof. Pite, in reply, said his paper had dealt with an aspect of work in concrete that had not yet captured the imagination of members of the Concrete Institute. He hoped it would in the future, as one could not but be sure that if the apparent fog that hung over progress in the architectural aspects of concrete construction were dispelled by a little clear light there ought to be a considerable acquisition of width and breadth to the operations of the institute. So long as that subject remained unexplored and unexperimented with, so long the institute would be looked upon as merely a body concerned with certain aspects of building only, and concrete construction, especially in its more prominent methods, now would be relegated to the larger, coarser and greater class of building, when it might, if there were interest and enthusiasm, and hope and light, be used for more monumental, more decorative and more homely, and therefore much wider purposes. It seemed to him that since it was recognised that there was a field—a field for experiment, a field for movement, a field for intellectual thought, a field which connected a decent contract in concrete with an ordinary and regular course of architectural study and æsthetic consideration—there would be the widened scope which their Special Committee so hoped for, and which they had in a way suggested by adding the word "Architects" to the title of the institute. That widened scope would come, and bring a very broad and very large, and, he would like to say, very popular appreciation of the possibilities of concrete, because the popular aspect of the subject was, of course, one closely allied to the commercial one. The commercial aspect and the popular aspect ought to make the institute a very wide and a very important public body. He made one suggestion with regard to this which he thought was a practical suggestion, a suggestion not at all inappropriately connected with the honour that they had ventured most courageously to bestow upon him, and that suggestion was that the subject should not be dropped, but that the attention of architectural students and designers should be drawn to it. The chairman had indicated that the Royal Institute of British Architects did not pay much attention to it. He thought he was perfectly right. He thought if he had said bluntly that they were prejudiced with regard to the whole subject of concrete, he would have only spoken what he felt and what with some delicacy they knew he hesitated to express. The best way to disperse that prejudice would be to show what great and good designs could be perhaps imagined, because every castle had to be built in the air before it could be built on the earth by young and enterprising designers, and the institution by the Concrete Institute of an annual competition in designs would he thought attract, at all events, a certain number of responses; but he was sure it would attract a few intellectual and careful thinkers on the subject of æsthetics. Those students who had little else to think about in their youth but the charm of design would turn with interest to such a competition, and if the medal which they had now created, and which was such an artistic object, were bestowed with such monetary attraction as either a special fund or some contribution from the institute would allow, the subject of any design to deal with the simple architectural aspects, elevation and details suitable for application to or distribution in ferro-concrete, with, if necessary, any descriptive theory as to the method of design, he thought, without expecting too much in the way of hard labour from the competitor, the institute would be put into possession annually of a large number of interesting artistic essays, that was to say, artistic inventions, artistic designs, and would attract to itself the attention of students, and attract them to its meetings.

The Chairman, as retiring president, then installed Mr. E. P. Wells, J.P., as president of the institute for the ensuing two years of office. In vacating the chair he said that in Mr. Wells he was sure they would have a president quite suitable to the institute, not an amateur, but one who was thoroughly acquainted with the business or with the profession of a designer in reinforced concrete. He felt great confidence that the institute would certainly advance under his guidance, and he wished him the best possible success during his two years of office.

Mr. E. P. Wells then took the chair and expressed his thanks.

Mr. A. Alban H. Scott, M.S.A., M.C.I., in moving a vote of thanks to Sir Henry Tanner, said they would never get another president to take up such energetic work on behalf of this institute as Sir Henry Tanner; he had given an immense amount of time, and the courtesy which he had shown to everyone with whom he had come into contact would also never be exceeded.

Mr. William G. Kirkaldy, ASSOC.M.INST.C.E., M.C.I., seconded the vote, which was carried with acclamation, and Sir Henry Tanner replied.

The meeting then terminated.

### ANNUAL DINNER.

The second annual dinner of the institute took place in the evening in the Empire Hall at the Trocadero Restaurant, Piccadilly-circus, W., Mr. E. P. Wells, J.P., president, in the chair. Among others present were: Sir W. Alfred Gelder, M.P., F.R.I.B.A.; Sir Henry Tanner, C.B., I.S.O., F.R.I.B.A., past-president, principal architect to H.M. Office of Works; Lieut.-Colonel G. E. Holman; Captain A Boyd Carpenter; Prof. J. H. Cormack, B.SC., ASSOC.M.INST.C.E., Professor of Mechanical Engineering, University College, London; Messrs. W. E. Riley, B.B.A., F.R.I.B.A., M.INST.C.E., superintending architect of Metropolitan buildings and architect of the London County Council; R Elliott-Cooper.

M.INST.C.E., president-elect Institution of Civil Engineers, chairman of Sectional Committee on Bridges and General Building Construction of the Engineering Standards Committee; H. Percy Boulnois, M.INST.C.E., vice-president, chairman of council of the Royal Sanitary Institute; E. A. Stickland, president of the Institution of Municipal Engineers, borough surveyor, Windsor; John Murray, F.R.I.B.A.; W. J. Downer, I.S.O., assistant secretary of H.M. Office of Works; F. E. Wentworth Sheilds, M.INST.C.E., vice-president; H. H. Dalrymple Hay, M.INST.C.E.; and C. R. S. Kirkpatrick, M.INST.C.E., chief assistant engineer, Port of London.

In proposing the toast of "The Concrete Institute," Mr. W. E. RILEY congratulated the society upon the great success which had been achieved already. Pioneer work was generally a very thankless task. He did suggest that those who had inaugurated the institute had very far-reaching thought, because, whether we liked it or not, concrete and reinforced concrete generally had come to stay. Those who had been through an architectural training understood the problems he meant, but he believed that the man who was going to make a mark in life was the man who would show adaptability and commercial interest. The institute was the absolute embodiment of that idea. He had always felt it his duty to make rigid laws elastic by administering them with benevolence, and he reminded those present that the aims of concrete experts had been greatly aided by three or four changes in the law which, though based on rigid principles, would be found to be more elastic in application than might be thought, and which encouraged the application of new materials. He thought the aims of the Concrete Institute would result in obtaining proper and artistic expression by those who were trying to interpret building materials. He felt somewhat diffident in speaking about regulations to an institute like this, but the onerous duty had been thrown upon him of trying to do something to put the regulations upon a proper footing. Nothing would be ideal, but the regulations should be made as ideal as could be. Any amount of personal effort had been put in to try and make them so, and he was glad to have an opportunity of thanking the institute for the great help they had given him personally in endeavouring to make the regulations such that they would be workable and practicable.

The PRESIDENT, in response, said the regulations put forward by the London County Council had for their primary object the protection of life and property. Personally, he would uphold those regulations throughout, because he felt convinced that, though they might at the time appear a little hard, they were for the benefit of London as a whole. He hoped that if anything were done in the future for their amendment that certain clauses would be added so as to place everything in such a condition that no one would be able to alter them in any shape or form. There might be one or two present who considered that the regulations were a little hard, but he thought that when the Act was thoroughly gone into and applied it would be found that they would be beneficial all round. Next session the council of the institute were going to institute educational lectures for the younger men, and he trusted that they would be attended not only by the younger but also by some of the older men, so as to give every help to the lecturer. He was happy to say that the total number of members was 920, but hoped before the end of the year that the number would be 1,000, and that in the next year or so they might see the number increase to 2,000.

Mr. F. E. WENTWORTH SHEILDS, in proposing "The Visitors," said they were now able to point with pardonable pride to their membership, and to say that the work which they had done had been useful, not only to structural engineers, but to the world at large, and particularly to the citizens of London. They were able to say they had formed rules by which the regulations and the drawing of reinforced concrete designs would in future be simplified. They were glad to be able to point to the fact that they had been able to draw up rules under which they hoped that in future their structures would not only be strong, but would last for their generation and many generations to come. They were able also to say with satisfaction that Parliament had entrusted them with the work of offering their criticisms and their suggestions to the rules which the London County Council had drawn up for the guidance of builders in reinforced concrete.

Lieut.-Colonel HOLMAN replied to the toast.

Sir HENRY TANNER, F.R.I.B.A., afterwards proposed the toast of The President, which was drunk with musical honours. Mr. WELLS responding in brief terms.

## THE ABUSE OF ROADS AND ITS PREVENTION.

### AXLE WEIGHTS OF HEAVY MOTOR CARS.

A subject of intense importance at the present time is the increase in the cost of upkeep of highways, the dust problem, and the alteration in the traffic that makes use of the roads. It has been pointed out in a contemporary that there has been placed in the hands of the local authorities no adequate and convenient means of checking the axle weights. While the Heavy Motor Car Act came into operation as long ago as March 1, 1905, no necessity was placed on the authorities to provide means to ascertain whether the Act was being carried out, or, in other words, whether the roads were being illegally used.

It is generally admitted that the greatest cause of the damage to the roads is the breaking of the crust by the traffic of the heavy motor cars. As is pointed out in the article referred to, all necessary regulations are embodied in the Act, and it is also clearly shown that the ordinary public weighing machine is not so constructed as to ascertain the axle weights of heavy motor cars of varying wheel bases, and that it might be difficult to get a conviction if the ordinary public weighbridge were used.

With these facts before us the natural question arises—what is the remedy? It is claimed to be supplied by the machine styled the Aveling & Avery patent axle-weight ascertainer. This machine requires no weigh-house, but, instead, foundations for the machine must be fixed permanently at suitable positions on the main roads of a district—a far less expensive undertaking. The machine consists of two 6-ton portable weighing platforms, the gross weight of which is not more than 24 cwt., and these can be erected where required by one man in three hours at any time that the road authority may require their use. When not in use, the foundations are covered with locking chequered plates, provided for the purpose. The sites for the foundations should be so chosen that water can be conveniently obtained, in order to fill up the tanks of the heavy car to be tested. The vehicle is then run on to the platform and the weights on the two axles are taken, registered and printed on two tickets. If either axle weight exceeds 8 tons, the vehicle is being run illegally, and the owner can be proceeded against under Article XIII. of the Order, nor must the total weight exceed 12 tons.

Since the penalties are heavy and the use of a vehicle infringing the regulations is forbidden, it is unlikely that any owner would run the risk of prosecution were the means of testing ready to hand, and it is estimated that the initial expense of providing the platforms and a certain proportion of machines for them would be a good investment, saving far more than interest, maintenance and working expenses in the diminished cost of upkeep of the roads.

The Bucks County Council, we believe, will be the first to adopt this manner of self-protection, and the results will be watched with great interest by county surveyors.

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**Coalville Gasworks.**—For the first time since these gasworks were purchased by the Coalville Urban Council by compulsory arbitration, some fourteen or fifteen years ago, a profit is this year shown. The profit in the revenue account amounted to £2,805, and this, transferred to capital account, was sufficient to meet the expenses and to show a balance of £120. Hitherto there has been a deficit which has had to be met out of the general district rate.

**Lawyer-Surveyor.**—A primary election was held in Illinois yesterday [April 9th] to select candidates for various State and county offices. Among the offices to be filled was that of county surveyor of Cook county. One of the candidates for the position, who, by the way, had the indorsement of several municipal associations and the support of some of the newspapers, was a lawyer, who had the further qualifications that "he has had experience in the office of county surveyor." Possibly the duties of the county surveyor of Cook County are such that they can be performed by a disciple of Blackstone. If this is the case, the duties of the position differ from those of similar positions elsewhere. Perhaps the pecuniary rewards differ also, which would explain the entrance of a member of the legal profession into the engineering field. From *Engineering and Contracting*.

## HORTICULTURE AT ENGINEERING WORKS.

Factories and works, especially in London, are so often associated with smoke and dirt, and generally unhealthy circumstances, that our photograph of a part of the Talbot motor works should prove interesting as a contradiction to the generally mistaken idea. The view we show is only part of the gardens round the home of the "Invincible Talbots," and that they receive some of the care and supervision that has made Talbots "invincible" is obvious. It is the little things that count, and it cannot be doubted

The Garden at the Talbot Works.

that surroundings such as these must have a beneficial influence upon the minds of the workers, which naturally is reflected in the quality of their work—the production of the Talbots.

**The Great Main Roads.**—Questions are being raised in private Bills now before Parliament which may affect the future of the great main roads of the country, the maintenance of which some think must inevitably, sooner or later, become a charge upon the taxes instead of the local rates. The Keighley Corporation have a Bill before one of the Standing Committees which asks power to run trackless trolleys outside their own area. The trollies would run over both county and district roads, and the West Riding County Council in consequence demanded a contribution from the Keighley Corporation for the upkeep of their roads. This demand the committee has declined to grant. The Corporations of Leeds and Bradford last year promoted trackless trolleys Bills, but they did not seek permission to run them outside the corporation areas. These cars, which only carry some twenty-six passengers, do not damage the roads nearly as much as do the heavy motor lorries which are run along the main roads by night, or as much as motor-omnibuses. Yet the view which county councils are beginning to take is that they should receive an upkeep payment in respect of trackless trollies. It follows, *a fortiori*, that soon they will ask for maintenance contributions from the motor lorry companies and other bodies which put heavy traffic upon the roads. Several other trackless trolley Bills are now before the House of Lords, so that this question will shortly be raised again. Then, too, there is the Light Railways Bill promoted by the Board of Trade, which is now before a Standing Committee, a Bill which obviously raises the question of the responsibility for the maintenance of the main roads. Tramway companies have to pay for the maintenance of the track and 9 in. on each side of it. Light railways, which are often run along the waste grass by a roadside, should, in such case, it will be contended, contribute to the repair of the roads. The question of the maintenance of the main roads will thus be further complicated. At present the motor lorries, which are the chief offenders, pay nothing but the petrol tax, and their liability will become an issue in the future. The subject is in need of simplification, if Parliament had the time to devote to it. The chronic congestion of Parliamentary business will probably result in its being treated for the present in a piecemeal and most unsatisfactory manner.—*The Times*.

## SOCIETY OF ENGINEERS.

### THIRD ANNUAL DINNER.

The annual dinner of the Society of Engineers was held on Saturday evening at the Criterion Restaurant, the president, Mr. John Kennedy, being in the chair. Among the guests, who included many ladies, were Sir W. H. Christie, K.C.B., F.R.S., F.R.A.S., HON.F.S.E., Sir David Gill, K.C.B., F.R.S., Sir Maurice Fitzmaurice, K.C.M.G., M.A., HON.F.S.E. (chief engineer to the London County Council), Prof. Henry J. Spooner, ASSOC.M.INST.C.E., M.I.MECH.E., Mr. H. Percy Boulnois, M.INST.C.E. (chairman of the Royal Sanitary Institute), Mr. A. Siemens, HON.F.S.E., Mr. F. W. Bridges, Mr. Henry R. Champness (assistant director of naval construction), Mr. J. W. Wilson, M.INST.C.E., M.I.MECH.E., Mr. William Clarke, M.INST.C.E., HON.F.S.E., Mr. Robert W. A. Brewer, ASSOC.M.INST.C.E., Mr. Maurice Ockenden, Mr. D. B. Butler, ASSOC.M.INST.C.E. (past-president), Mr. W. B. Esson, M.INST.C.E., Mr. Henry C. Adams, ASSOC.M.INST.C.E., M.I.MECH.E., Mr. G. Lacygood, M.INST.C.E., Mr. Arthur Valon, ASSOC.M.INST.C.E., and Mr. A. S. E. Ackermann, ASSOC.M.INST.C.E. (secretary).

The loyal toasts having been proposed by the president,

Sir David Gill submitted "The Society," and remarked that it was established in the first instance by students, and for several years existed as a club, after which the name Society of Engineers was adopted. Such names as Kelvin and Playfair, which had been associated with the society, were names to conjure with in the engineering world. The society owed much to its presidents and officers, especially to Mr. Williams. In his (the speaker's) opinion a mechanical engineer ought to be a civil engineer, and *vice versâ*, for he liked a man to be an all-round engineer; and it was, he thought, a very good feature of the society that they did not make a distinction between the two, but merged them in one. The members were possessed of the common sense of dining together in friendly company, thus promoting good feeling and goodwill, and they had the chivalry to invite their ladies to the table on these occasions.

Mr. Arthur Valon, in response, said he would suggest that they should look upon the Society of Engineers and the Civil and Mechanical Engineers' Society as two phœnixes who had given birth to one society. The amalgamation had been most satisfactory, and the members claimed that they were the most democratic of any engineering society in existence. They had instituted an examination for fellowship, thus following the Institution of Civil Engineers, except that they made it an examination at entrance, whereas the Society of Engineers made it an examination for the higher class of members, and they considered that that examination represented the last word in engineering examinations. Other activities had been started, in particular that of rendering legal assistance where the cases were likely to be of general professional interest. Altogether he thought they had undoubtedly during the last two years reaped ample benefit from the reorganisation of the society.

The toast of "The Ladies" was proposed by Mr. J. W. Wilson, who, alluding to the proposition that the education of engineering students ought to be standardised, argued that such a system would produce a dead level of capacity, and tend to make every engineer exactly alike. It was an appalling prospect, and personally he said, Heaven forbid!

A brief and appropriate acknowledgment was made by Miss Siemens.

The company then proceeded to the reception-room, where they listened with appreciation to an extended programme of music carried out by Messrs. Harold Wilde, George Baker, Misses Carrie Herwin and Ethel Bentlestone, under the direction of Mr. Charles Capper.

**Odhams, Limited.**—We are informed that the issue of 6 per cent Cumulative Participating Preference Shares advertised in our issue last week has been over-subscribed.

## NEW STONEWARE PIPE JOINTS.

The Ames Crosta Sanitary Engineering Company, Limited, 12 Victoria-street, Nottingham, are putting on the market two new patent joints for stoneware pipes, one, the "Standard" grout joint, being intended for work in bad ground, and the other, the "Flexible" joint, having been designed for use in ground liable to subsidence.

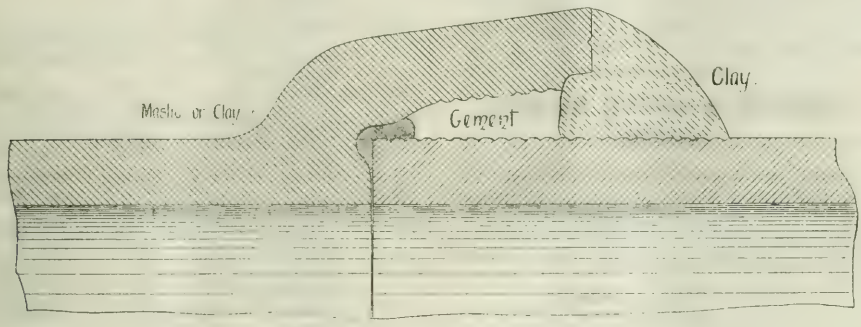
Efficiency, economy and simplicity are the claims advanced on behalf of the first-mentioned joint, and special points in connection with it are the absence of composition rings, provision for true alignment by means of a taper ring formed at the bottom of the socket, sealing chambers at the shoulder of the socket, and a buffer stop and key at the entrance of the socket for a clay or mastic seal, in addition to ample space for grouted cement joint between the seals. The special formation of the socket to secure the advantages claimed is so designed as to be readily made by the pipe machine, and it is therefore produced at the lowest possible cost.

Even in badly water-logged ground the "Standard" grout joint is very simple to make. Before lowering the pipes in the trench a small roll of puddled clay or other mastic material is pressed in the recess in the shoulder of the socket, as shown in the illustration. Care must be taken not to get this roll too large, or more space than is necessary may be taken up with this seal. The spigot of the pipe is gently tapped home with a wood mallet or ram, and a long length of pipes laid in this way before the outer seals are put on and the joints prepared for grouting.

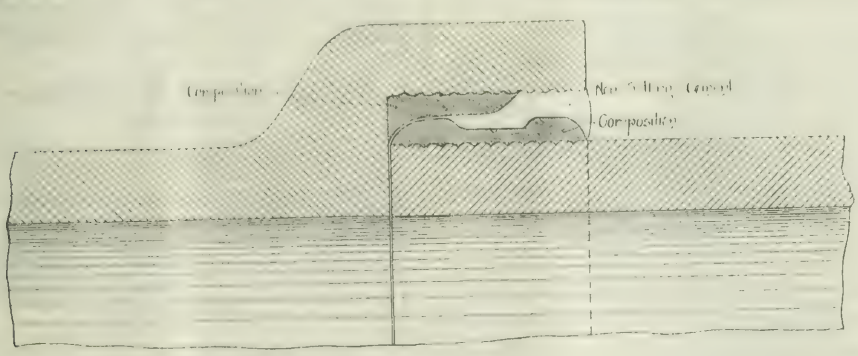
A large roll of well puddled clay or mastic material is next well pressed around the entrance to the socket of each joint, after which a clay cup is formed around the three grouting holes, with a division between the holes. The cement grouting is then poured down one of the side holes until it rises in the hole on the opposite side, and the centre hole, ensuring that all water and air has been forced out of the joint. If, however, it is found that there is a slight leakage in any of the seals, the joint should be left for a short time and the other joints proceeded with. It will be found if the leaking seals are left for a short time that the cement will have healed up the leak, and the joint may then be grouted up in the usual way. There is ample space for a perfect joint to be made with the grouted cement, but if preferred the clay seal at the entrance to the socket may be removed and the joint finished with a fillet of stiff cement.

It will be apparent that with this form of socket grouting may be dispensed with in good ground if desired, and the joints made with stiff cement, in the usual way. The extra depth and formation of the socket, together with the provision for securing a true alignment, are claimed to ensure a perfect joint being made, with proper care, under ordinary circumstances.

The flexible joint has been designed to obviate the bursting of sockets which frequently takes place in moving ground. It will be seen from the illustration that a special formation of bitumen ring is used on the spigot and in the socket, forming a ball and cup joint at the seat of the socket, which permits a movement in any direction. A special sealing chamber for mastic non-setting cement is provided on the spigot end, the seal formed by the mastic cement in this chamber not being destroyed by movement of the spigot in the socket, as the mastic is simply displaced longitudinally in the socket. The joint is so formed as to take a minimum amount of mastic cement, and at the same time allow for ample movement without damage to the sockets in case of subsidence. The cement used is imperishable and acid-proof, and will retain its life as long as the pipes last. Before the pipes are lowered in the trench a thin coating of mastic cement is smeared on the bitumen ring in the socket. The recess in the ring on the spigot is well filled with mastic cement, the spigot tapped gently home with a wood mallet or ram, and as much mastic cement as the joint will take is afterwards tooled in.




The "Standard" Grout Joint.




The "Flexible" Joint.

**Burton-on-Trent Tramways.**—The annual report of the Burton Corporation tramways gives the total income for the year at £16,165, an increase of £798, and the receipt from traffic £14,822, an increase of £832. Each quarter of the year revealed a substantial improvement.

## PLANNING OF WORKING-CLASS DWELLINGS.

At a Southern District meeting of the Institution of Municipal Engineers, held in the council chamber on May 8th, Mr. Sidney Palmer (Member) presented a paper entitled "The Planning of Working-Class Dwellings." The chair was taken by Mr. Horace Boot, vice-president and chairman of the district.

Mr. Palmer subdivided his paper into six sections, dealing respectively with site, accommodation, elevation, construction, decoration and sanitary arrangements, and he illustrated the various points by reference to a set of plans which he had prepared.

There was a good attendance of members, from both the Southern and South-Eastern Districts, and the paper was freely criticised and discussed.

The paper will, we understand, appear in the May issue of the Journal of the Institution.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President*—Mr. Albert D. Greatorex, M.Inst.C.E., Borough Engineer and Surveyor of West Bromwich.

The official programmes of the meetings of the Institution of Municipal and County Engineers to be held in Paris and Stirling are appended:—

### VISIT TO PARIS, WHITSUNTIDE.

ITINERARY.

*Thursday, May 23rd.*

9.30 a.m.—Assemble at Victoria Station (L.B. and S.C. Railway).
10 a.m.—Train leaves London.
7.12 p.m.—Arrive at Paris.

*Friday, May 24th.*

10 a.m.—Conveyances leave hotel.
10.30 a.m.—Meet at the hall of the Société des Ingénieurs Civils, 19 Rue Blanche.
Return to hotel for luncheon.
2 p.m.—Leave hotel.
2.30 p.m.—Reception at the Hotel de Ville (morning dress), after which the members will proceed to inspect works of the public highways.
4.30 p.m.—Visit reservoirs of Montmartre.

*Saturday, May 25th.*

8.30 a.m.—Conveyances leave hotel.
9 a.m.—Visit the sewers, starting from Place du Chatelet after which visit works of the public highways.
11 a.m.—Visit the reservoirs of Montsouris.
Lunch at the buffet of the Gare de Lyon.
2.30 p.m.—Visit the filters at St. Maur, and apparatus for purification by ozone.
4 p.m.—Visit the filters at Ivry, and apparatus for treatment by ultra-violet rays.

*Sunday, May 26th.*

Day left free for individual action.

*Monday, May 27th.*

9 a.m.—Conveyances leave hotel.
9.30 a.m.—Visit the electricity works of Paris at St. Denis.
10.30 a.m.—Visit the Plain du Gennevilliers et l'Usine de Colombes.
Luncheon at Maisons-Laffitte.
2.30 p.m.—Visit the purification works at Carrières-Triel du Picquenard et d'Achères.

*Tuesday, May 28th.*

9 a.m.—Conveyances leave hotel.
9.30 a.m.—Visit the works of the Metropolitan Railways: Paris at the Mirabeau Bridge. (Cross the Seine.)
11 a.m.—Visit the works of the manufacture of paving [illegible] Quai de Javel.
Return to hotel for luncheon.
2 p.m.—Leave hotel.
2.30 p.m.—Visit municipal dust destructor works at Romainville.
4 p.m.—Visit [illegible] at Laval, Avenue de Par[illegible]

*Wednesday, May 29th.*

9.15 a.m.—Conveyances leave hotel for St. Lazare Station.
10.15 a.m.—Train leaves for Dieppe.
7.35 p.m.—Arrive London.

Thomas Cole,
*Secretary.*

### SCOTTISH DISTRICT MEETING AT STIRLING.

(June 7th and 8th.)

PROGRAMME.

*Friday, June 7th.*

11 a.m.—Reception in the Albert Hall, Stirling, by Provost Bayne and the magistrates of Stirling.
11.10 a.m.—District business.
11.30 a.m.—Discussion on paper (which will be taken as read) entitled, "The Municipal Works of Stirling," by Mr. A. H. Goudie, burgh surveyor, Stirling.
12.15 p.m.—Discussion on paper (which will be taken as read) entitled, "Work Carried Out in Central Stirlingshire under the Road Development Grant," by Mr. D. F. Cox, county road surveyor.
1 p.m.—Luncheon, provided by Stirling Town Council.
2 p.m.—Inspection of burgh works, &c., and county improved roads and quarry.
Mr. Morris, town clerk, Stirling, has kindly consented (should a sufficient number so desire) to conduct members and their lady friends through the Castle and upper part of the town, and point out and describe the buildings of historical and antiquarian interest.
6.30 p.m.—Annual dinner, Golden Lion Hotel, tickets 5s. each.

*Saturday, June 8th.*

Circular tour by motor char-a-banc from Stirling to Lochearnhead, *viâ* Callander and Strathyre, and returning by St. Fillans, Comrie and Crieff.

The following is the probable time table of the tour:—

9.30 a.m.—Leave Stirling, Golden Lion Hotel.
12.30 p.m.—Lunch at Lochearnhead Hotel.
1.30 p.m.—Leave Lochearnhead Hotel.
3.15 p.m.—Afternoon tea, Drummond Arms Hotel, Crieff.
3.45 p.m.—Leave Crieff.
5.45 p.m.—Arrive Stirling.

Tickets for the tour, including lunch, 8s. 6d. each (exclusive of tea at Crieff, which can be arranged personally), can be obtained from the honorary district secretary. Those intending to make the tour should intimate their intention at least a week before the date.

David Ronald,
*Hon. District Secretary.*

Falkirk, N.B.

The following meetings have also been arranged:—

June 1st.—Council meeting.
June 15th.—East Ham.
June 22nd.—Lowestoft.
June 29th.—Bridlington.
July 6th.—Stourbridge.
July 11th—13th.—Annual meeting, London.

Provincial members who propose to take part in the visit to Paris will, in cases where the journey exceeds a distance of 30 miles, be able to obtain return tickets to London at a single fare and a quarter.

Thomas Cole,
11 Victoria-street, S.W. *Secretary.*

## ROYAL SANITARY INSTITUTE.

### MEETING AT BLACKPOOL.

On the 24th inst., at Blackpool Town Hall, discussions will take place on "The Card Index System as applied to Public Health Work," to be opened by E. W. Rees-Jones, M.D., D.P.H., M.O.H., and on "A Description of the Joint Scheme of Sewerage for Thornton le Fylde, Bispham with Norbreck and Carleton," by Arthur Hindle, Assoc.M.Inst.C.E. On Saturday, May 25th, visits will be arranged to the new promenades, the new main sewerage works for Thornton le Fylde, Bispham-with-Norbreck and Carleton, and the new main drainage works of the Fleetwood Urban District Council.

## INSTITUTION OF MUNICIPAL ENGINEERS.

*President*—Mr. E. A. STICKLAND, ASSOC.M.INST.C.E., Borough Surveyor, Windsor.

### NORTHERN DISTRICT MEETING.

A meeting of the above district will be held at Sunderland, on Saturday, May 18th.

PROGRAMME.

2.30 p.m.—Meet at town hall for short business meeting.
3.15 p.m.—Visit to Ayres Quay gasworks.
4.15 p.m.—Visit to Wear Portland Cement Works.
5.15 p.m.—Visit to infectious diseases hospital.
6 p.m.—To examine "Durax" paving, Newcastle-road.

JOHN ROBINSON,
*Hon. District Secretary.*

Union Offices,
Darlington.
May 8, 1912.

A discussion on "Water Softening" will be opened by the chairman of the South-Eastern District of the institution in the council chamber, 4 Southampton-row, London, W.C., on Wednesday, May 22nd, at 7.30 p.m.

Open discussion, in which it is hoped that several experts will take part, is invited.

Dr. J. F. Meyer will read some notes on the Permutit system, now being introduced into this country. Copies of these notes can be obtained from the secretary of the institution, 39 Victoria-street, S.W.

Members of the Southern District are specially invited to attend the meeting.

BERNARD PARTRIDGE,
*Hon. District Secretary.*

Town Hall,
Walthamstow.

### COUNCIL MEETING.

The next meeting of the council of the institution will be held on Wednesday, May 22nd, at 5.30 o'clock.

A visit will be paid to the show rooms and works of Messrs. Doulton & Co., Limited, Albert Embankment, London, on Wednesday, June 5th, at 2.30 o'clock.

Members will assemble in the show rooms at 2.30, and the processes to be seen during the round of visits will include the manufacture of drain pipes and other sanitary stoneware, fireclay stoves, architectural terra-cotta, and Doulton and other art ware.

B. WYAND,
39 Victoria-street, S.W. *Secretary.*

## ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

*President*—Mr. J. D. WATSON, M.INST.C.E., F.R.S.I.

### MIDLAND DISTRICT: VISIT TO LICHFIELD SEWAGE WORKS.

By the kind permission of the Mayor (Mr. Councillor C. T. Wigham) and the chairman of the Sanitary Committee (Mr. Councillor H. Y. C. Winterton), a visit of inspection will be paid to the above works on Saturday, May 25th.

PROGRAMME.

3 p.m.—Meet at Guildhall (about three minutes' walk from City Station), where the members will be welcomed by his Worship the Mayor.
3.15 p.m.—Paper to be read by Mr. W. B. Chancellor, city surveyor, on "Lichfield Sewerage and Sewage Disposal."
3.45 p.m.—Proceed to sewage farm, Curborough, by motor brake.
4 p.m.—Arrive at outfall works.
4.45 p.m.—Leave outfall works.
5 p.m.—Arrive at Guildhall, where the members will be entertained by his Worship the Mayor.

Members intending to be present must notify the district secretary not later than Wednesday, May 22nd, so that arrangements can be completed.

### MEETING AT GLASGOW.

A meeting of the association is to be held at Glasgow on Saturday, June 8th.

## INSTITUTION OF WATER ENGINEERS.

### SEVENTEENTH SUMMER GENERAL MEETING.

The seventeenth summer general meeting will be held at Cheltenham on Thursday, Friday and Saturday, the 6th, 7th and 8th of June next, under the presidency of Mr. J. S. Pickering, M.INST.C.E., borough surveyor and water engineer. The meetings will be held in the town hall, and at the opening of the proceedings on Thursday, June 6th, the institution will be welcomed to Cheltenham by His Worship the Mayor (Councillor C. H. Margrett, J.P.) The programme will include the presentation of premiums awarded by the council for papers presented during the year 1911, as well as other business of special interest to members, so that a large attendance is confidently anticipated.

PAPERS AND COMMUNICATIONS.

The following papers have been promised for reading and discussion at this meeting:—

(1) "The New Waterworks for Skegness," by Percy Griffith, M.INST.C.E. (held over from the last winter meeting).
(2) "The Rating of Water Undertakings," by Donald Dinwiddy, F.S.I.
(3) "The Rating of Water Undertakings," by Arthur Valon, ASSOC.M.INST.C.E.
(4) A discussion upon the desirability of standardising the "General Conditions of Contracts" will be introduced by Harold W. Woodall, M.INST.C.E., water engineer, Bournemouth.
(5) "The Hinckley Waterworks," by E. H. Crump, ASSOC.M.INST.C.E.
(6) "The Gloucester Waterworks (Whitcombe Reservoirs)," by R. Read, ASSOC.M.INST.C.E., city engineer.
(7) "The Use of Sulphate of Copper in Purifying Water Supplies," by Geo. Embrey, county analyst of Gloucestershire.
(8) "The Self-pollution of Water by Natural Growths," by Dr. J. H. Garrett, medical officer of health, Cheltenham.
(9) "The Geology of Cheltenham, with Special Reference to the Water Supply," by L. Richardson, F.R.S.(ED.), F.L.S., F.G.S.

NOTE.—Papers (2) and (3) will be discussed together.

The president-elect, Mr. J. S. Pickering, will deliver his presidential address on Thursday, June 6th, and will also supply a description of the Cheltenham Corporation waterworks. Dr. Samuel Rideal will give a few descriptive notes on the pre-filtration process now being introduced at the Tewkesbury works.

VISITS TO WORKS.

On Thursday afternoon a visit will be made to the Tewkesbury waterworks of the Cheltenham Corporation, including pumping station, new pre-filtration plant, &c.

On Friday afternoon a visit will be made to the Dowdeswell reservoir and filters, also the Hewletts reservoirs of the Cheltenham Corporation waterworks.

On Saturday afternoon a visit will be made to the Witcombe impounding reservoirs and filtration works of the Gloucester Corporation waterworks.

SOCIAL FUNCTIONS.

The annual dinner will be held at the town hall on Friday evening, June 7th, when the Mayor of Cheltenham and other distinguished guests of the institution will be present.

On Thursday evening members and their friends are invited by the Town Improvement Committee to attend at Montpellier Gardens from 8 p.m. till 10 p.m., when a concert will be given by the Munster Fusiliers.

On Friday afternoon members and their friends are invited by the Mayor of Cheltenham to attend a garden party in Pittville Park, from 5 p.m. to 6 p.m.

Tea will be provided on Thursday afternoon at the Tewkesbury pumping station, and on Saturday afternoon at the Gloucester waterworks.

The manager of the light railway company has arranged for members and their friends to have free use of the trams during the meeting, on presentation of programme card.

Admission to the public parks and gardens may be obtained free during the meeting on presentation of programme card.

PERCY GRIFFITH,
*Secretary.*

54 Parliament-street, S.W.

## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

SANITARY INSPECTOR.—May 18th.—Corporation of Manchester. 35s. per week.—Chairman of Sanitary Committee.

SURVEYOR.—May 18th.—Newhaven Urban District Council. £130—£150 per annum.—Mr. E. Knightley, clerk.

GENERAL FOREMAN. May 22nd. Bethnal Green Borough Council. £150—£172 10s. per annum. Mr. C. G. E. Fletcher, town clerk.

ROAD FOREMAN.—May 22nd.—Silsdon Urban District Council. 25s. per week.—Mr. H. Longbottom, surveyor.

TEMPORARY ENGINEERING ASSISTANT.—May 22nd.—Corporation of Brighouse. £3 per week.—Mr. Jas. H. Rothwell, town clerk.

ENGINEERING ASSISTANT.—May 24th.—Corporation of Nelson. £85 per annum.—Mr. J. H. Baldwick, town clerk.

BOROUGH SURVEYOR.—May 25th.—Corporation of Buckingham. £100 per annum.—Mr. Thomas R. Hearn, town clerk.

INSPECTOR OF NUISANCES.—May 25th.—Wells-next-the-Sea Urban District Council. £100 per annum.—Mr. E. B. Loynes, clerk, Wells, Norfolk.

FOREMAN. — May 28th. — Stroud Urban District Council. £104 per annum.—Mr. E. N. Wichell, clerk, 1 Lansdown, Stroud.

GENERAL FOREMAN.—May 29th.—Corporation of Lewes. 35s. per week.—Mr. David Roberts, borough surveyor.

SURVEYOR.—May 29th.—Carmarthenshire County Council. £200 per annum.—Mr. J. W. Nicholas, clerk, county offices, Carmarthen.

ASSISTANT ENGINEER FOR BUILDINGS AND ARCHITECTURE.—May 31st.—Municipality of Bombay. 600 rupees—800 rupees per month. — Mr. P. R. Cadell, municipal commissioner.

## MUNICIPAL COMPETITIONS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

HASTINGS.—May 18th.—Sunk arena and bandstand (cost not to exceed £4,500). Premiums 15 and 10 guineas.—The Town Clerk.

SOUTHEND.—May 22nd.—Designs for a council school. Premiums £25, £15 and £10.—The Education Office, Municipal Buildings.

LIANELLY.—May 24th.—Tenders and designs for a bandstand, for the urban district council.—Mr. H. W. Spowart, clerk, Town Hall. Envelope to be endorsed "Bandstand."

LYMINGTON.—May 25th.—Designs for public offices. Premiums 30 and 15 guineas. Assessor, Mr. R. F. Gutteridge, F.R.I.B.A., town clerk.

LLANELLY.—June 18th.—Designs for school buildings, comprising boys', girls' and infants' departments, for the urban district council. Premium 50 guineas. —Mr. I. W. Watkins, clerk, Education Office, Coleshill-terrace, Llanelly.

HALE.—June 28th.—Designs for a town planning scheme for the urban district council. Premiums of £50 and £25 are offered.—The Clerk.

PADIHAM.—June 30th.—Designs for town hall and baths. Premiums £40 and £20. Mr. J. Gregson, surveyor.

DUSSELDORF.—July 1st.—Plan for the extension of the city. Premiums of £1,000 and £375 are offered. - The Chief Burgomaster.

CARDIFF.—August 6th.—Designs and estimates for fire station.—The Town Clerk.

BIRMINGHAM.—Designs for public baths. Premiums 20 and 10 guineas for second and third designs. Superintendent Engineer, Kent-street.

## MUNICIPAL CONTRACTS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

### Buildings.

COVENTRY.—May 18th—June 17th.—For the erection of municipal buildings, for the corporation.—Mr. G. Sutton, town clerk.

COVENTRY.—May 18th.—For the erection of three branch libraries, for the corporation. — Mr. J. E. Swindlehurst, city surveyor.

GLOUCESTERSHIRE. May 18th. For the erection of a handicraft and cookery centre, for the Education Committee. Mr. R. S. Phillips, architect, Shire Hall, Gloucester.

ESSEX.—May 18th.—For repairs at council school, for the Education Committee.—Mr. W. Adams, clerk, 14 Church-street, Saffron Walden.

COSELEY.—May 20th—June 17th.—For the erection of a council school, for the Education Committee.—Mr. Fred. J. C. Poole, secretary, Education Offices, Coseley, near Bilston.

LEEDS.—May 20th.—For constructing market entrance and alterations to shops, for the Markets Committee.—Mr. W. T. Lancashire, city engineer.

BERWICK.—May 20th.—For the construction of a convenience, for the Sanitary Authority.—Mr. W. Weatherhead, clerk.

WEST RIDING.—May 20th.—For the erection of two schools, for the Education Committee. — Education Architect, County Hall, Wakefield.

RADNORSHIRE.—May 21st.—For the construction of a small bridge, for the county council.—Mr. T. L. Wishlade, surveyor, Penybont.

CARDIFF.—May 21st.—For the erection of a disinfecting station, for the corporation. — Mr. J. L. Wheatley, town clerk.

NORFOLK.—May 21st—June 5th.—For the erection of two schools and other work, for the Education Committee.—Mr. T. A. Cox, secretary, Shire Hall, Norwich.

WALLINGFORD.—May 21st.—For alterations to isolation hospital, for the Joint Hospital Board.—Mr. P. C. A. Slade, clerk, 7 St. Martin's-street, Wallingford.

DURHAM.—May 21st.—For the erection of four schools, for the county council.—Mr. A. J. Dawson, Shire Hall, Durham.

LUTON.—May 21st.—For the erection of a cookery centre, for the corporation.—Borough Engineer.

CARDIFF.—May 22nd.—For the construction of boundary wall, railings and entrance gate at cemetery, for the corporation.—Mr. W. Harpur, city engineer.

GLAMORGAN.—May 22nd.—For building four schools and various works at schools, for the county council. — Mr. T. Mansel Franklen, clerk, County Council Offices, Westgate-street, Cardiff.

CHELMSFORD.—May 22nd.—For the construction of a public convenience, for the corporation.—Mr. W. Smith, town clerk.

SOUTHEND-ON-SEA.—May 22nd.—For the erection of a council school at Hamstel, for the Education Committee.—Mr. J. W. Barrow, clerk.

HARWICH.—May 22nd.—For the erection of a convenience, for the corporation.—Mr. A. J. Ward, town clerk.

OSWESTRY.—May 22nd.—For the erection of a park-keeper's lodge, for the corporation.—Mr. G. Wm. Lacey, borough engineer and surveyor.

RATHDOWN.—May 22nd.—For the erection of five labourers' cottages, for the rural district council.—Mr. P. Cunniam, clerk, Loughlinstown.

MOGDEN.—May 22nd.—For repairs to hospital, for the Joint Committee.—Mr. F. C. Greville-Smith, clerk, 213 High-street, Hounslow.

MANCHESTER.—May 22nd.—For the erection of ninety cottage flats, for the Sanitary Committee.—Mr. Thomas Hudson, town clerk.

WILTS.—May 22nd.—For the erection of a school, for the county council.—Mr. J. George Powell, county surveyor.

YEOVIL.—May 23rd.—For the erection of twelve houses, for the rural district council.—Mr. J. E. Rodber, clerk.

ESSEX.—May 23rd.—For alterations at a school, for the Education Committee.—Mr. J. H. Nicholas, secretary, County Offices, Chelmsford.

SALFORD.—May 23rd.—For rebuilding boundary walls, for the corporation.—Borough Engineer.

PEMBROKE.—May 23rd.—For the erection of a school, for the Education Authority. — Mr. O. T. Thomas, education architect, 8 Victoria-place, Haverfordwest.

CARDIGAN.—May 24th.—For erecting a school at Tregaron, for the county council.—Mr. Geo. Dickens-Lewis, county architect, 49 North-parade, Aberystwyth.

LLANELLY.—May 24th.—For the erection of twenty-four houses, for the urban district council.—Mr. Henry W. Spowart, clerk.

GLASGOW.—May 27th.—For the erection of a sub-generating station, for the corporation.—Town Clerk.

WEST SUSSEX.—May 28th.—For additions and alterations to school, for the Joint Education Committee.—Mr. Lionel Thompson, secretary, High-street, Worthing.

BRADFORD-ON-AVON.—May 31st.—For the construction of a retaining wall, for the urban district council.—Mr. James Compton, clerk.

SALFORD.—June 1st.—For the construction of an underground convenience, for the corporation.—Mr. W. Plant, engineer and surveyor.

CHURCH.—June 3rd.—For the erection of public conveniences, for the urban district council.—Mr. W. Wood, surveyor.

WEST HAM.—June 4th.—For building extension to electricity generating station and coal bunkers, for the corporation.—Mr. Fred E. Hilleary, town clerk.

BARNET.—June 4th.—For the erection of twenty-two cottages, for the urban district council.—Mr. H. W. Poole, clerk.

RAWTENSTALL.—June 5th.—For alterations at the market hall, for the town council.—Mr. J. Johnson, borough surveyor.

WEST HAM.—June 5th.—For the erection of refuse destructor and steam-raising plant, for the corporation.—Mr. Fred. E. Hilleary, town clerk.

SOUTHEND-ON-SEA.—June 6th.—For the construction of a new loading pier (580 ft. in length), for the corporation.—Mr. H. J. Worwood, town clerk.

MERTHYR.—June 10th.—For the erection of forty-eight workmen's dwellings, for the corporation.—Mr. T. A. Rees, town clerk.

HANWELL.—June 10th.—For the construction of a refuse destructor, for the urban district council.—Mr. Percy Scott, clerk.

ESSEX.—June 24th.—For repairs and alterations to schools, for the Education Committee.—Mr. D. T. Williams, clerk.

WIMBLEDON.—For the erection of public conveniences, for the Common Conservators.—Messrs. P. H. Clarke & Son, 2 Lancaster-place, Strand, W.C.

## Iron and Steel.

GLASGOW.—May 20th.—For the supply of iron and steel works for turbine foundations and engine-room floor, and erection of steam and water piping at power station, for the corporation.—Mr. J. Lindsay, town clerk.

SALFORD.—May 20th.—For the supply of steel tramway rails, for the corporation.—General Manager of Tramways, 32 Blackfriars-street, Salford.

PONTYPRIDD.—May 20th.—For the supply of steel and cast-iron pipes, for the Joint Water Board.—Mr. W. P. Nicholas, clerk, Gelliwastad-road, Pontypridd.

BISHOP'S STORTFORD.—May 21st.—For the supply of 145 tons of cast-iron pipes and special castings, for the urban district council.—Mr. Cecil J. Hancox, clerk.

ROCHDALE.—May 22nd.—For the supply of materials for an overhead line of electricity, for the Paving Committee.—Mr. W. H. Hickson, town clerk.

MARPLE.—May 23rd.—For the supply of spigot and socket pipes and specials, for the urban district council.—The Clerk.

LLANELLY.—May 24th.—For the supply of wrought-iron railings, for the urban district council.—Mr. H. W. Spowart, town clerk.

RHONDDA.—May 24th.—For the supply of cast-iron water pipes, special pipes and gratings, for the urban district council.—Mr. W. P. Nicholas, clerk.

HARRINGTON.—May 27th.—For laying new water mains, for the Joint Water Committee.—Mr. W. White, clerk, Council Offices, Harrington.

BRIDGWATER.—May 27th.—For the supply of and laying 3-in. cast-iron water pipes, for the rural district council.—Mr. T. M. Read, solicitor and clerk.

LEIGHTON BUZZARD.—May 29th.—For supply and fixing artesian-bored tube well, for the urban district council.—Mr. Reginald F. A. Tutt, clerk.

CHESHUNT.—June 7th.—For laying cast-iron and steel conduits, for the Metropolitan Water Board.—The Clerk, Savoy-court, Strand, W.C.

HOWRAH (India).—June 18th.—For the supply of steel pipes, cast-iron specials, sluice valves and air valves, for the municipality.—The Chairman, Howrah Municipality, India.

## Roads.

BOWDON.—May 18th.—For making up York-road, for the urban district council.—Mr. W. Paterson, clerk.

HALIFAX.—May 18th.—For carrying out private street works, for the corporation.—Mr. J. Lord, borough engineer.

EAST PRESTON (Sussex).—May 20th.—For the supply of flints, for the rural district council.—Mr. A. Shelley, clerk, Littlehampton.

WHITLEY AND MONKSEATON.—May 20th.—For constructing foundations of new streets and laying sewers, for the urban district council.—Mr. Augustus Whitehorn, clerk, 60 Saville-street, North Shields.

MONMOUTH.—May 20th.—For the supply of materials and for hauling broken and unbroken stone, for the county council.—Mr. W. Tanner, county surveyor, Newport, Mon.

GREAT HARWOOD.—May 20th.—For excavating, paving and kerbing (labour only), for the urban district council.—Mr. John B. Ingham, clerk, Town Hall, Great Harwood.

EPSOM.—May 20th.—For the making-up of Norman-road, for the rural district council.—Mr. T. E. Ware, surveyor of highways.

HORNSEY.—May 21st.—For sewering, levelling, paving, metalling, kerbing and channelling, for the corporation.—Mr. E. J. Lovegrove, borough engineer and surveyor.

WILLESDEN.—May 21st.—For wood paving, laying natural rock asphalt, and road making, for the urban district council.—Mr. O. C. Robson, engineer.

TOTTENHAM.—May 21st.—For the improvement of St. Ann's-road junction with Seven Sisters-road, for the urban district council.—Mr. Edward Crowne, clerk.

ACTON.—May 21st.—For tar-spraying certain roads, for the urban district council.—Mr. W. Hodson, clerk.

SOUTH TOTTENHAM.—May 22nd.—For wood-block paving and tarring works, for the Metropolitan Asylums Board.—Mr. T. Duncombe Mann, clerk.

FAILSWORTH.—May 22nd.—For private street improvement works, for the urban district council.—Mr. H. C. Broome, clerk.

GOSFORTH.—May 22nd.—For carriageway and footway construction, for the urban district council.—Mr. G. Nelson, engineer and surveyor.

ISLE OF THANET.—May 23rd.—For making up a private street, for the rural district council.—Mr. Chas. Taylor, clerk.

NEWPORT (Mon.).—May 23rd.—For making up a street, for the corporation.—Mr. A. A. Newman, town clerk.

INVERNESS.—May 24th.—For laying concrete footways and repairing gravel footways, for the corporation.—Burgh Surveyor.

NELSON.—May 25th.—For making up several streets, for the corporation.—Mr. W. Shackleton, borough engineer and surveyor.

WEST RIDING.—May 25th.—For works of excavation and rubble pitching, for the Highways Committee.—Mr. F. G. Carpenter, county surveyor, County Hall, Wakefield.

GODSTONE.—May 27th.—For the supply of broken granite, Kentish ragstone, Chichester gravel and chippings, tar-macadam, consolidation of tar-macadam, kerb, channelling, and hire of steam roller, for the rural district council.—Mr. Geo. E. Crowter, engineer and surveyor.

YORK.—May 27th.—For channelling and laying tar-macadam over cobbles in thirty-six streets, for the corporation.—Mr. F. W. Spurr, city engineer.

MELKSHAM.—May 27th.—For steam rolling and scarifying, for the rural district council.—Mr. F. U. Greenhill, district surveyor.

GREETLAND.—May 29th.—For the supply of Lancashire setts, broken granite macadam, knotted random flags, and dressed kerb, for the urban district council.—Mr. F. J. Mallinson, surveyor.

MIDDLETON.—May 29th.—For private street works, for the corporation.—Mr. Frederick Entwistle, town clerk.

LLANTRISANT AND LLANTWIT.—May 29th.—For the completion of the new Ely Valley-road and branch roads, for the rural district council.—Mr. Gomer S. Morgan and Mr. Thomas Saunders, engineers, School-street, Pontyclun, Glam.

WANSTEAD.—May 30th.—For widening, kerbing and channelling, for the urban district council.—Mr. Bruce Blewitt, clerk.

ASHFORD.—May 30th.—For the supply of gauge-broken granite, for the urban district council. Mr. W. Terrill, surveyor, 5 North-street, Ashford, Kent.

WIDNES.—May 30th.—For works of making up and paving, and the supply of granite setts or syenite cube setts, for the corporation.—Mr. H. S. Oppenheim, town clerk.

CHURCH.—May 30th.—For making up a road, for the urban district council.—Mr. J. R. Reddish, clerk.

BLACKROCK.—June 1st.—For laying 30,000 sq. yds. of tar or bituminous macadam, for the urban district council.—Mr. R. Finlay Heron, town clerk.

ELY.—June 1st—3rd.—For the supply of machine-broken Leicestershire granite, for the urban district council.—Mr. G. M. Hall, clerk, Market-square, Ely.

COLCHESTER.—June 11th.—For sewering, metalling, kerbing, channelling, paving and making good, for the corporation.—Mr. H. Goodyear, borough engineer and surveyor.

LEWES.—June 22nd.—For scarifying and steam rolling, for the corporation.—Mr. Montague S. Blaker, town clerk.

FARNBOROUGH.—For the supply of Hungry Hills flints and gravel, tar-macadam, Portland cement, and hire of steam roller and scarifier, for the urban district council.—Mr. J. E. Hargreaves, surveyor.

## Sanitary.

LLANDAFF AND DINAS POWIS.—May 18th.—For the construction of earthenware pipe sewer and manholes, for the rural district council.—Mr. M. Warren, clerk.

PONTYPRIDD.—May 20th.—For the relaying of a portion of a 27-in. sewer, for the urban district council.—Mr. J. Colenso Jones, clerk.

BOSTON.—May 20th.—For the roding and cotting of drains, for the Sluice Commissioners.—Mr. F. S. Robins, 6 Bridge-street, Boston.

BLABY.—May 20th.—For the construction of stoneware and cast-iron pipe sewers, Shone's ejectors, manholes and flushing chambers, for the rural district council.—Mr. B. A. Shires, clerk, 1 Friar-lane, Leicester.

EASTBOURNE.—May 21st.—For the supply of two Shone automatic ejectors, for the corporation.—Mr. A. Ernest Prescott, borough engineer.

WATFORD.—May 21st.—For works of drainage, for the urban district council.—Mr. W. Hudson, solicitor and clerk.

BELFAST.—May 21st.—For the construction of brick and pipe sewers, for the corporation.—Mr. R. Meyes, town clerk.

BRADFORD.—May 21st.—For scavenging work, for the Cleansing Committee.—Mr. F. Stevens, town clerk.

WEST SUSSEX.—May 22nd.—For laying surface-water drains, for the county council.—Mr. H. W. Bowen, county surveyor, North-street, Horsham.

MACCLESFIELD.—May 22nd.—For works of sewerage, for the corporation. Borough Engineer.

MORLEY.—May 22nd.—For work of conversion to water-closets, for the corporation.—Mr. W. E. Putman, borough engineer and surveyor.

MACCLESFIELD.—May 22nd.—For works of sewerage, for the corporation.—Mr. Chas. W. Stubbs, borough engineer.

ROMFORD.—May 23rd.—For laying surface-water sewer and filling in ditch, for the urban district council.—Mr. G. T. King, clerk.

UXBRIDGE.—May 24th.—For the construction of settling tanks and bacteria beds, for the rural district council.—Mr. J. W. Harrison, engineer and surveyor.

FOLKESTONE.—May 25th.—Offers for a steam motor lorry used for the collection of house refuse.—Mr. A. F. Kidson, town clerk.

GREENOCK.—May 25th.—For the supply of coals, cement, lime, fireclay pipes, pavement, whinstone setts, road metal, pitch, oil and cartage, for the corporation.—The Town Clerk.

MACCLESFIELD.—May 27th.—For laying sewers and water mains, for the rural district council.—Mr. Frederick May, solicitor and clerk.

DRIFFIELD.—May 29th.—For cleaning drain and construction and repair of culverts, for the rural district council.—Mr. H. Botterill, clerk, 23 Exchange-street, Great Driffield.

VALETTA (Malta).—May 30th.—For the supply of stoneware pipes and specials.—Crown Agents for the Colonies, Whitehall-gardens, S.W.

BILSTON.—June 3rd.—For laying pipe sewers and manholes, and making up and sewering, for the urban district council.—Mr. V. Turner, surveyor.

CHESHAM.—June 8th.—For construction of outfall works and laying out additional land for sewage disposal purposes, for the urban district council.—Mr. Percy C. Dormer, engineer.

## Stores.

WALSALL.—May 20th.—For the supply of requisites in the gas department, for the corporation.—Mr. John R. Cooper, town clerk.

BRADFORD.—May 21st.—For the supply of iron castings, iron, steel, bolts and nuts, candles, oils, cotton waste, soap, street-sweeping machine brushes, brooms, shovels, nails, lime and iron piping, for the corporation.—Mr. F. Stevens, town clerk.

RHONDDA.—May 24th.—For the supply of ironmongery, tools, lubricants, packing, tallow, candles, paints, timber, Portland cement and sand, for the urban district council.—Mr. W. R. Nicholas, clerk.

CHURCH.—June 3rd.—For the supply of flags, kerbs, setts, grit, granite, limestone, pitch, creosote oil, salt-glazed socket pipes, scavenging brooms, manhole covers, lamphole covers, step-irons, street grates and disinfecting powder, for the urban district council.—Mr. J. R. Reddish, clerk.

PAIGNTON.—June 3rd.—For the supply of coal, coke, granite, lamp columns, gully gratings, oil and firewood, for the urban district council.—The Surveyor.

## Miscellaneous.

HALIFAX.—May 18th.—For the supply of filtering medium, for the Highways Committee.—Mr. J. Lord, borough engineer.

DEVON.—May 23rd.—For general repairs and painting, for the county council.—Mr. F. Bailey, clerk, The Castle, Exeter.

DARTFORD.—May 25th.—For the supply of disinfectants and broken granite, for the urban district council.—Mr. W. Kay, clerk.

TYLDESLEY.—May 31st.—For the supply of goods, for the gasworks.—Mr. W. J. Matthews, clerk.

# TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

ALDERSHOT.—For the supply of granite, gravel and tar, for the urban district council.—Mr. F. C. Uran, surveyor:—

Granite.

| | Per ton. s. d. |
|---|---|
| Enderby and Stoney Stanton Granite Company ... | 14 1 |
| Tytherington Stone Company ... ... ... | 13 8 |
| Penlee and St. Ives Stone Quarries, Limited ... ... ... | 12 10 |
| St. Keverne Stone Company ... ... ... ... | 12 6 |
| Johnston Brothers† ... ... ... ... ... ... | 12 0 |

Gravel.

| | W. Morris.† s. d. | T. Lamport & Son. s. d. |
|---|---|---|
| Alexandra-road ... ... ... | 4 0 | 4 4 |
| Sebastopol road ... ... ... | 4 0 | 4 9 |
| Brighton-road ... ... ... | 4 0 | 4 9 |
| Cranmore-lane ... ... ... | 4 0 | 4 0 |
| Farnborough-road (grit) ... ... | 4 0 | 4 6 |

Tar.

Aldershot Gas and Water Company, 3½ per gallon.
Burt, Boulton & Haywood, Limited†, 4d. per gallon.
T. Crow & Sons, 4½d. per gallon.
E. Catchpole & Sons, 4¾d. per gallon (surfacing fluid).
Anglo-American Oil Company, 6¾d. per gallon (surfacing fluid).
Anglo-American Oil Company, 7d. per gallon (Roadoleum).†
Canadian Mineral Rubber Company, 8d. per gallon (Camaroo Road Asphalt).

BLYTH (Northumberland).—For making-up Dalmatia-terrace, Arcadia-terrace, Columbia-terrace, Bohemia-terrace, and the back streets in connection therewith, for the urban district council.—Mr. R. Grieves, surveyor:—

| | |
|---|---|
| T. C. Usher & Co., Newcastle-on-Tyne | £4,576 |
| J. McLaren, Newcastle-on-Tyne | 3,475 |
| J. Robson, Newcastle-on-Tyne | 3,194 |
| G. E. Simpson, Newcastle-on-Tyne | 3,174 |

BLYTH (Northumberland).—For the addition of a class-room to Newsham Infants' School.—Mr. R. Grieves, architect and surveyor to Blyth Education Committee:—

| | |
|---|---|
| Cook, Brothers, Blyth | £335 |
| R. Baxter, Blyth | 320 |
| J. & W. Simpson, Blyth | 291 |
| A. Best, Blyth | 291 |
| Kelsey & Dower, Blyth | 290 |
| R. H. Hogg, Blyth | 290 |
| Robson & Waddle, Blyth * | 254 |

INVERKEITHING.—For the construction of ferro-concrete water tank, enclosure walls and footpaths, for the corporation:—

| | |
|---|---|
| J. A. McTaggart & Co., Glasgow | £1,573 |
| Simpson & Lawson, Dunfermline | 1,430 |
| J. Martin, Dunfermline | 1,288 |
| W. G. Flett, Lerwick | 1,250 |
| R. C. Brebner & Co., Edinburgh | 1,189 |
| Wellwood & Lockie, Rowuth | 1,169 |
| A. Blair, Glasgow | 1,096 |
| J. Ritchie, Dunfermline | 1,075 |
| Allen Construction Company, Glasgow | 1,028 |
| J. & J. Street, Clarkenheath | 983 |
| A. J. McLeod & Co., Glasgow | 983 |
| J. Fotheringham, Cameron | 979 |
| A. H. Robertson, Inverkeithing* | 880 |

KINGSBRIDGE (Devon).—For sewerage works at Brownston, for the rural district council:—

| | |
|---|---|
| Devon Constructive Committee | £196 |
| W. Ash, Modbury | 159 |
| G. Steer, Modbury | 158 |
| R. Yabsley, Loddiswell | 113 |

LEWISHAM.—For the erection on the Plassey-road site, Lewisham, of a school for 100 physically defective children, for the London County Council:—

| | |
|---|---|
| G. Parker & Sons, Peckham | £6,119 |
| W. Downs, Walworth | 6,080 |
| R. Cook & Sons, Crawley, Sussex | 6,029 |
| Kirk & Randall, Woolwich | 5,960 |
| J. Smith & Sons, Limited, South Norwood | 5,950 |
| W. Akers & Son, Limited, South Norwood | 5,907 |
| J. & C. Bowyer, Limited, Upper Norwood | 5,770 |
| Courtney & Fairbairn, Limited, Camberwell | 5,672 |
| R. A. Lowe & Co., Chesterfield | 5,583 |
| Galbraith Brothers, Limited, Camberwell-green | 5,549 |
| F. & H. F. Higgs, Herne-hill | 5,483 |
| T. D. Pope, Hertford | 5,462 |
| J. & M. Patrick, Wandsworth | 5,375 |
| W. Johnson & Co., Limited, Wandsworth-common | 5,351 |
| F. & T. Thorne, Isle of Dogs | 5,230 |
| H. L. Holloway, Deptford | 5,216 |
| J. Appleby & Sons, Southwark-park * | 5,034 |

Architect's estimate, £5,350.

MARKET HARBOROUGH.—For the construction of new sewerage with manholes, for the urban district council.—Mr. H. G. Coales, engineer:—

| | |
|---|---|
| H. H. Barry, Bedford | £1,105 |
| W. G. Skinner, Stockport | 1,076 |
| A. E. Palmer, Liverpool | 1,076 |
| Hickman & Sons, Market Harborough | 1,040 |
| Barker & Sons, Lowestoft | 1,003 |
| H. F. Stuart, West Bromwich | 975 |
| Martin & Edmunds, Birmingham | 928 |
| A. Sykes, West Bridgford * | 889 |

PAIGNTON.—Accepted for laying sewers and drains, and constructing roadway, for the urban district council.—Mr. C. Owen Baines, engineer and surveyor:—

H. Drew, Paignton, £1,077.

POPLAR.—For converting a three-roomed tenement on the ground floor of Baffin-buildings into five bathrooms, for the London County Council:—

| | |
|---|---|
| Vigor & Co., Poplar | £245 |
| J. Mowlem & Sons, Walworth | 240 |
| H. L. Holloway, Deptford | 231 |
| F. & T. Thorne, Isle of Dogs | 227 |
| J. & C. Bowyer, Limited, Upper Norwood* | 222 |

PORT GLASGOW.—For making-up work, for the corporation.—Mr. J. Murray, burgh surveyor:—

| | |
|---|---|
| J. Erskine, Kilsyth | £1,161 |
| G. Duncan & Son, Glasgow | 1,135 |
| A. & F. Paul, Glasgow | 1,093 |
| A. Stark & Son, Glasgow | 980 |
| Clarke & Laird, Renfrew | 900 |
| Black Brothers, Johnstone* | 794 |

SIDMOUTH.—The following tenders have been accepted by the urban district council:—

Horse hire: J. Skinner, 7s. per day, for April, June, and August; C. A. Mason, 7s. per day, for May, July, and September.

Steam-rolling.—J. Skinner, 21s. per day, provided such price includes the supply of water cart.

Scavenging streets.—Scavenging, 1d. per square yard.

Devon Basalt Dressed Granite and Granite Company, Limited, 1,000 tons at 8s. 1d. per ton of 2-in. metal.

SLOUGH.—For private street works, for the urban district council.—Mr. W. W. [illegible], town surveyor:—

| | Langley New Town No. 1 | Langley New Town No. 2 | Castle street. | Side road off the Grove. | Part of Victoria road. |
|---|---|---|---|---|---|
| Jarvis & Johnson, Slough* | £148 | £155 | £180 | £ 99 | £30 |
| H. W. Swaker, Hounslow | 152 | 162 | 182 | 142 | 34 |
| E. Free & Sons, Maidenhead | 167 | 175 | 205 | 187 | 38 |
| H. Elliott & Co., Ealing | 170 | 177 | 208 | 127 | 37 |
| H. D. Bowyer, Slough | 179 | 187 | 217 | 126 | 37 |

STANFORD-LE-HOPE.—For sewerage and sewage disposal works.—Contract No. 1, Sewage disposal works; Contract No. 2, Main sewerage; Contract No. 3, Machinery ejectors, and air mains.—Mr. S. A. Hill-Willis, engineer and surveyor to the Orsett Rural District Council.—Quantities by Mr. S. C. Gordon, Finsbury-house, Bloomfield-street, London, E.C.:—

| | Contract No. 1. | Contract No. 2. | Contract No. 3. |
|---|---|---|---|
| W. Cunliffe & Sons, Limited | £4,449 | — | — |
| D. T. Jackson | 3,266 | £11,532 | £1,402 |
| Kemp Brothers | 3,262 | 8,121 | 1,250 |
| G. Porter | 3,099 | 9,420 | 973 |
| W. Muirhead & Co., Limited | 3,059 | 10,167 | 1,204 |
| Perry & Co., Limited | 3,037 | 10,090 | 1,546 |
| P. Wilson & Co. | 3,000 | 8,798 | 1,100 |
| G. Brown | 2,995 | 9,390 | 999 |
| G. Bell & Sons, Limited | 2,950 | 8,075 | 1,283 |
| Wilson, Border & Co. | — | 8,095 | — |
| Adams-Hydraulics | — | — | 1,367 |
| Hughes & Lancaster | — | — | 1,315 |
| D. Adamson & Co. | — | — | 1,475 |
| T. W. Pedrette | 2,750 | 8,998 | 1,378 |
| W. & C. French | 2,750* | 8,087* | 998 |
| Tuke & Bell, Limited | — | — | 880* |

STOWMARKET.—For rolling and scarifying, for the urban district council:—

Doran Brothers, Limited (rolling), £1 3s. per day.
Edison Steam Rolling Company, Limited, £1 4s. 5d. per day.
East Stow Rural District Council †, £1 per day.

VAUXHALL.—For the supply of electric wiring material required for the Vauxhall sub-station, for the London County Council:—

Edison & Swan United Electric Light Company, Limited, Queen-street†, £53 (less 2½ per cent. discount).
General Electric Company, Limited, Queen Victoria-street, £54 (less 2½ per cent. discount).
Armordict Manufacturing Company, Limited, Farringdon-avenue, £58 (less 2½ per cent. discount).
Pinching & Walton, Cannon-street, £65.

Estimate of the Chief Officer of Tramways, £56.

YORK.—For the construction of works of sewage disposal (septic tanks, filters, &c.), for the corporation.—Mr. F. W. Spurr, city engineer:—

G. Bell & Sons, Limited, Manchester, £21,351.

## MEETINGS.

*Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.*

MAY.

17.—Junior Institution of Engineers: Mr. G. C. Allingham on "Storage Battery Engineering." 8 p.m.
20.—Quantity Surveyors' Institution: Annual Dinner, Connaught Rooms, Kingsway. 7 p.m.
22. Institution of Municipal Engineers: Discussion on "Water Softening." 4 Southampton-row, W.C. 7.30 p.m.
22.—Institution of Municipal Engineers: Council Meeting. 5.30 p.m.
24-29.—Institution of Municipal and County Engineers: Visit to Paris.
24.—Royal Sanitary Institute: Meeting at Blackpool; Mr. A. Hurdle, Assoc.M.Inst.C.E., on "The Joint Scheme of Sewerage for Thornton-le-Fylde, Bispham-with-Norbreck and Carleton;" Mr. F. W. Rees Jones on "The Card Index System as Applied to Public Health Work," Town Hall. 7.30 p.m.
25.—Association of Managers of Sewage Disposal Works: Visit to Lichfield Sewage Works.
30-31.—Surveyors' Institution: Country Meeting at Nottingham.

JUNE.

1.—Institution of Municipal and County Engineers: Council Meeting.
3.—Royal Institute of British Architects: Mr. W. Woodward on "The Responsibilities of Architects and the Case of Minter v. Wallstein."
6-8.—Institution of Water Engineers: Summer Meeting at Cheltenham.
7-8.—Institution of Municipal and County Engineers: Meeting at Stirling.
8. Association of Managers of Sewage Disposal Works: Meeting at Glasgow.
15.—Institution of Municipal and County Engineers: Meeting at East Ham.
22.—Association of Managers of Sewage Disposal Works: Metropolitan District Meeting, Southall-Norwood and Hatwell.
22.—Institution of Municipal and County Engineers: Meeting at Lowestoft.
29.—Institution of Municipal and County Engineers: Meeting at Bridlington.

JULY.

6.—Institution of Municipal and County Engineers: Meeting at Stourbridge.
11-13.—Institution of Municipal and County Engineers: Annual Meeting, London.

## APPOINTMENTS OPEN.

BOROUGH ENGINEER AND SURVEYOR (A.M.Inst.C.E.) of large town in the Midlands (40,000) has vacancy for Pupil. Address Box 1,144, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

WATER INSPECTOR AND PLUMBER

Applications are invited for the above position in connection with the Waterworks undertaking in a seaside resort. Candidates must have had previous Waterworks experience, particularly with the Deacon Waste-water Meter system, and must have a knowledge of Plumbing and Fitting Work. Wages, 30s. weekly.

Applications must be accompanied by copies of three recent testimonials, and addressed "Water Inspector," Box No. 1,155, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

BOROUGH OF NELSON.

Applications are invited for the post of Engineering Assistant in the Borough Engineer's Department. Salary £85 per annum.

Applications, stating age, qualifications and experience, and accompanied by copies of three testimonials, must be sent to me, endorsed "Assistant," not later than Friday, 24th instant.

Canvassing will be a disqualification.

J. H. BALDWICK,
Town Clerk.

Town Hall, Nelson.
May 11, 1912.

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BOROUGH OF BUCKINGHAM.

APPOINTMENT OF SURVEYOR, &c.

The Town Council invite applications for the office of Borough Surveyor, Inspector of Nuisances, &c.

The person appointed will be required to reside in Buckingham, and to devote his whole time to the performance of the duties of the several offices, and he will be required to give security.

Annual salary £100.

Applicants must hold the certificates of the Royal Sanitary Institute and Institution of Municipal and County Engineers. The appointment as Inspector of Nuisances will be for one year, and be made subject to the approval of the Local Government Board, and the appointment as Surveyor will be made subject to three months' notice in writing on either side.

Applications, stating age and previous experience, and accompanied by not more than three testimonials of recent date, to be sent to me on or before Saturday, the 25th May, endorsed "Surveyor." Further particulars may be obtained on application to me. Selected Candidates will have notice to attend on the day of election, and their reasonable travelling expenses will be paid.

Canvassing will be deemed a disqualification.

THOMAS R. HEARN,
Town Clerk.

Buckingham.
May 7, 1912.

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ENGINEERING DRAUGHTSMAN.—Wanted, a thoroughly competent and experienced Engineering Draughtsman, Surveyor and Leveller; actual experience in the design and construction of bridges in masonry, steel, and ferro-concrete essential.—Send full particulars, age, and salary required to Box 1,156, office THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

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BOROUGH OF LEWES.

GENERAL FOREMAN.

The Town Council of this Borough invite applications for the appointment of General Foreman, at a commencing wage of 35s. per week, who must devote all his time to the duties of the office. Practical experience in the construction, maintenance and cleansing of roads and sewers, and supervision of labour is essential.

Applications to be in Candidate's own handwriting, addressed to the undersigned, stating age, accompanied by copies of three testimonials, on or before Monday, the 27th May, 1912, endorsed "General Foreman." Canvassing will be a disqualification.

DAVID ROBERTS,
Borough Surveyor.

Town Hall,
Lewes, Sussex.
May, 1912.

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WANTED immediately, for a month or six weeks, competent Surveyor, for Graded Pipe-Line Survey in Cornwall.—Apply, with copy testimonials, and stating salary required, Cowell, Central Chambers, Newquay, Cornwall.

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## APPOINTMENTS WANTED.

PUPIL-ASSISTANT to Rural District Surveyor seeks position; good practical knowledge of surveying and levelling; experienced in preparation of plans and drawings; practical experience on private street works and new sewerage.—Kelsey, Homestead-road, Eden Bridge.

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# SEWAGE PURIFICATION

# DIBDIN'S BIOLOGICAL SLATE BEDS

**47 VICTORIA STREET, WESTMINSTER, S.W.**

TELEPHONE—2211 VICTORIA.

"AFTER 7 YEARS' WORKING RESULTS ARE AS GOOD AS AT FIRST."

CONTRACTORS TO H. M. GOVERNMENT

FILLING SLATE BEDS, CURRAGH CAMP.

# The Surveyor

And Municipal and County Engineer.

Vol. XLI. MAY 24, 1912. No. 1,062.

## Minutes of Proceedings.

**Aviation and the Municipal Engineer.**

Considerable interest centres around the meeting of the Institution of Municipal Engineers which is to be held at the London Aerodrome, Hendon, on Wednesday, June 12th, by the courtesy of Mr. C. Grahame-White and the directors of the Grahame-White Aviation Company, Limited. We have no reason to doubt the claim made by the secretary of the institution that "the meeting is the first of its kind to be held in this country," and we are inclined to agree with him in saying that, so far as we know, it is the first of its kind in the world. If the relations which must be established between aviation and municipal engineering have not absolutely escaped attention so far, it must at least be admitted that little, if anything, of a practical nature has yet been done to pave the way for that joint action which must eventually be taken. There can be little doubt that the making of aeroplanes will ere long progress almost as rapidly as did that of motor-cars. Production will grow cheaper and cheaper, and even now the cost of a machine is not nearly so great as was that of a car in the early days of the motor industry. On the score of maintenance, the aeroplane is by far the cheaper, the cost of running being little beyond that of the petrol used, and tyre troubles being entirely eliminated. Housing accommodation may form a serious item, and great improvements in balancing will have to be effected if starting and landing are to be accomplished with anything like precision. As matters are, too, aviators must of necessity band themselves into clubs, the expense of a private ascent ground being prohibitive for the ordinary man. One by one, however, these and other defects and obstacles will be remedied and removed, and the conquest of the air will proceed upon a commercial basis. No inconsiderable amount of capital is now locked up in aviation enterprise, and it is to be hoped that those who have come forward so boldly at this early hour will reap their reward. That the new science, in common with almost every other science, should come to be largely utilised in the wholesale slaughter of mankind is deplorable; but we are not concerned in the present instance with the ethical side of the subject, and will say no more upon it. The Government appears at last to have awakened to the importance of aviation to the national life, and its recent action has already given an immense impetus to the "trade." A new career has been opened for the young man, and parents with "wild" sons might do worse than put them for a few months under the tuition of one of the many pilots who are now engaged in teaching the graceful art.

New forms of buildings must, as Mr. Wyand says, call for new by-laws, while regulations will have to be framed for the protection of life and property. An aerodrome is like no other "drome," and its buildings and appurtenances call for special treatment. The present Model By-laws lack elasticity, and modifications and additions will become imperative. The papers to be presented at the meeting of the Institution of Municipal Engineers are "The Structures of the Future in Relation to Aviation," by Mr. Horace Cubitt, and "Some Suggestions for By-laws and Regulations in Relation to Aviation," by Mr. B. Wyand; and we would submit that the two would really have been better presented as a whole. There will necessarily be considerable overlapping in the papers; still, as they are to be "taken as read," this will not matter so much, as the audience will escape any weariness from repetition. We hope, however, that they will be discussed together. There should be a large attendance at the London Aerodrome, which has been kindly placed at the disposal of the institution by Mr. Grahame-White. Mr. Grahame-White is, as usual, in the forefront of aviation, and he is to be commended on his readiness to accept the offer of the institution, and to allow on his ground a free discussion on the framing of regulations to which he himself will be compelled eventually to submit. We feel, however, that his course is a politic one. The framing of any code of by-laws or regulations should be the joint work of the municipal engineer and the aviator. Each is skilful in his department, and undue laxity on the one hand or undue harshness on the other is only to be avoided by a judicious fusion of the two interests, the municipal engineer acting on behalf of the public and the aviator on behalf of—himself! The meeting will be the first serious attempt at a combination of these interests. We note with satisfaction that the Institution of Municipal Engineers has extended invitations "to other engineering (and to architectural) societies" to attend and take part in the discussion. The architect, as is pointed out, is equally interested professionally,

and we would add a strong appeal to members of local authorities to attend also, and to show an intelligent interest in what quite as intimately interests them in their public duties. At the risk of repetition, we impress upon our readers the importance of the meeting. Its interest, with exhibition flights and the opportunity of inspecting buildings and aeroplanes, is self-evident, and the fact that ladies can attend should add to the attractiveness of the day. There must be thousands of municipal engineers and members of local authorities who have never yet witnessed the intrepidity and skill of the aviator. Here is the opportunity, with the advantage thrown in that the day may be made a profitable one at the same time.

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**Mirrors at Street Corners.**

We have reproduced on another page a plan of a part of Folkestone, kindly sent us by Mr. A. E. Nichols, M.INST.C.E., the borough engineer and surveyor, showing the position of a mirror which has been fixed at a street corner in order to give the drivers of vehicles a view of the traffic approaching the corner along the other streets. The position of the mirror is shown on the plan by a cross. We have also reproduced a drawing, for which we are indebted to Mr. Charles Bowman, borough surveyor of Malmesbury, showing the exact form of a mirror erected for the same purpose in that town. This mirror is a large one, 8 ft. by 5 ft., while that at Folkestone is much smaller, being 2 ft. square. The Malmesbury mirror is fixed above a footway so that pedestrians can pass under it. The wider such a reflector is, the greater is the width of road which it serves, and the taller it is the greater is the length of road from which a view of the road round the corner may be obtained. In this connection the suggestion of Mr. Nichols, that the mirror might be made slightly convex, is worth considering, as that would enlarge the field of view for a given size of mirror. We regret that we have been unable to obtain any information with regard to the reported proposals for the erection of such mirrors at Colchester and at Knaresborough, but the results obtained at Malmesbury and Folkestone seem to be distinctly encouraging.

The application of this device to turnings on country roads is on a different footing, mainly because there is seldom any strong objection to slowing down when approaching such a turning, as well as from the consideration that the safety of glass is more or less inversely as its distance from a policeman. To arrange mirrors to serve all classes of traffic—having regard to the great differences in height of the drivers' seats of different vehicles—may be by no means an easy matter, and for some time to come, perhaps, the experience gained will be chiefly from the results with motor carriages, the drivers of which are nearly all seated at about the same level, and nearer the road than the drivers of most horsed vehicles and of motor vans. As regards confusion resulting from the reflections in such mirrors, persons and horses approaching them will not see their own reflections, except when approaching by a third road which runs towards the mirror squarely. Generally, the matter seems to demand further consideration and trial rather than any sweeping forecasts as to its usefulness or otherwise.

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**Motor Haulage in Paris.**

In view of the report on the subject of motor haulage for municipal services recently presented to the Wimbledon Town Council by Mr. C. H. Cooper, the borough engineer, and the statistics from various British towns which he collected and tabulated, it is of special interest to note that the city of Paris has gone further than perhaps any other capital city in the adaptation and perfection of motor appliances of this character. Those members of the Institution of Municipal and County Engineers who are attending the Paris meeting will therefore have an excellent opportunity of seeing for themselves how far in present circumstances the internal combustion motor can be economically used for such purposes as the cleansing and watering of the streets of a great town. The general opinion, based upon experience in this country, is, as we pointed out last week, that motor traction only pays (as compared with horse haulage) with heavy loads carted over long distances, but not with intermittent work such as watering, dusting and slopping. The Paris authorities have, as the result of experiments, adopted three types of motor-driven machine. Those of the first class are used exclusively for watering, and are of two kinds, consisting respectively of a rectangular tank mounted on a steam lorry, and a water cart driven by means of a Mors gasoline motor. Either of these machines is capable of doing the work of four horse-hauled carts, and they have been found more economical in use. The second class consists of combined machines for watering and sweeping at one and the same time or separately. The tank capacity is of 2,600 litres, and the roller brush is placed between the front and driving wheels at an inclination of 50 deg. to the axis of the vehicle. A Dumont centrifugal pump forces the water through a four-way cock to the two distributing boxes placed in the rear. An interesting feature is the spraying apertures placed in front of the brush to check the dust caused by the latter. In the winter the watering arrangements can be removed, thus reducing the weight and allowing the machine to be used as a sweeper.

It has been noticed that the De Dion motor sweeper and waterer does the work of four sweepers or three one-horse watering carts of 2,000 litres and two of 3,000 litres capacity. The remaining class of machine is used exclusively for sweeping, and this, again, is of two kinds. The first model is an ordinary sweeper adapted to a gasoline-driven front tractor of the Latil type, while the other model, which is an automobile sweeper proper, is very compact. The experience of the Paris Municipality has led to a gradual increase in the use of motor traction for these services, and when the cost of upkeep can be reduced sufficiently, horse haulage will probably be entirely superseded.

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**The "Intervening Strip."**

In cases where owners are asked to pay their proportion of the expenses of works of private street improvement the theory of the intervening strip is not unknown. The application of this theory usually takes the form of an allegation that the particular owner is not a frontager on the ground that a strip of land (it may be that on which a fence stands) which does not belong to him lies between his land and the street. In the recently decided case of *Tottenham Urban District Council* v. *Rawley*, however, it was sought to apply the theory, not for the purpose of avoiding the payment of private street works charges, but in order to prevent access to a highway from adjoining land. The facts of that case were these: Keston-road is a street recently made, and turning to the west out of Downhills-road. The land north of Keston-road belongs to the Tottenham Urban District Council. It is used as a public park, and is separated from Keston-road by a wooden pale fence erected some years ago by the council. Some time ago they removed a portion of this fence so as to allow of ingress and egress through the opening thus made to and from their land, this being wanted for the purpose of conveying materials in connection with the building by them of a new school on their land at some little distance from the road. This the council were perfectly entitled to do if Keston-road were a public highway. The defendant, however, thought he could compel the council to pur-

chase a road from him, and he put up a wire fence in front of the opening made by them, his justification for doing this being the allegation that the Keston-road was a private road, and that he owned this narrow strip of land between the road and the fence. The defendant some time ago purchased the tract of land south of and up to this fence, and the site of the portion of Keston-road in question is part of what he so purchased. He laid out his land as a building estate, and it is now practically all built upon except what has been appropriated for roads or streets. In the course of the trial the defendant dropped his plea in regard to the alleged intervening strip, and the decision ultimately turned upon whether or no Keston-road had been dedicated to the public as a highway. The learned judge found that it had, and that the council, as adjoining landowners, had a perfect right of access to it from their land. The council are to be congratulated on having successfully resisted a claim the foundation of which appears to have been of a very flimsy character.

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**The Value of Pure Water.**

The figures given in Mr. Charles B. Burdick's paper, read before the Indiana Sanitary and Water Supply Association, are dealt with in greater detail elsewhere in these pages. It is difficult to place any definite money value upon human life, not because the average human life is without its money value to the community, but because life is beyond price. Yet hard statistics show that where water formerly impure has been efficiently purified many lives have been saved. Beyond doubt the work of the engineer properly done actually saves from death a certain definite proportion of the inhabitants of the district every year. The death-rate per 1,000 is lowered, and is lowered permanently. Not only does this point to the fact that much loss and suffering is saved to the persons who do not die, and to their relations or dependents, but it is clear that for every life saved we may also reckon that there are a certain number of persons who would have suffered loss and inconvenience by contracting disease without actually losing their lives. Hence, on the lowest reckoning, the money spent on purification works when required often results in a saving equal to from 50 to 200 per cent per annum. This the author has demonstrated very clearly.

It is apparent from the figures given by the author that the total cost of water supplied to 105 cities in America, having a total population of nearly 20,000,000 persons, is about £1 0s. 10d. per head per annum. The author gives the figure of £2 1s. 8d. per 1,000,000 gallons as the cost of water filtration, including operating and fixed charges. For mechanical filtration the operating costs, with fixed charges, run from 11s. 7d. to £1 9s. 2d. per 1,000,000 gallons. However, taking £2 1s. 8d. per 1,000,000 gallons, and a consumption of 100 gallons per head per day, the total cost of filtration is only about 1s. 6d. per head. It is reckoned, on the other hand, that a saving of 5½ lives per 100,000 will balance the cost of the filtration. Whether the money value given to each life saved is in excess of the actual saving, or whether it is below it, is a matter which cannot be ascertained as exactly as the costs of filtration, but enough has been said by the author to prove the immense value of pure water simply from a financial standpoint

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**Rockhampton (Sydney) Waterworks.**

Mr. Herbert Bellamy's scheme for the waterworks about to be constructed at the city of Rockhampton is certainly worthy of note. The proposed works are described at greater length elsewhere in these pages, and without doubt they afford an excellent example of the application of new methods. Water drawn from the Fitzroy river will be purified by means of Puech-Chabal filters. The filters themselves will be formed in tanks of reinforced concrete built on the Kahn system. The Kahn system will also be used for the reinforced concrete clear water basin. High-lift pumps will deliver this purified water through a 13-mile length of 18-in. rising main to a service reservoir. The pipes are to be made of mild steel plate on the locking bar principle. The service reservoir is also to be of reinforced concrete built on the Kahn system. A 22-in. gravitation main, 9 miles long, will convey water to the city. These pipes will also be made of mild steel plate on the locking bar principle. Thus the whole scheme will embody some of the latest methods. These methods are, however, very well known and have been well tried. Only in this country would they be considered new.

In our Colonies and in America the merits of reinforced concrete, improved methods of filtration and purification, new types of water mains, and so forth, are acknowledged fully as the result of successful trial. In this country we cling to old methods, and new systems of work and of construction receive very little encouragement. The objection of the Local Government Board to reinforced concrete, for instance, has certainly not encouraged English engineers to make use of that material. Thus, in order to study the application of some of the newest and best processes, we must look abroad. It is, however, questionable whether our conservative attitude leads to economy or to the best results. The English engineer is not lacking in the skill, courage and energy which are characteristic of his brethren in the Colonies and in America, but he is so hampered by restrictions and conflicting interests that he may not move far out of the beaten track. It is, nevertheless, refreshing for him to observe what can be done in a new country where the engineer has a free hand.

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**Trackless Trolley-Car Tyres.**

The Standing Committee of the House of Commons which has been considering the Light Railways Bill discussed recently the question of the dimensions and materials of tyres on trackless trolley vehicles. Viscount Helmsley sought to invest the Board of Trade with plenary powers by moving that the department should make regulations specifying the dimensions and materials and that such regulations should be periodically revised. This did not appeal very strongly to Mr. Robertson, Parliamentary Secretary to the Board, who with exceptional modesty for the representative of a Government department — refused to accept the proffered powers. He stated that the policy of the Board of Trade was to consider each scheme on its merits, and he claimed that the protection at present given by the department amounted to more strict control than that of any of the general Acts under which the regulations are made. In the cases of Leeds and Bradford the speed is limited to 12 miles an hour, and the weight is also limited, while as to materials the production of detailed drawings of every part of the trolley vehicle has been insisted upon before a scheme is sanctioned. The subject of the control of tyres in general, as we have previously shown (THE SURVEYOR, April 21, 1911), has not yet been settled to the general satisfaction of those most interested, and as regards trackless trolley tyres, it appears to us that, however well the authority of the Board of Trade may be exercised, the dimensions and materials of tyres are essentially things that should be decided by the local authorities in whose areas the schemes are to be worked. They are assumed, correctly as we think, to know their own special requirements better than a bureaucratic department, or even a Standing Committee of Parliament.

# Motor Car Traffic and Main Road Crusts.

## THE VALUE OF SURFACE LAYERS.

The steadily increasing volume of motor traffic, accompanied by a considerable increase in the average severity of the effects of individual vehicles, is leading to the development of a method of maintenance which, though it has proved useful on roads with light traffic, was not, until quite lately, regarded as of much importance in the maintenance of main road crusts. We allude to the practice of periodically strengthening the surface of a road crust by adding a thin layer, about one stone thick, of hard stone.

This practice sometimes gives good results on roads which are provided with crusts of cheap materials, which, though they bind well and have ample strength, do not furnish a good wearing layer. If a fairly good local stone is available, and one which will provide a layer several inches thick at a moderate cost, it is usually good economy to add such a layer to the crusts of roads with light traffic, on which wearing and weathering action balance well, and where the layer may be expected to keep a good shape. But when the local stone is very hard, or when a hard imported stone is used, the tendency for the wearing layer to become jolty and out of shape generally is often so considerable that it is better policy to add only a thin layer, not enough, perhaps, fully to cover the main crust after rolling, but sufficient to take the brunt of surface wear. This layer may then be worn right out, the main crust having, it is assumed, sufficient hardness and bond to serve well enough for a time before it is again reinforced with hard stone. The waiting period may include a whole season of comparative immunity from wear in some cases, and the quantity of stone used per mile per annum may be very small.

It is desirable, if not essential, to provide a surface stone which will bind well with the crust, as, for instance, hard limestone on soft limestone, ferruginous whinstone on ferruginous sandstone, a stone with a clayey detritus on a sandy main crust, or quartz on a clayey main crust. The hard stone is rolled into the crust, the process of getting it to go in evenly without a roller being a troublesome one. It is important, too, that the hard stone shall not be used for filling holes or ruts, and any tendency to segregation should be avoided. A crust consisting of hard metal in some parts and of soft stuff in other parts tends to become bumpy and puddly.

When the process has been going on for some years on a softish crust, the whole thickness may have become less charged with the hard stone, and it may be worth while to treat the crust in some other way next time it is made up. Details need not, however, be discussed here, the immediate point being that this somewhat unusual, often undesirable, but occasionally serviceable method is one which has been followed here and there for some years.

### THE THIN LAYER ON MAIN ROADS.

Coming now to roads with more considerable traffic, and particularly main roads subjected to a large proportion of motor-car traffic, the principle considered above is likely to come more and more into play on account of the difficulty of maintaining a layer 3 in. or 4 in. thick through a useful life. Motor vehicles, propelled by a rasping action of their often steel-studded tyres, tend to fret the whole surface of the road in dry weather, but they also form ruts and lines of potholes, and often lines of potholes in ruts. This action, it should be noted, is especially marked on dead flats and on sharp bends.

Valuable as is the method of maintenance, the main feature of which is the provision of a thick wearing layer incorporated with the main crust or a foundation course, there is no getting away from the fact that the useful life of such a layer, or its reputable life, is becoming shorter and shorter on roads with a large amount of motor traffic, and especially when the proportion of swift motor-car traffic is high. Useful as is the principle of small, constant repair, it is necessary to face the fact that it is becoming difficult to apply it with full success to roads with a large amount of swift motor-car traffic. The number of vehicles passing per month has increased, but the weather has not become correspondingly more changeable.

Dry spells are too frequent and too long to allow the surveyor to take advantage of weather changes as he did ten years ago when the traffic was less. Even if the water-cart and rammer are energetically used in dry weather, and the roads swept of water-holding mud in drizzly weather—even then the attempt to keep pace with wear and tear cannot always be successful, or economical. Small constant repair, as ordinarily practised, may succeed on a straight stretch of 1 in 30, well shaded from direct sunshine, and it may, on the same road, fail on a level part, with several sharp bends, and exposed to the drying effects of wind and sunshine. It is therefore desirable that the failure of the thick-wearing layer on parts of a road should not lead to its condemnation if it is suited to other parts.

Now, the plan of adding a layer of stone about one stone thick may be looked at in two ways. We may regard it as a development of the thick-wearing layer and as a development of small, constant repair. From the former point of view it consists in providing a thin layer because a thick layer will hardly last any longer than the thin one before it needs something much more than ordinary repairs. What is the use of providing a wearing layer, say 3 in. thick, which, long before it has worn out generally, is pierced by ruts and potholes? The life of the 3-in. crust as a material is longer than its life as a shape, and the renewal of the shape cannot always wait for the renewal of the material. So there is an important principle involved in the adding of a thin layer of stone instead of a thick one.

In some cases the surveyor will scarify the whole crust, roll it lightly, add the fresh stone, and roll hard. In other cases he will pick the ruts and potholes, fill the deeper parts with bottoming material of large gauge, fill up with metal and binder, and roll, the patches wet, the rest of the road dry. He then wets the whole road and rolls in the fresh metal, very carefully spread. It is worth while to re-roll when the road has partly dried and the crust is in the plastic state. If the intervals between such operations are the short ones corresponding to the wearing down of a thin layer of stone, the results are likely to be better than they are when the intervals are those corresponding to the wearing down of a thick layer. Regarded as a development of small, constant repair, the plan of spreading stone one stone thick may be adopted in conjunction with an effective system of watering, sweeping, and light rolling, on untarred stretches of road, and may give good results if the whole crust is of sufficient thickness to start with so that it keeps its shape well.

### THE ONE-STONE LAYER ON SURFACE-TARRED ROADS.

However effective the restoration of a surface may be, a road will become bumpy if the crust is weak. If we do anything to destroy the *filling* effect of wearing layer renewals we must guard against any ill consequences.

Perhaps the most important underlying idea in the whole range of these observations is that the modern developments of traffic make it necessary to consider renewal of shape separately from renewal of material. A few years ago a good layer of stone, 4 in. thick, rolled hard into a scarified surface, filled the moderate depressions, and provided a wearing layer of maximum and minimum thicknesses sufficiently near the average thickness to give a satisfactory result. Renewals have to be more frequent now, and thinner, so that the depressions would give us greater relative differences of thickness even if they were no deeper. In addition to this they *are* deeper.

In the case of a tarred road the preservation of the material sometimes tends to loss of shape. A road may become very bumpy in spite of, and partly because of, annual tarrings. Motor vehicles are apt to follow the same tracks, often needlessly, and tarred road crusts, though protected from the actual beating out of binder, and rasping out of stones, became jolty or rutted owing to the loss of the shape-restoring influences of attrition and rain. In some cases this tendency may be corrected by judicious restraint in the matter of annual tarrings, the road smoothing out during the winter months, but this may not be always desirable, or effective. The question then arises: Is the crust to go on getting into worse and worse shape during the life of a thick wearing layer?

In such a case the plan of adding a layer one stone

thick has its advantages, provided it be accompanied by some restoration of shape. It is difficult enough to force in a fresh layer of stone to bind with an unscarified surface of a tarred road, and still more difficult to do this in a way which will restore the shape of the finished surface so as to last. If, however, only a thin layer of stone be used, the fresh tarring on its surface and the old tarry material below are not very far apart. There is not the same loss of continuity as occurs when a thick layer is added. To get the road true to shape it is necessary to scarify, or to do a good deal of detail pick work, and so great are the advantages of better bind and better shape that the old crust should be scarified, we think, whenever possible.

The question then arises as to whether it is possible to make use of such of the old tarry material as comes away in lumps or slabs, and we venture to place before our readers the outline of a method which has been very successful on an important road with which we are acquainted. The road was scarified, and the lumps, consisting of pieces of stone held together by a tarry matrix—the road had been tarred for several years in succession—were broken up with the hammer and raked evenly over the surface. Fairly large gauge granite was then spread, dry-rolled, watered, and then rolled hard. The tarry material worked up between the stones, as in the Gladwell method. The surface was finished off with ½-in. chips, and was tarred as soon as it was dry. It was thus possible to combine the advantage of good binding with restoration of shape, without losing the value of successive tarrings. It may be suggested that the broken-up tarry stuff should be exposed to sunshine, if possible, before being placed on the road, supposing the part of the road which is about to be rolled to be itself in shade.

## CEMENT AS A ROAD BINDER.

### NEWARK SURVEYOR'S EXPERIMENT.

In his report for the year ended March 31st last Mr. Ralph Oakden, junr., Assoc.M.Inst.C.E., highway surveyor to the Newark Rural District Council, suggests in connection with the subject of road binding that sufficient attention has hardly been given to the possibilities of a material which is so largely and successfully used in connection with constructional work—namely, Portland cement. The manufacture of Portland cement, he points out, has reached a high state of perfection, and as when once set it is unaffected by water, it appears to him to possess very considerable advantages as a road binder.

A short experimental section was constructed with this material in Cotham village, the work being done on March 23rd, and as there has been practically no rain since that date its efficiency as a binder has been severely tested. The amount used was 1 cwt. to every 30 sq. yds., and no soil or scrapings were permitted in connection with the work. The actual cost of the cement, including carting, was 1d. per yard. "I trust, therefore," says Mr. Oakden, "that I shall be able to utilise it more freely during the ensuing year, as I am convinced that something better than a soil binding is necessary on roads with even a moderate amount of motor car traffic."

### The Troubles of a Temporary Surveyor.

An interesting sidelight is thrown upon the life of the professional surveyor by a statement made recently at the Wells-next-the-Sea Council by a councillor, who volunteered to deputise in the absence of the regular officer. The gentleman in question, Mr. A. H. Cadamy, said the county surveyor had objected to too much sand being placed on the tar on the roads, so he had instructed the men to sift the material more. He had found his position of temporary surveyor not a very amiable one. It had been more bother than any harvest he had ever endured during the many years he was a farmer. In this capacity he had found it most difficult to please people. Taking all things into consideration, he sometimes felt tired of the whole business. He had tried to do his best, but above all he liked to have the instructions of the council on what he was to do.

## MUNICIPAL WORK AT PRAHRAN.

### CITY SURVEYOR'S REPORT.

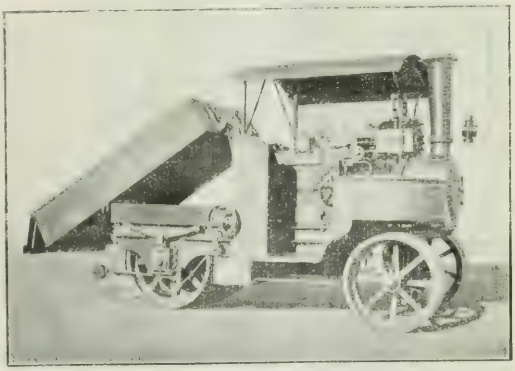
The present area of the Australian city of Prahran, as given in the report of Mr. W. Calder, Assoc.M. Inst.C.E., the city surveyor, is 2,357 acres; there are over 64 miles of streets and some 18 miles of lanes. Tar paving to the amount of 1,940 sq. yds. was carried out in the year 1910-11—the period with which

Prahran Town Hall.

the report deals—and concrete paving of a total area of 3,484 sq. yds. was also laid; in addition 113,287 sq. yds. of street surface were tar painted.

In noting the installation of new street lamps, Mr. Calder mentions that there are now in the city 530 Welsbach lamps, five single-mantle globe lamps, three 2-mantle globe lamps, three 3-mantle globe lamps, thirty-seven 500-watt arc lamps, seven 32-candle power lamps, seven 8-candle power lamps, ninety-eight metallic filament lamps, and one oil lamp.

The council's steam roller was in use in Prahran on



Five-Ton Roller (Detachable Tipping Wagon), Prahran.

306 days, and was hired out for thirteen days, in addition a motor roller was at work in the city on eighty-three days.

The quarry and stone crushing plant were kept in constant work during the year, and with the exception of several breakages to the stone crusher, involving an expenditure of £197 for repairs, the operation of the plant and the output of stone were satisfactory. The total quantity of stone of all descriptions quarried and transported from the quarry was 16,006 tons, which

included 10,674 tons of broken metal, 3,618 tons of screenings and toppings, 4,582 ft. of guttering, 17,771 6-in. and 9,695 8-in. pitchers, 2,970 ft. of kerbing of various sizes, besides miscellaneous quantities of dressed stone. The quarry face now shows a depth of from 55 ft. to 67 ft. A rotary crusher has been installed for receiving and crushing the large pieces of metal rejected by the screens, and a tramway, supported on trestles, and loading bank have been constructed for the more economical loading of cut stone, pitchers and spalls. As compared with current contract rates, the result of the year's working was a nett saving of £462, after deducting capital charges and reasonable allowances for depreciation and so forth.

The whole of the collected house refuse, amounting to 7,712¾ tons, and trade and market refuse, amounting to 845¼ tons, making a total of 8,558 tons, were destroyed at the destructor. The number of electrical units generated and sold was 430,850, and the quantity used for the council's own lighting and other works purposes, 32,527. The quantity of electricity generated per ton of refuse burned for the whole year reached the high figure of 54·14 units. The revenue from electricity sold was £808. The increase over last year's figures is considered to be mainly due to the increased steaming efficiency since the installation of a superheater, and to the increased use by the citizens of covered refuse receptacles. The price received for electricity previous to the month of May was ·486d. per unit; since then it has been ·411d. per unit.

Rain fell in the city on 127 days in the year under review, the total reading being 33·84 in.

## MIRRORS AT STREET CORNERS.

### EXAMPLES AT FOLKESTONE AND MALMESBURY.

In order that drivers of vehicles approaching a street corner may be able to see the vehicles and persons approaching the same corner by another street, mirrors have in several cases been fixed at such corners.

In answer to an inquiry from the Editor of The Surveyor, the following information has kindly been furnished.

Mr. A. E. Nichols, assoc.m.inst.c.e., borough engineer and surveyor of Folkestone, writes:—

"I have to inform you that I fixed a square re-

Sketch Showing Position of Street Mirror at Folkestone.

flector, 24 in. by 24 in., at cross-roads in Folkestone in June, 1910. It was supplied by Messrs. O. C. Hawkes, Limited, of Globe Glass Works, Birmingham, at a cost of 30s. In addition, I made the upright on which it is fixed of 1½-in. diameter iron gas pipe, driven into the ground.

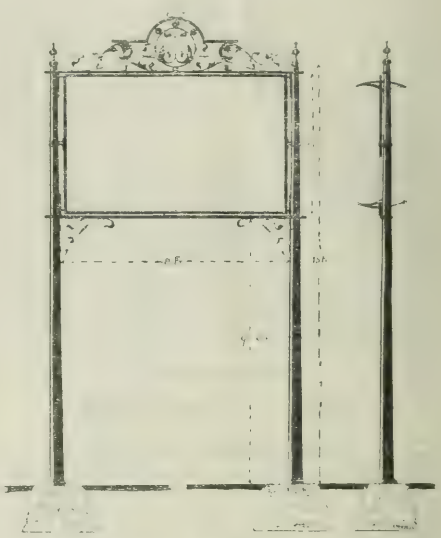
"I enclose a rough tracing showing the position of the mirror at the junction of Bouverie road and square with Cheriton place and gardens, where houses are built tight up to the back footway (the roads in question carrying quick traffic), and it is impossible for motorists approaching the junction to see any oncoming traffic. Not accidents and several narrow escapes have occurred at that point. However, since the mirror has been fixed I have not heard of anything approaching to accident, and as a motorist myself have personally experienced its value.

"I do not find that the damp, mist, rain or frost has had any ill-effects on the mirror, which is occasionally cleaned by a passing lamplighter when cleaning his lamps, nor do I think apparatus of this description unduly encourages high speed at turnings.

"I do suggest, however, that these street mirrors would be of very much greater value if they were very slightly convex, in order that a larger area could be observed than is possible with a flat mirror."

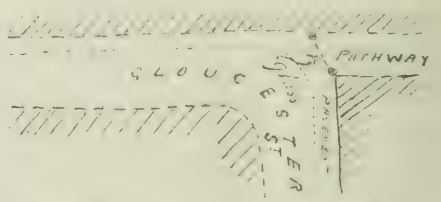
Mr. Charles Bowman, m.r.i.p.h., borough surveyor of Malmesbury, Wiltshire, writes:—

"The mirror here requires scarcely any cleaning—a wipe over once in about three months. It is not of much use on a foggy or frosty morning till the sun



Reflecting Mirror for Dangerous Corner at Malmesbury.
(Can be fixed at any angle.)

or rain has been on it a few minutes. Drivers of conveyances, I believe, go steadier round the corner since it has been fixed—strangers especially. We have had no accidents since that time. It is




Sketch Showing Position of Street Mirror at Malmesbury.

fixed on two pillars on the pavement, and I have heard no complaints from people living near since it has been up. I can with every confidence recommend it."

**London Water Supply.**—Consideration of a scheme for the construction of three new reservoirs, at an estimated cost of £3,481,900, was adjourned at the last meeting of the Metropolitan Water Board. In the course of the proceedings it was reported that the quantity of water supplied by the board during the past year exceeded that of the previous year by upwards of 7,000,000 gallons, the total output having been 89,137,000,000 gallons. That occasioned an increase in the quantity of coal consumed of some 25,000 tons, amounting in value to £19,500. Labour troubles occasioned a further increase of cost amounting to nearly £6,000. Thus the expenditure on coal alone showed an increase of upwards of £25,000.

## PROPOSED WATERWORKS FOR ROCKHAMPTON, SYDNEY.

### MR. HERBERT BELLAMY'S SCHEME.

A large scheme for new waterworks is under consideration for the city of Rockhampton, and Mr. Herbert E. Bellamy, of Sydney, having been asked by the authorities to prepare a report, has submitted plans and estimates for the work, which is likely to be carried out in the near future.

The rapid growth of the city of Rockhampton and the increased consumption of water have produced grave problems for the waterworks engineer. In the year 1878 the population was 6,600, while in the year 1911 it had increased to 25,000. The annual consumption of water in the year 1881 was a little over 54,000,000 gallons, while in the year 1910 it exceeded 336,000,000 gallons. The present supply is said to be drawn from a series of contaminated lagoons; the catchment area is used as pasture land for cattle, and the water is of undesirable quality.

Various schemes have been under consideration, but the final scheme prepared by Mr. Bellamy possesses superior advantages. It is proposed to draw water from the Fitzroy river, which is formed by the junction of the Dawson and Mackenzie rivers, and which has a catchment area of 50,000 square miles. The suggested intake will be on the southern bank in the Yaamba reach. At this point there exists a magnificent natural storage reservoir about 1 mile long by 8 chains wide, containing about 175,000,000 gallons.

INTAKE.

The river water will be admitted into a low lift pump well through a circular tunnel lined with concrete. This tunnel will be 474 ft. long, and 4 ft. internal diameter, and it will have a fall of 1 in 500 from the river to the pump well. The intake will be a monolithic mass of concrete, in which will be fixed a wrought-iron screen and guides for receiving stop planks to shut out the river water from the tunnel for cleaning and repairs. There will be a 30-in. stop valve at the pump well end, so that the water may be shut off during floods, or when the pumps are repaired, and so that the supply can be regulated to suit the pumps.

The pump shaft is to be 12 ft. internal diameter, and will be lined with concrete. Stages with ladders will be fixed in the shaft 10 ft. apart.

PUMPS.

The water will be raised from this shaft by vertical duplex direct-acting low-lift compound surface-condensing pumping engines, placed in duplicate. The engines will be carried on steel girders. Each pump will be capable of lifting 1,000,000 gallons per day to the filters or through pipes direct to the clear-water basin.

FILTERS.

After inspecting filtration plants in all parts of the world, and after considering the respective merits of slow sand filters, rapid filters, coagulation and sterilisation, Mr. Bellamy is of opinion that the best method for Rockhampton is the Puech-Chabal system. It will be remembered that in the Puech-Chabal system the water is passed through successive beds of gravel arranged in layers of moderate thickness, the gravel being graded from coarse to fine, the final treatment being on sand filters. The filters proposed will be capable of treating 1,500,000 gallons of water per day, and they will be constructed in reinforced concrete on the Kahn system. From the filters the water will flow into a clear-water basin. This basin is of novel design, and will also be constructed of reinforced concrete on the Kahn system.

LIFTING ARRANGEMENTS.

The water will be lifted from the clear-water basin by horizontal duplex direct-acting high-lift triple-expansion surface-condensing engines, in duplicate, each capable of lifting 2,400,000 gallons in twenty-four hours. The rising main will be 18 in. diameter and 13 miles long. The water will be lifted to a service reservoir situated on Jamie's Hill. Babcock water tube boilers are to be used. It is to be noted that the engineer, having given every consideration to the claims of suction-gas plant and high-lift centrifugal pumps, came to the conclusion that superheated steam and pumps as described, of the fly-wheel type, were to be preferred at Rockhampton.

ENGINE-HOUSE.

The engine and boiler house are to be of framed hardwood resting on concrete foundations. The chimney shaft will be of steel. There will be an overhead travelling crane in the pump-house to travel the full length of the engine-room. A tramway line of light section will be laid for the conveyance of fuel to the two boilers. Five cottages will be provided for the engineers and firemen. The site of the works will be fenced in with a split post and rail and wire fence.

SERVICE RESERVOIR.

The service reservoir to be constructed on Jamie's Hill will hold 2,600,000 gallons, and is to be circular in form, and 150 ft. internal diameter. This reservoir will be divided into two separate sections by a cross wall, so that one half of the reservoir can be cleaned while the other half is in use. The whole structure will be built of reinforced concrete on the Kahn system. Each section of the reservoir is supplied with inlet, outlet and hour valves. The inlet valves are so arranged that in the event of the valves being accidentally shut while pumping is going on no damage will be done. A by-pass is provided on the pumping main, which is connected to the gravitation service main at a point well below its exit from the reservoir. By this device water could, in case of need, be sent directly into the gravitation main and so direct to the town if the whole reservoir had to be put out of use for repairs. The service reservoir is situated at an elevation of about 300 ft. above low-water mark at Rockhampton, thus giving all the hydraulic pressure that can be desired.

MAINS.

The rising and gravitation mains will be of $\frac{3}{16}$-in. plate mild steel pipes on the locking bar principle. The rising main will be 18 in. diameter, and the gravitation main will be 22 in. diameter. The whole of the pipes will be coated with hessian. Making every allowance for friction in the gravitation main, which is 9 miles 4 chains long, it is estimated that it will pass 176,400 gallons per hour, or 4,000,000 gallons per day.

The total cost of the work, including charges and fees of all kinds, is estimated as £124,530.

## ROADS IMPROVEMENT ASSOCIATION.

### COUNCIL MEETING.

There was a good attendance at the monthly council meeting of the Roads Improvement Association held on the 16th inst. Colonel R. E. Crompton, C.B., R.E., presided.

The report of the negotiations and correspondence with the Institution of Municipal and County Engineers respecting the gritting of London streets was received, and it was decided to invite the co-operation of the institution in making representations to those authorities who were still using material of excessive size.

The secretary presented a list of authorities who had made by-laws under sec. 78 of the Public Health (Amendment) Act, 1907, for the more efficient regulation of traffic in large towns, and also notes as to the efficiency of the by-laws in the various localities; instructions were given as to the preliminary action to be taken as regards the Metropolis.

A memorandum is to be prepared and circulated to local authorities setting out road users' views and suggestions in regard to the tar-treating of roads.

It was reported that a number of influential organisations had already formally approved the association's memorandum concerning the unification of the type and mode of erection of caution symbols. A further report is to be presented later.

Committee reports were received and adopted, and an amount of routine business was also transacted.

**Cheltenham Electricity Undertaking.**—The Board of Trade have informed the Cheltenham Town Council that they have decided to grant the Provisional Order they have asked for so as to extend the electric-lighting area of the corporation to the parishes of Leckhampton and Prestbury, in the rural district of Cheltenham.

**The Greater Leeds Scheme.**—A Local Government Board Order was received lately by the town clerk of Leeds sanctioning the extension of the city of Leeds. Under the order the city will embrace all Scarcroft, all Shadwell, all Roundhay, and over half of Cross Gates. The total acreage added is 4,670, and the total population 7,500.

## THE VALUE OF PURE WATER.

### STRIKING FIGURES FROM AMERICA.

Some interesting figures are contained in Mr. Charles B. Burdick's paper, read before the Indiana Sanitary and Water Supply Association, of which a summary is given in the New York *Engineering Record*.

Of course, it is quite clear in the first place that water, being a vital necessity, is above price, but the author in his paper goes so far as to set a definite money value upon the lives saved when an impure water is purified, and from this basis makes some interesting calculations, showing that by the installation of filters the nett return in pounds, shillings and pence upon the outlay, "viewed as a business proposition," will amount to from 50 to 200 per cent per annum.

Figures are quoted from the United States census reports showing that the investment in public water supplies in cities of over 30,000 population amounts to £6 15s. 10d. per head, while the approximate value of these properties is estimated at £6 11s. 8d. per head. Taking into account the annual operating expenses, taxes at 1½ per cent on the present value, and allowing 5 per cent on the present worth of the properties and deducting 2 per cent for depreciation, the author estimates that the cost of the water supplied to 105 cities with a population of 19,600,000 and a daily supply of 142 gallons per head per day, is 15s. 4d. per head per year. If to this figure is added the cost of the improvements on the premises of the consumer, the author estimates that the cost of the water supplied would be £1 0s. 10d. per head per year. These figures include all supplies, good and bad, and are taken to represent the average cost of water as it is supplied in American cities to-day.

It is pointed out that very conservative estimates show that where a pure water supply replaces one that is polluted, the monetary return to the community is altogether in excess of the expenditure required to bring about the improvement. Where a public supply is of really bad quality the money spent on bottled waters alone has been shown to be sufficient in many cases to purify the entire public supply. Again, with regard to the removal of hardness, Whipple has shown that on a basis of 1 gallon per head used for purposes requiring soap, with soap at 2½d. per pound, a value of £2 1s. 8d. is obtained per 1,000,000 gallons for each 100 parts per 1,000,000 reduction in hardness. Then the economies brought about by the use of soft water in heating systems, in saving the wear of clothing in washing, in steam plants, and in the mechanical arts show a further important saving of money resulting from the treatment of water.

It is, however, from the standpoint of health that pure water brings the largest financial return. It is stated that Mr. M. O. Leighton estimates the average value of each life taken by typhoid at £965 12s. 6d., while £1,041 13s. 4d. ($5,000) is commonly considered to be the value of life. There are from ten to twenty cases of typhoid for each death, which must, of course, involve considerable expense. The statistics available indicate an expenditure of about £458 6s. 7d. for each death. Mr. Allan Hagus has presented figures of five cities where purification works have been introduced. These indicate that for each typhoid death saved three additional lives have been saved from other causes, and it is argued that pure water has evidently a very beneficial effect on the general health. Taking all these figures into consideration, Whipple is quoted as concluding that £2,083 6s. 8d. ($10,000) per typhoid death saved is a conservative estimate of the saving secured through the purification of a polluted supply.

The [illegible] figures that on the basis given a saving of ten lives per 100,000 is equivalent to 4s. 2d. per head per annum on the whole population, and that the value of the purified water at Lawrence, Mass., is £1 0s. 7d. per head per annum, 19s. 9½d. at Albany, N.Y., 15s. 1od. at Binghampton, N.Y., and 19s. 9½d. at Watertown, N.Y.

### COST OF FILTRATION.

Some interesting and useful figures are given as to the cost of filtration. It is stated that the cost of filtration has been very generally estimated at £2 1s. 8d. per 1,000,000 gallons of water filtered, including operation and fixed charges. In mechanical filtration the operating costs run from 11s. 7d. to £1 9s. 3d. per 1,000,000 gallons, with fixed charges, including basins. The author quotes figures relating to a dozen modern plants, large and small, that run from £3,125 to £5,208 per 1,000,000 gallons of filter capacity, including basins. Allowing 7 per cent for fixed charges, the above figures of cost and working produce annual charges of from £1 9s. 2d. to £2 18s. 4d.

At £2 1s. 8d. per 1,000,000 gallons, and a consumption of 100 gallons per head per day, the total cost of filtration is 1s. 6½d. per inhabitant per year, and at 150 gallons per head this cost becomes 1s. 5½d. Assuming this cost at 2s. 3½d., and the value of life at £2,083 6s. 7d. ($10,000), including incidental losses, a saving of 5½ lives per 100,000 will balance the cost of filtration. A reduction in the death-rate of eleven will show a return of double the nett cost, and in all the cities whose death-rates have been quoted above the indicated nett return amounts to from six to twenty times the yearly cost of purification, including fixed charges.

The author's figures are useful, and certainly illustrate the value of pure water.

## HEAVY MOTOR TRAFFIC.

### METROPOLITAN COUNCILS' SUGGESTIONS.

In the House of Commons on Tuesday the Secretary of State for the Home Department was asked whether he had received representations from Metropolitan borough and other councils upon the subject of the continuous and systematic use of selected thoroughfares by the owners of heavy motor vehicles and the additional and heavy expenditure necessary for the upkeep of such routes, and urging that legislation was urgently needed to enable local road authorities to recover from such owners additional contributions to local expenses; whether such representations had been considered, and, if so, with what result; and whether he had received representations from the Deptford Borough Council and other local authorities, with reference to motor-omnibus traffic in London, urging that the proprietors of mechanically-propelled vehicles should be brought under contribution for the repair and upkeep of the roads over which they travelled in the Metropolitan boroughs, and that the borough councils should have a veto on the use by such vehicles of roads which, in their opinion, were unsafe or otherwise unsuitable for such traffic.

Mr. McKenna said he had received and considered the various representations referred to. The question of additional taxation of mechanically-propelled vehicles for maintenance of the roads was one for the Chancellor of the Exchequer to consider. As regarded the proposed power of veto, the Local Government Board already had power under sec. 8 of the Motor Car Act, 1903, to prohibit motor car traffic on roads which were very narrow or where such traffic would be specially dangerous; but there were strong reasons against giving local authorities a special veto on the use of particular roads by motor-omnibuses, which, Mr. McKenna added, provided facilities for locomotion which were a boon to the great majority of Londoners.

**Shorland's Manchester Grates.**—St. John's Schools, Cardiff, are being supplied with Shorland's warm-air ventilating patent "Manchester" grates by Messrs. E. H. Shorland & Brother, Limited, of Failsworth, Manchester.

**Reinforced Concrete Street-Paving.** — *Scientific American* for May 4th refers as follows to the use of woven wire mesh as a reinforcement for concrete street-paving in Plymouth, Wisconsin: "The wire was laid upon the concrete bed and the surface was filled in above it, making a tougher mass and one less likely to crack from heat or cold than the plain concrete. This pavement was laid in the summer of 1909, and has stood remarkably well. The surface is roughened to prevent skidding of automobile tyres, granite chips being spread upon the soft concrete surface before it had time to set. These were embedded only to ensure no noticeable unevenness, yet there are a great protection in wet weather and materially prolong the life of the pavement. To allow for expansion [illegible] boards of pulp express are set along the gutter-on edge and at 40-ft. intervals over the surface of the street. Thus the pavement is divided into monolithic blocks 40 ft. sq. The boards are set flush with the surface of the concrete; they wear evenly with the rest of the pavement." If this is so, it is surely a rather remarkable coincidence.

## BOMBAY WATER SUPPLY.

### HYDRAULIC ENGINEER'S SCHEME FOR IMPROVEMENT.

Mr. H. J. Trivess Smith, ASSOC.M.INST.C.E., M.I.M.E., hydraulic engineer to the Municipality of Bombay, has submitted a report making proposals for increasing and improving the water supply of that city.

The ultimate necessity for an increase in the quantity of water brought daily into the town has long been recognised. It was part of the conception of the Tansa scheme, which, as the hydraulic engineer points out, was never carried out in its entirety. It was estimated that, if continuous supply were to be maintained, an enlargement of Tansa would be required so early as 1899. Continuous supply has long since ceased, and the intermittent supply which took its place to meet the ordinary wants of the city is now insufficient. Yet nothing, it appears, has been done since the Tansa scheme was completed to its present extent to bring more water into the city.

It is pointed out, however, that in many ways the city was not, and cannot even yet be altogether said to be, ready for an increased water supply. The drainage system was far from complete, and large areas of land were subject to flooding. The whole north of the island was unsewered, and it had not even been decided to what point its sewage should ultimately be taken. There was great leakage throughout the city, and waste went on to an extent amounting to a sanitary danger.

In the last few years, however, much has been done, or has reached a stage either of execution or of design, which will allow of the improvements being carried out before the increased supply of water enters the city. Storm-water channels have been completed in the northern part of the island, and a storm-water drain, which will carry off the water from the higher parts of the city, is being actively constructed. Powerful pumping plant is being installed for the sewage arriving at Love-grove, and pumps are in contemplation for the more rapid disposal of water brought by the low-level channels to Worli. A great deal of leakage has been checked by the creation of a maintenance and waste-prevention branch of the waterworks department, and, though it is not claimed that the amount of water carelessly wasted by private consumers has been diminished, the danger to health from such waste is being recognised, and more effective means for the prevention of waste, especially such as arises from fittings defective or in bad repairs, are under consideration, and have already been approved of in principle by a committee of the corporation.

While, however, the objections that could previously be urged against bringing a larger quantity of water into the city have been to a great extent removed, the necessity for the increased supply has been emphasised by the special circumstances of late years. Increase of population and development of trade would by themselves have demanded increased water supply, but there have been in addition three special causes. The first of these has been the substitution to a very considerable extent of a water-carriage sanitary system for the privy system previously existing. This substitution was inevitable in the large number of residential buildings on the flat system built of late years; but it is perhaps even more desirable from a sanitary point of view in the older and more closely built parts of the city. The second cause is the general tendency to increase in the height of buildings and the demand for water supply at this increased height. The third reason is the disuse, discouragement and compulsory closing of wells. The growing recognition of the general impurity of well water would in any case have led to a decrease in its use; but this tendency has been greatly accelerated by the discovery of the share which these wells take in the prevalence of malaria by the shelter they afford to dangerous mosquitoes. At the same time many outside wells, tanks and low-lying pieces of ground have been filled up either for sanitary reasons or for building purposes. In many ways, therefore, the people of the city have taken more and more generally to the use of pipe water, and at the same time the supply of that water has shown, if not an actual diminution, at least no increase to meet the enlarged demands made upon it.

The need for water has been accentuated by the deficiency caused by the unsatisfactory rainfall of last year; but this shortage has only emphasised a deficiency which was in the nature of things permanent. The hydraulic engineer calculates that the domestic supply is at present only 18¼ gallons per head daily, and that in 1915 the amount will only be 16 gallons. These figures by themselves are taken to show that the city has come to the end of its tether, and that an increase in the water supply must, when the time inevitable for the carrying out of the work is considered, be regarded as a work of the most urgent necessity.

In his report, Mr. Treviss Smith estimates the requirements of the population that will either now or shortly have to be provided for at 51,000,000 gallons per diem. Fortunately there is no difficulty, engineering or local, in finding the required amount of water; and the cost, heavy though it will be, is well within the resources of the city. The hydraulic engineer puts this cost at Rs.92,32,000.

The immediately urgent steps outlined by the hydraulic engineer in his report include the raising of the Tansa dam, the re-duplication of the Tansa main into Bombay, and the preparation of the distributing mains in the city itself. Immediately the Tansa pipe is re-duplicated as far as Vehar, an additional supply is available for the city by putting the water brought by the new pipe into Vehar Lake. This assistance to Vehar from Tansa was always contemplated, but has not been possible since 1905. The corporation are at present considering the nature of the pipes through which water should be brought to the city, and the material favoured is steel.

## SOME RECENT PUBLICATIONS.*

THE HOUSING, TOWN PLANNING, &C., ACT, 1909. By W. A. Casson, Barrister-at-Law. Price 10s. 6d. nett. London: Chas. Knight & Co., Limited.

This commentary on the Housing, Town Planning, &c., Act, 1909, will be found useful alike to the lawyer and the administrator. In addition to the annotation from the purely legal standpoint of the statute, and the enactments which it incorporates, the author has endeavoured to foresee and deal with points of difficulty which are likely to arise in practice. This is particularly the case in that part of the book which deals with town planning, which is discussed from a general standpoint, with a view of rendering as much assistance as possible to persons engaged in the new art. In addition to the fully annotated text of the Act of 1909, the appropriate parts of the Housing of the Working Classes Act, 1890, and of other housing statutes are included in the book. The various forms, notices, regulations and circulars which have been prescribed or issued by the Local Government Board are all included in appendices. It should be pointed out that this is the third edition of Mr. Casson's book, and that all the notes have been carefully revised, re-written and amplified. The usefulness of the work is shown by the rapid exhaustion of the earlier editions, upon which the new edition is founded, although in its new form the book is much more complete and compendious than was possible heretofore.

MINUTES OF PROCEEDINGS OF THE INSTITUTION OF CIVIL ENGINEERS, vol. clxxxvii., 1911-12 (Part I.). Two papers, which were taken together for discussion, relate to the Loch Leven water-power works, the works of construction being described by Mr. A. H. Roberts, M.INST.C.E., while Mr. F. B. Sonnenschein, ASSOC.M.INST.C.E., read a paper on "The Hydro-Electric Plant in the British Aluminium Company's Factory at Kinlochleven." Another paper is that by Mr. R. T. Smith, ASSOC.M.INST.C.E., on "Electric Lighting of Railway Trains: the Brake Vehicle Method." Among "other selected papers" are: "A Method of Dealing with a Railway-Cutting in Bog," by G. H. Mills, M.INST.C.E.; "Wave-Impact on Engineering Structures," by Prof. A. H. Gibson, ASSOC.M.INST.C.E.; "Vehicular Ferries in New South Wales," by H. H. Dare, M.INST.C.E.; and "Further Notes on the New Lanarkshire Middle-Ward District Waterworks," by the late John McNee, ASSOC.M.INST.C.E. Among the abstracts are: "The Marikanave Dam," by H. D. Rice, executive engineer, Mysore Works Department. The masonry of this dam cost only 6s. 7d. per cubic yard.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

# Institution of Municipal and County Engineers.

## MIDLAND DISTRICT MEETING AT NUNEATON.

(*Conclusion.*)

In last week's issue we reproduced, together with a number of explanatory drawings, the paper entitled "Ten Years of Municipal Work in Nuneaton," which Mr. F. C. Cook, ASSOC.M.INST.C.E., the borough engineer and surveyor of the town, submitted at the recent Midland District meeting of the Institution of Municipal and County Engineers. The following is a report of the discussion which ensued upon the contribution:—

### DISCUSSION OF MR. COOK'S PAPER.

Mr. E. G. MAWBEY (Leicester), who was unable to be present at the meeting owing to a severe cold, wrote: "It is a most important and instructive paper, and deals with works of the first importance, reflecting the greatest credit on the corporation, as well as the engineers who have prepared and carried out these schemes. I agree with the author that, notwithstanding the great advantage to road users of tar-spraying as a dust preventative, the expenditure of something like £55 per mile per annum is very much the reverse of economical, and the money would be better expended on a more permanent method of treatment. We all know, however, that with the funds at our command this is not possible at present, except to a comparatively limited extent, compared with the wide-reaching temporary relief made possible by the tar-spraying method. Having regard to the recent trouble by fish poisoning, and also the occasional failures in tar-macadam, it seems inevitable that we must refuse to use crude or unrefined tar, from which the well-known damaging constituents have not been removed. The success of the floods prevention scheme reflects a great credit upon its author. The flood on the last day of the last century referred to was also the greatest recorded flood in Leicester. The great flood scheme for Leicester, mostly prepared and carried out by the late Mr. Gordon and Mr. F. Griffith, and completed by myself, was designed on a basis of discharging a volume actually flowing off the drainage area equal to a rate of 1¾ in. per twenty-four hours. This provision proved ample on the occasion of this great flood. The construction of the waterworks reservoir with ferro-concrete is interesting, and one would like to know what term of years was granted for the repayment of the loan. The capacity of the silt or sedimentation tanks at the sewage works is given as only one-fourth of the dry-weather flow. It is, of course, below the usual standard, but as the result of extended experiments at Leicester in 1898-9, I decided that from one-fourth to one-fifth was the best proportion to minimise septic action (a course which I have always strongly upheld), and the works carried out here on this basis have proved the advisability of this ratio. The grading of the various media used for the single-contact beds in Leicester varies from ¾ in. to 2½ in., and with the before-mentioned capacity of sedimentation tanks in use, the reduction of water capacity of these beds, after five years' use, amounts to 31 per cent of the total water capacity, but the present water capacity is still well over 30 per cent of the gross capacity, and there is no ponding. There is at present no necessity for any washing of the material. The thorough and able way in which this paper is prepared, with the facilities afforded for the inspection of these excellent works at Nuneaton, cannot fail to be of considerable interest and value to our members."

Mr. N. H. DAWSON (Banbury) said he had to thank Mr. Cook for his valuable and interesting paper, the reading of which had given him much pleasure. It afforded him all the more pleasure to be there that day because he was present at the meeting in 1901, when the sewage works were under construction. In his paper Mr. Cook said the county council granted the corporation the sum of £2,100 per annum for 10¾ miles of main roads. That worked out at about £195 per mile, the same amount as they received in Banbury. He would like to know how many tons of stone per annum per mile was laid on these roads. Either there was a great amount of metal and very heavy traffic, or the county council were very liberal to Nuneaton. They had stone at 2s. 3d. per ton, and the same stone cost them 9s. 3d. per ton at Banbury, so that Nuneaton had a very great advantage in having its own quarry. In regard to tar-painting, Mr. Cook said that "an expenditure of something like £40 a mile year after year, with the sole object of dust prevention, and without any prospect of effecting permanent improvement to the highway, appeared a particularly uneconomical way of dealing with the matter." He had to differ from Mr. Cook. He thought the diminishing of the dust nuisance in a town was of vital importance; there was the saving in the watering of the road; and he believed, if continued for two or three years, there would be a saving in the cost of maintenance, as the tar helped to bind the stone together to a great extent, and would increase the life of the road. Mr. Cook was happy in having constructed these separating tanks, as it was an economical way of removing suspended matter prior to treatment in the percolating filters. How often had the media been washed since they were put in?

Mr. W. B. CHANCELLOR (Lichfield), in proposing a hearty vote of thanks to Mr. Cook for his paper, said he did not agree with the last speaker that an allowance by the county council of £195 per mile per annum for main roads was too much, taking into consideration the enormous amount of traffic they now had on the main roads. How did the figure compare with the actual cost? His experience of entering into contracts with the county councils was that the county surveyor saw that the sum granted was expended, and as much more as the local authority would grant. The corporation were to be congratulated on the cheapness of the road metal. Could Mr. Cook give them the cost of repairing roads 3 in. or 4 in. thick, and also the cost with tar-macadam of the same thickness? With regard to tar-spraying, he noticed that crude tar had been used. Was any difficulty experienced with the roads in winter months, as he had found that when crude tar was used a nasty, dirty, greasy crust was formed on the surface of the road; but when distilled tar was used that did not occur. Mr. Cook had mentioned the reconstruction of highways. They were spending £40 to £50 per mile a year to prevent dust without permanently improving the highways. The general public were becoming more particular than ever, and what was regarded as a good road ten years ago was a very bad one to-day. The cost of materials and labour was increasing every day, but the local authorities were disinclined to increase their estimates. If the money spent on preventing dust were spent on improving the highways it would be better, and in the long run more economical. The only relief for the surveyor he could see was that in the future aviation might supersede road traffic. With regard to the small-pox hospital, he congratulated the corporation on not having had to use this, but where buildings were left for so long a time unoccupied they were subject to deterioration. He was glad to hear that the corporation electricity works were remunerative. With regard to the waterworks, he congratulated Mr. Cook on the excellent results he had obtained with his ferro-concrete tank. With respect to the sewage disposal works, the loss of capacity of the contact beds was a very serious matter. The loss on the percolating filters was not so much. At Lichfield they had had percolating filters in use for twelve years with very little loss of capacity. Some of the new percolating filters at Nuneaton were 7 ft. in depth, a depth which he thought excessive. He would like to know if Mr. Cook had carried out any tests at the different depths of these filters—say at 1 ft. and 2 ft. and 4 ft. and 5 ft. respectively? Below that depth probably very little purification took place. He was quite sure they had been over-tanking their sewage, and much of the colloidal trouble had been brought about by the sewage being over-septicised. He wished to know what proportion of suspended matter there was, also whether any flocculent matter collected on the tanks or the sides of the streams during the winter months.

Mr. G. W. LACEY (Oswestry), in seconding the vote of thanks, said he should like to congratulate the town on its general statistics on the height of the birth-rate and the lowness of the death-rate. It spoke very well for the physical state of the in-

habitants of Nuneaton that the birth-rate should be 31·2 per 1,000, and that the death-rate should be so low as 11·8. He was rather surprised to find that Mr. Cook was using crude tar for tar-spraying. He would hesitate to adopt that material because of its varying quality. With regard to the greasy condition of a tarred road in winter time, that was due to meteorological conditions. If they were in a district subjected to continuous rainfall and the subsoil was moist, they did not get so good a result from tar as where the subsoil was dry and the roads dried very quickly. From his experience of tar as a preservative he did not think there was anything in it. It did improve the condition as to dust in summer time, but on roads with considerable traffic he did not believe it had much preservative effect; on roads with lighter traffic, however, with two or three years' tarring, an improvement in the surface and a lengthening of the life of the road would be obtained. It seemed with regard to the small-pox hospital that the incidence of small-pox was very small; at the same time the expenditure of £6,000 was a very large one, and one would have thought that the money would have been better expended by providing a hospital for all infectious diseases and temporary accommodation for small-pox. It was somewhat of a novelty to find old sewage tanks converted into swimming baths. It was rather fortunate that use could be made of them in that way, but he hoped the brickwork was well scraped before the water was turned into them. With regard to the water supply, would Mr. Cook state what system of inspection he had in the town, as the consumption of 17·9 gallons per head seemed a very moderate one? One could never understand why, especially where the water undertaking belonged to the authority, a special charge should be made for baths. He saw that it had been reduced by one-half, and he hoped the council would further reduce it, or remove it. In regard to the sewage works, it had become the usual thing in the past few years to replace contact beds with percolating filters. It was not stated in the paper how often the silt was removed from the sedimentation tanks. The construction of the separating tanks was novel, but he would like to know if Mr. Cook found that the coarse material had any effect in eliminating suspended solids. The drying of the sludge was accomplished very rapidly, and Mr. Cook was fortunate in being able to get 1s. per load for the material. The analysis appeared to be very satisfactory, but he should like to know the reason for the great increase in the amount of free ammonia after passing through the tanks. The average figure for the year would be useful. He would also like to know whether the whole of the effluent was finally treated on the land after passing through the filters.

Mr. T. READER SMITH (Kettering) remarked that in regard to tar-spraying the process was valuable from the point of view of preserving the surface of the road. They sprayed the whole of the surface, and for six months of the year they were running on top of the tar instead of on the metal. In regard to the question of crude and distilled tar, if ordinary crude tar was thoroughly well boiled they got rid of a good deal of the light oils and water, and obtained practically a prepared tar. At Kettering he made an arrangement with the gas manager to put some tubes in an old boiler and used it for boiling tar, so that they had practically a prepared tar waiting for them when they required it. The boiler held 5,000 or 6,000 gallons, so they were able to boil the tar as fast as they took it out.

Mr. H. E. STILGOE (Birmingham) said he thought it was pretty well understood that the use of tar must be looked upon in the first instance as a great preservative of the road surfaces, and not merely as a dust palliative. He thought that had been discovered all over the country. He found it in Birmingham, where they treated just under 100 miles of macadam road at a cost of ·56d. per square yard. They obtained the very best results from that in the way of economy as well as in that of a dust palliative.

Mr. R. W. BLANCHARD (Cannock) inquired whether the treatment of scarlet fever cases on the Milne principle had gone beyond the experimental stage. If successful it appeared to him that it would do away with a great deal of hospital accommodation in the town.

Mr. H. CLARSON (Tamworth) suggested that previous speakers had overlooked the fact that the sewage of Nuneaton was of a unique kind, and it was impossible to apply there what was being done in other districts. He thought the works were as near perfect as it was possible for them to be.

Mr. F. E. G. BRADSHAW (Tamworth) inquired whether the £4,000 mentioned in connection with the flood prevention works represented the actual cost, or whether any compensation was paid to the owners when the work was done?

Mr. W. PLANT (Stafford) put a question as to the nature of the arrangement with the railway and canal companies for the maintaining of the bridges; and also whether they were paid anything for scavenging the approaches to the bridges? His experience also was that tar-spraying increased the life of the road. Had they obtained any of the land for street improvements free of cost? At the Road Conference last year it was stated that when owners were caught in a nice frame of mind the land might be got free of cost. He had not been able to do it, but he was afraid owners were not very public spirited in his district. With regard to sewage disposal, did the pumping at the works continue over the twenty-four hours, for if confined to twelve hours the main seemed rather small. Also, what was the cost of sinking the well at the new works? The amount of water obtained, considering the depth of the well, seemed small. The fact that 1s. per load was obtained for the sludge was interesting; most of them had to give it away.

Mr. NORMAN SCORGIE (Hackney) expressed pleasure at being able to attend the meeting, as he was one of those present at the meeting in 1901. He certainly thought they were not treated too liberally by the county council in the amount they received for the maintenance of the main roads. They were fortunate in the matter of cost of road metal, but what they saved in that connection they appeared to waste in application. He could not conceive that they were using with economy on their 42 miles of roads the amount stated in the paper. He agreed that they had to consider tar-spraying not altogether as a palliative, but as an adjunct to the preservation of the road surface. He considered the engineer was to be congratulated on the flood prevention works. He (Mr. Scorgie) had the honour of being resident engineer of a considerable portion of the Leicester works, and if the Nuneaton scheme proved as beneficial to the town as those to which he referred had been the energy spent on them would be well repaid.

Mr. H. J. COLEBY (Atherstone) said he was in agreement with the statement as to the application of crude tar in preference to distilled tar for tar-spraying. He had used crude tar from gasworks for streets with light traffic, and it had given excellent results, comparing very well with the distilled tar used on the main roads. He had found the distilled tar had caked on the surface of the roads, and was liable to break up in winter time in case of frost, while the crude tar had penetrated into the crust and acted as a preservative. As the surveyor to the neighbouring district of Atherstone, he took a lively interest in the doings of Nuneaton, and when he told them the corporation had done him the doubtful honour of placing their sewage works in his district they would appreciate his interest. After the conversion of the old contact beds to percolating filters, the complaints of the works had become fewer and fewer, and he felt when they had done away with all the contact beds the complaints would cease altogether.

The CHAIRMAN (Mr. R. J. Thomas) said he should like to say a few words on the question of tarring, with reference entirely to country roads. He suggested that in any comparison made as to the effect of tarring they should differentiate between streets and country roads, because it was the pace that killed. He had found on country roads for the last seven or eight years that unless they did apply tar to the surface of the road they could not keep the metal down, and his experience had been that roads which were surface tarred annually had at least a 25 per cent longer life, and that certainly more than compensated for the cost of the tarring. One speaker had referred to the fact that he had tar kept ready boiled for them at the gasworks. That was very useful when it could be done, but on a big area of country roads, where perhaps there was not a gasworks within 20 miles, it was difficult to do that. They boiled theirs on the roadside, putting it hot on the road, and the secret of success was to keep it boiling and brush it well between the stones. The result was that on country roads there was little tar left in winter time to bring horses down.

The vote of thanks was carried.

Mr. COOK said before replying to the discussion he ought to mention that he had received a letter that

morning from Mr. Pickering, who said how sorry he was at not being able to be present, but he (Mr. Pickering) felt he must pay a tribute of respect to the memory of one whom he always held dear. He regretted Mr. Pickering's absence because he owed more to him in a professional sense than to anyone else. From what he had heard during the discussion it seemed to be alleged that he had deprecated in some way the continuance of tar-spraying. He had not done anything of the sort. They tar-sprayed last year 8 miles of road, and he was convinced that of remedies of that sort which were not permanent remedies, tar-spraying was the best, inasmuch as it had the effect of lengthening the life of the road. They had tried distilled tar, but he did not see they had value for their money as compared with crude tar. As to Mr. Mawbey's question in regard to the repayment of the cost of the ferro-concrete reservoir, the work was done under Act of Parliament. Mr. Chancellor asked how often the medium of the percolating filter was washed. They had never washed it, but he was convinced the time would come when they would have to wash it. The cost of the highways, main roads, and other roads was £182 per mile. They were always glad to get more money from the county council, but they had not found the county council unduly sparing in that respect. Mr. Chancellor was rather afraid the small-pox buildings were not improving. There was a resident caretaker there, and, at any rate, they were not going back. He agreed with Mr. Lacey about the charge for the baths. To his mind it was an anachronism that any authority should charge a man for a bath in his own house and make a loss on public baths. They ought to encourage the use of the bath. The effluent from the percolating filter was not treated on the land, it was turned direct into the river. The flow of 136 gallons per square yard on the percolating filters was the average throughout the year. There was no difficulty in getting rid of the sludge in ten days. Replying to Mr. Bradshaw, they paid nothing to owners as compensation, paying only for the land they took. If anything they had improved the land. They had no difficulty in making an arrangement with the railway companies. In increasing the width of roads, landowners, generally speaking, treated them very fairly. The pumping station worked continuously throughout the twenty-four hours. As to the well-sinking operations, he had not the figure by him.

## QUANTITY SURVEYORS' ASSOCIATION.

### ANNUAL DINNER.

Mr. C. W. Ball, M.S.A., the president, occupied the chair on Monday evening at the annual dinner of the Quantity Surveyors' Association, the company including the Lord Mayor of Leeds (Mr. Wm. Nicholson), Messrs. H. Riley, T. J. Carless, and W. R. Hood, F.S.I., vice-presidents, S. Chatfeild Clarke, F.S.I., and Walter Lawrance, F.S.I., past-presidents, H. Percy Boulnois, M.INST.C.E., chairman of the Royal Sanitary Institute, H. Arthur Bartlett, president of the Institute of Builders, F. G. Rice, president of the Builders' Benevolent Institution, Dudley Bartlett, president of the Builders' Clerks' Benevolent Institution, James Wright, president of the National Federation of Building Trades Employers, H. M. Hodgson, F.S.I., G. Corderoy, F.S.I., A. W. S. Cross, M.A., F.R.I.B.A., A. A. Hudson, K.C., and Arthur G. Cross, F.S.I., hon. secretary.

The Lord Mayor of Leeds proposed the toast of "The Quantity Surveyors' Association." In the course of his remarks his lordship, after alluding to the flourishing condition of the association, went on to deprecate the practice which prevailed in the North of architects taking out their own quantities. He said without hesitation that that was not right, and he condemned also the employment of municipal engineers on work which rightfully should be undertaken by architects. He felt he must warn his hearers that in the near future they must look forward to dearer prices. The condition of things in the engineering and building trades had been extremely bad recently, and the time had now arrived when they would have to alter their prices and allow for rates which would permit of the proper carrying out of work.

The President, in response, said he thought quantity surveyors would take to heart what the proposer of the toast had said. Proceeding, he said that when they did him the honour of electing him as their president he had expressed the hope that it would be possible to put their Benevolent Fund on a satisfactory basis. He had sent out a circular-letter in which he asked that a sum of £46 should be subscribed by that night, and it had been exceedingly gratifying to him that, instead of the amount for which he had appealed, £78 had been sent. As a council they had had a very busy year. They had completed the revision of their Articles of Association. Many minor alterations had been necessary, the principal being the introduction of a new class of membership. They now had associates, who must be at least twenty-two years of age, and must have passed the association's examination or some similar examination, and give evidence of good training. It was expected that this step would have good results. Some three months ago they passed a new by-law which made it an offence for any member to do work below the schedule of the association when concerned with contracts up to a value of £70,000. They had not issued this year another pamphlet on the standardisation of measurements. They had already issued two, however. A sub-committee met a committee of the Surveyors' Institution some time ago and discussed the matter, and another meeting was about to be held, so that, beyond hoping that the two societies would see their way to take some joint action, he would not say anything more about it on that occasion. Commenting, in conclusion, on the valuable work of the hon. secretary, Mr. Arthur G. Cross, the president stated that there had been a considerable increase in the membership of the association, and that among those recently elected were some of the leading men in the profession.

Mr. H. M. Hodgson, in proposing "The Architects," alluded to the great improvement in London street architecture which had taken place during the last twenty years. That improvement, he was glad to say, was still going on. Anyone who had been absent from the Metropolis for any length of time would be struck on his return by the great beauty and refinement of the buildings which had taken the place of the old structures; everywhere brick and stucco were being replaced by marble and stone, and in some instances ferro-concrete was being employed, although the last-named material was usually at present content to be decently clothed in a skin of masonry. (Laughter.) What London would be like in another twenty years he would not venture to prophesy, but it was his hope that by that time there would be in existence a body of architects to regulate the architecture of our streets. At present he thought there was too much of a tendency towards buildings of a colossal type. The association of architects with the development of large building estates such as the garden cities of Hampstead, Gidea Park and elsewhere, was a matter for satisfaction; their connection with such schemes had, he thought, had the best results, and would do much in time to alter the appearance of those dreadful suburbs with which most of them were familiar.

Mr. A. W. S. Cross, acknowledging the toast, congratulated the association on its progress. In course of time he hoped to see them extend their sphere of influence, and that the day would come when it would be possible to insist on every quantity surveyor in the United Kingdom submitting himself to the test of examination. The quantity surveyor was indispensable to the architect, more especially when, as usually happened, the builder's bill of extras loomed large on the horizon. The relations between architects and quantity surveyors had always been of the most friendly character, and he trusted that that would long continue to be the case.

The toast of "The Contractors" was given by Mr. Henry Riley, and responded to by Mr. H. Arthur Bartlett. Mr. S. Chatfeild Clarke proposed "The Visitors," Mr. George Corderoy replying, and before separating the company drank in hearty fashion the health of the hon. secretary, Mr. Arthur Cross, further appreciative reference to whose work was made by Mr. A. A. Hudson, K.C.

**Road Tarring and Fish Life.**—At a meeting at Fishmongers' Hall on the 16th inst. of the Salmon and Trout Fishing Association, Mr. Runciman, M.P., president of the Board of Agriculture and Fisheries, said that the question of the pollution of streams near roads that had been tarred would have to be dealt with by administration and possibly by legislation. Some means would have to be taken to prevent fish from being poisoned.

## CORRESPONDENCE.

*"Men are never so likely to settle a question rightly as when they discuss it freely."*—MACAULAY'S "Critical and Historical Essays."

### MUNICIPAL AND COUNTY ENGINEERS: MUTUAL AID AND PROTECTION: SECURITY OF TENURE.

*To the Editor of* THE SURVEYOR.

SIR,—Kindly feelings impel me to ask you to be good enough to allow me to state through THE SURVEYOR that it would, to my mind, be a good thing if a scheme were formulated on sound lines in connection with the subject-matter of this letter, and that, in the interests of my professional brethren, I am prepared to formulate one, provided a sufficient number are willing to join, and will send their names direct to me.

Upon receipt of the latter I will endeavour to form a good Advisory Committee of Engineers and Surveyors to assist in the matter, with a view to handing over an already prepared scheme to the institution (with the approval of the council of that body) for actual management.

Considering the large number of men employed in the profession a nominal (annual) subscription should be sufficient to meet requirements.

To initiate the movement, I shall be glad to receive a few donations from sympathisers with it to add to the amount I personally am prepared to give to the object.

I might add that deserving cases came before the council of the Institution of Municipal and County Engineers during the nine years I previously served on that body. But, as there are no funds at the disposal of that council out of which such cases can be met, no assistance was given. The formation of a scheme such as I suggest would, I think, change this.

With many thanks for an anticipated insertion in your next edition.—Yours, &c.,

H. T. WAKELAM.

63 Victoria-street,
Westminster, S.W.
May 21, 1912.

### AVIATION AND THE MUNICIPAL ENGINEER.

*To the Editor of* THE SURVEYOR.

SIR,—I beg to direct your particular attention to the programme of a meeting of this institution which is to be held on June 12th at the London Aerodrome. The meeting is the first of its kind to be held in this country—indeed it is, so far as I know, the first of its kind in the world. The relations which must be established, at no very lengthy period of time, between aviation and municipal engineering would seem, so far, to have escaped attention.

Aviation will be one of the factors of our every-day life, and municipal engineers must come into close touch with it. New forms of buildings must call for new by-laws, and regulations will have to be framed for the protection of both life and property. In how far local authorities will be called upon to administer the latter remains to be seen; but it is a foregone conclusion that to the duties of their engineering officials will be added the administration of the new code of by-laws.

The matter is eminently ripe for full discussion, and invitations have been extended to other engineering (and to architectural) societies to participate in it. The architect, it is to be remembered, is equally interested professionally.—Yours, &c.,

B. WYAND,
Secretary, Institution of Municipal Engineers.
39 Victoria-street,
London, S.W.
May 20, 1912.

### ROAD TARRING AND FISH LIFE.

*To the Editor of* THE SURVEYOR.

SIR,—One of the chief benefits which the advent of the motor car has produced is unquestionably the improvement of the roads throughout this country, and that a few fish may have lost their lives by the use in a primitive manner of tar as a dust-laying palliative in the transition hardly appears to warrant a great outcry, especially as it is apparent to all those who are making a study of the road question of to-day that in the course of a very few more years tar will no longer be used for this purpose. The Park Commissioners of Chicago, who have had considerable experience with tar in the extremes of climate which obtain in that city, have already entirely abandoned its use in future road building, as during the extremely warm weather of last summer, when in one period of eight days the thermometer never went below the actual melting point of tar, they were forced to keep a large gang of men at work with shovels and buckets gathering the tar from the gutters, where it ran in great quantities.

The material which has been conclusively demonstrated, and which is now being adopted in the construction of road surfaces in America in lieu of tar, is natural asphalt containing a large percentage of pure bitumen, and having a high melting point. This material, as the Americans say, "stays put," and therefore has no tendency to wash off the surface of the roadway into trout streams; but if the improvement of the roads throughout this country has been achieved at the cost of only a few fish, our good roads of the future stand out as a monument to the advent of the motor car, and have indeed been obtained at small expense.—Yours, &c.,

CECIL NATHAN.

The Royal Automobile Club,
Pall Mall,
London, S.W.
May 20, 1912.

### PRIVATE STREET WORKS.

*To the Editor of* THE SURVEYOR.

SIR,—I shall be much obliged if any of your readers can inform me of cases where urban district councils have granted extra remuneration, either by way of increased salary or honorarium for extra work involved in the preparation of plans, specifications, &c., and the subsequent supervision of the work for private street works under the Private Street Works Act, 1892, together with the costs of the schemes for which such extra remuneration was granted.—Yours, &c.,

G.

May 17, 1912.

### LIFTING OF SEWAGE SLUDGE.

*To the Editor of* THE SURVEYOR.

SIR,—We should be very grateful to know whether any of your readers have used a windmill to work a pump for lifting sewage sludge, and, if so, whether this method has proved satisfactory.—Yours, &c.,

KAYE PARRY & ROSS.

48 Kildare-street,
Dublin.
May 18, 1912.

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**London's New County Hall.**—Complaints were made recently at a meeting of the London County Council of the slow progress in the building of the new County Hall. It was decided to instruct the Establishment Committee to use all possible efforts to expedite the building work.

**New Form of Gas Lighting.**—At a recent meeting of the North of England Gas Managers' Association, held at Newcastle-upon-Tyne, Mr. Jacques Abady, of London, in the course of a paper on "Light and Competition," mentioned that a few years ago he had attended an experiment of a new form of gas lighting. While he was unable to disclose what that form was, he thought he could say with deliberation that the introduction of that new form of light would do as much for gas as the filament lamp has done for electricity. It would do wonders, he believed, for higher pressure gas.

**Highway Maintenance in Newark Rural District.**—The expenditure on roads in the rural district of Newark during the year ended March 31st last amounted to £2,036—according to the report of the surveyor, Mr. Ralph Oakden, junr., ASSOC.M.INST.C.E. The following materials were made use of: Tar-macadam, 180 tons; granite, 777 tons; slag, 1,985 tons; slag screenings, 85 tons—a total of 3,027 tons. Both in regard to expenditure and materials used, these figures are the lowest of which Mr. Oakden can find a record, and he considers they show that reasonable economy is being used. Owing to the difficulty in getting water last autumn, Mr. Oakden postponed a considerable portion of the steam rolling until March last, and most of the accounts in connection with the work would be charged into the succeeding half-year. Moreover, owing to the coal strike, they were not able to get all the material wanted during the last part of the quarter.

# Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

### THE MONTHLY PREMIUM.

Mr. GEORGE SMITH, of Luton, to whom the premium for April was awarded, has chosen the following books:—

"Waterworks Distribution," by J. A. McPherson (Batsford).

"Public Health Law," by Sydney G. Turner (St. Bride's Press, Limited).

"Practical Road Engineering," by H. P. Boulnois (St. Bride's Press, Limited).

These have been duly forwarded to him.

### QUESTIONS.

This week answers are invited to the following questions:—

**245. Pumping.**—What is the discharge in gallons per hour from a single-acting pump, 6 in. in diameter, working thirty strokes per minute, length of stroke being 12 in.? Allow 10 per cent for loss due to friction, leakage, &c. (B. M. R.)

**246. Reinforced Concrete.** — A reinforced concrete beam 10 in. deep by 5 in. broad carries a load of 3 tons, distributed over a span of 12 ft. The two reinforcing rods have a united area of 1·2 sq. in., and the centre of them is 1 in. from the bottom of the beam; find the unit stresses in the concrete and in the steel rods at the centre of the beam. Do you consider either of the ascertained stresses excessive. (M.R.S.I.)

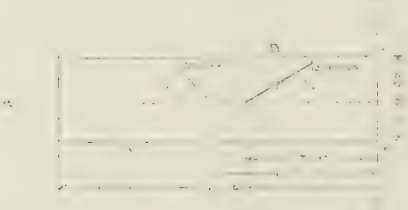
**247. Statics.**—Prove that if three forces acting on a particle keep it in equilibrium, each is proportional to the sine of the angle between the other two. (T. R.)

**248. Pumping.**—What power engine is required to pump 160,000 gallons per day of ten hours through ¾ mile of 5 in. diameter main against 8 ft. head suction and 90 ft. head delivery? Also state size and kind of pump. There are three right-angle bends in the main, in addition to those in the pump-house at connections. If a 4-horse power turbine and 6½-horse power engine, which will be used as a lay-by, be provided, and the figure given (160,000 gallons) is twice a day's supply, is this a reasonable margin when the storage capacity is 60,000 (fire contingency being considered)? (Hack.)

**249. Applied Mechanics.**—What is meant by the reciprocal of a point, and a pair of reciprocal figures?

### REPLIES TO QUESTIONS.

**239. Stresses in a Beam.**—A B is part of a beam, of which $pq$ is a cross-section, cut by the plane P Q; $aa$ is the axis of the beam. Forces of 4,000 lb. and 12,000 lb. act at the inclinations and distances



shown. The moment of inertia of the section is 12-in. units, and its area is 4½ sq. in. Find the total compressive and tensile stresses in the section $pq$. (E. A. B., *Leicester.*)

Resolve both forces along centre line of beam thus—

Total force parallel to centre of beam

$$= 4{,}000\cos 45 + 12{,}000\cos 30$$

$$= 1{,}000\times\frac{1}{\sqrt{2}} + 12{,}000\times\frac{\sqrt{3}}{2}$$

$$= 2{,}828 + 10{,}492$$

$$= 13{,}320 \text{ lb.}$$

This component causes a uniform compressive stress over the section $pq$ of intensity $= \frac{13{,}320}{4{\cdot}5} = 2{,}960$ lb. per square inch.

Take moments of the two forces about the point in section $pq$ in which it is cut by the neutral axis—

$$\text{M} = 12{,}000\times 3\times\sin 30 - 4{,}000\times 4\times\sin 45$$

$$= 12{,}000\times 3\times\frac{1}{2} - 4{,}000\times 4\times\frac{1}{\sqrt{2}}$$

$$= 18{,}000 - 11{,}312 = 6{,}688 \text{ ft. lb.}$$

Hence the section $pq$ is subject to a uniform compressive stress of intensity 2,960 lb. per square inch in addition to a B.M. of 6,688 ft. lb.

If $f$ be the intensity of stress at any point distant $y$ from the neutral axis, due to bending moment M, and I be the moment of inertia of the section about the same axis,

$$\frac{\text{M}}{\text{I}} = \frac{f}{y} \text{ or } f = \frac{y}{\text{I}}\times\text{M}$$

and hence tensile stress at $q$ due to bending

$$= \frac{1\frac{1}{2}}{12}\times 6{,}688\times 12$$

$$= 10{,}032 \text{ lb. per square inch,}$$

and compressive stress at $p$ due to bending

$$= \frac{2\frac{1}{2}}{12}\times 6{,}688\times 12$$

$$= 16{,}720 \text{ lb. per square inch,}$$

$\therefore$ tension at $q = 10{,}032 - 2{,}960 = 7{,}072$ lb. per sq. in.
and compression at $p = 16{,}720 + 2{,}960 = 19{,}680$ lb. per sq. in.
(A.)

**243. Water Supply.**—What kind of water acts upon lead? State the risk attendant upon its use and the means you would adopt for avoiding or reducing such risk. (M. C. E.)

The following additional reply to this question has been received since our issue of last week:—

Soft water, especially when full of air, or when containing organic matter, acts upon lead in such a way that some of it is taken up in solution and the water is poisoned.

This makes lead a dangerous material to use in many cases for cisterns, and pipes connected with the supply of water for drinking purposes.

When the water contains much oxygen the lead is oxidised, and oxide of lead, which is to some extent soluble in water, is a highly poisonous substance, which leads to serious diseases among users of water of this description.

The poisoning of the water in this method may be avoided by coating and lining the insides of lead pipes, cisterns, &c., through which the water is conveyed by one of the following methods:—

(1) M'Dougal's patent: Consists in applying an internal bituminous coating, which is said to be successful.

(2) Schwartz's patent: The pipe is boiled in sulphide of soda for fifteen minutes, by which the interior is coated with sulphide of lead (a substance insoluble in water).

(3) Lead-encased pipes: Consists of an inner pipe of block-tin, encased in a lead pipe. In consequence of the tin melting at a lower temperature than the lead, it is somewhat difficult to make a soldered joint in these pipes. However, it may be done with care, or Heap's mechanical joints may be used, in which the union is effected by means of screwed couplings. (H. F. B., *Milton Regis.*)

**Exhibits at Bath Show.** The exhibits on the stand of Messrs. Marshall, Sons & Co., Limited, Britannia Work, Gainsborough, Lincolnshire, at the Bath and West and Southern Counties Show at Bath, include all their standard productions, and comprise a road-roller, traction engine, oil tractor (agrimotor), thrashing machine, and a trailer wagon.

# Law Notes.

EDITED BY J. B. REIGNTER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

*The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries which should be written legibly on foolscap paper, one side only, should be addressed to "The Law Editor," at the office of* THE SURVEYOR, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

DRAINAGE WORKS: OBSTRUCTION OF ACCESS TO SHOP: CLAIM FOR COMPENSATION: PUBLIC HEALTH ACT, 1875, SEC. 308.—An important and interesting point as to the right to compensation under sec. 308 of the Public Health Act, 1875, was decided in *Lingke v. Christchurch Corporation* (King's Bench Divisional Court). The corporation, in executing certain drainage works under their statutory powers, threw up a heap of soil in front of the plaintiff's shop, rendering access thereto less convenient. The plaintiff claimed compensation, and an arbitrator was appointed, who awarded £23 7s. 10d. An action was brought in the Southampton County Court to recover that sum, together with the arbitrator's fees, making a total of £53 10s. 8d. The county court judge held that the corporation were not liable, and gave judgment in their favour, on the ground that there had been no negligence, improper conduct or unreasonable delay in the execution of the work. The High Court affirmed this decision. Mr. Justice Darling, in the course of his judgment, said that if it had not been for the authorities he should have been very much inclined to agree with the contention of the plaintiff's counsel that it was not necessary for him to prove negligence. His lordship then referred to *Herring* v. *Metropolitan Board of Works* (19 C.B., N.S. 510), and *New River Company* v. *Johnson*, to show that unless something is done which would be actionable, if it were not for the powers given by the Act, there is no right to compensation. If there had been a finding in the present case that the plaintiff had been deprived of access to her premises to an unreasonable extent, or for an unreasonable time, then such an interference would have been wrongful, and she would have been entitled to compensation. In the absence of such a finding he did not think she was entitled to any compensation. The authorities were strong to show that a pre-existing right—that was to say, a right existing apart from the Public Health Act—must have been interfered with before she had any right of action. Mr. Justice Bucknill agreed. He said if they allowed the appeal, that would be taking upon themselves to decide contrary to a long series of decisions which went to show that where a local authority, acting under statutory powers, performed its necessary duties reasonably and properly, then, although the work they executed might cause inconvenience to persons in the position of the plaintiff, such persons had no right to compensation, unless the statutory powers had been carried out unreasonably—that was to say, in such a way as to give a personal cause of action to the plaintiff.

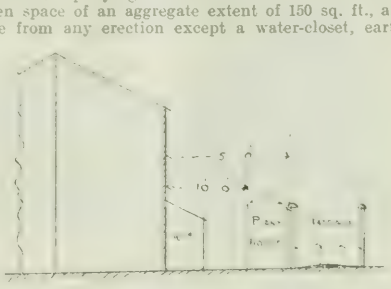
## QUERIES AND REPLIES.

*In order to avoid confusion correspondents are requested to use distinguishing words as noms de plume. The letter X, consonants as names X Y Z, and words such as "engineer" and "surveyor," should never be used.*

DISTURNPIKED ROADS.—"M. Q." writes: Certain turnpike roads within a borough of less than 10,000 inhabitants, but having a separate court of quarter sessions, were disturnpiked upon the passing of the Highways and Locomotives Amendment Act, 1878 (sec. 13), and they were unobjected to by the county authority under sec. 16. (1) Did these roads thereupon become, nominally, main roads, although unentitled to receive any grant for maintenance from the county authority? (2) When the Local Government Act, 1888, was passed, did sec. 38 (3), transforming the borough into an urban sanitary district within the meaning of the Highways and Locomotives Amendment Act, give it exactly the powers of an urban sanitary authority under sec. 11, sub-sec. 2, with respect to claiming to retain the powers of maintaining its main roads? (3) Is the operation of sub-sec. 4 of sec. 38 directed to the disturnpiked roads (or nominally main roads), or does it refer to such other district roads as the borough council consider ought to become "main" roads? It is noticed that the phraseology in sec. 35 (4) [illegible] borough [illegible] different from that of sec. 38 with respect to the small borough, and this has evoked strong difference of opinion along the lines indicated in these queries in the case under discussion.

A. Yes, for the purposes of the Act, and subject to its provisions. (2) Apparently the borough cannot claim to retain the *control* of main roads under sec. 11, sub-sec. 2(*a*), of the Act of 1888, that power not being necessarily incident to an "urban sanitary authority" within the meaning of the Act of 1878. But they can undertake the *maintenance* of main roads under sec. 11, sub-sec (2), of the Act of 1888: see Pratt and Mackenzie's "Law of Highways," 15th edition, page 584). Practically this means that the main roads, though maintained by the borough, remain vested in the county council, and the borough cannot exercise the powers of improvement, &c., given by the Public Health Act, 1875. (3) Apparently the operation of this sub-section is not limited to disturnpiked roads, but extends to any roads in the borough "mentioned in the application."

BUILDING BY-LAWS: OPEN SPACE IN REAR OF DOMESTIC BUILDINGS.—"REX" writes: The building by-law in force in this borough with regard to the open space in the rear of domestic buildings is the same as Model By-law No. 54 (1877 Series). Plant-houses, if wholly detached and at a distance of 10 ft. at the least, are by by-law 2 (*h*) exempted from the operation of the by-laws. The question arises whether a plant-house may be erected at the rear of houses in the circumstances which will be apparent on an inspection of the accompanying sketch. The house must have an open space of an aggregate extent of 150 sq. ft., and free from any erection except a water-closet, earth-




closet, privy, or ashpit, and as the house is more than 15 ft. in height the distance across the open space from the house to the boundary wall must be 15 ft. at the least. The occupier wishes to erect a plant-house on the open space, the distance from the house to the proposed wall of the plant-house being 10 ft. The occupier asserts that he is entitled to do this, as the plant-house is exempt from operation of the by-laws (By-law No. 2), and therefore is to be rated as non-existent, but the local authority contend that the erection of this plant-house would contravene By-law No. 54, as it is an erection other than a water-closet, &c. I shall be glad to have your opinion on the point.

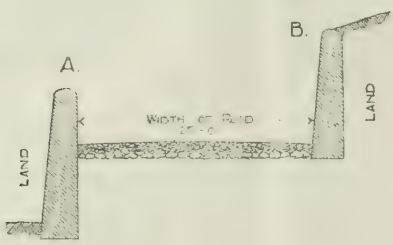
The erection of the plant-house on the open space is, in my opinion clearly a contravention of by-law 54. The effect of by-law 2, clause (*h*), is to exempt the plant-house itself from the operation of the by-laws. But the main building is, of course, subject to the provisions of by-law 54, which requires the open space to be free from "*any erection*" except a water-closet, earth-closet or privy, and an ashpit. Now a plant-house is an erection, even though it is an exempted building. The occupier's contention amounts to this—that an exempted building is not an erection. But if this were so it would follow that any of the exempted buildings enumerated in By-law 2, might be erected upon an "open space," which is manifestly absurd.

EXTRAORDINARY TRAFFIC.—"Anxious" writes: A private individual has purchased 10 acres of land for the purpose of erecting brickworks in a village in my district containing about thirty houses and a church. The only approach road to the village is a narrow lane about 12 ft. wide, which is a *cul-de-sac*, terminating at the church; at the other end it connects to a main road leading to a large town. The whole of the traffic from the new brickworks must pass through the village and along the above lane, and I anticipate great damage will result. The lane has always been maintained in good condition by my council sufficient for the local traffic, but the cost of maintaining it in a condition to carry the increased traffic from the brickworks must of necessity be [illegible] expended [illegible] I shall

be glad of your opinion as to whether a good case for extraordinary traffic could be made out.

The tendency of the Courts of late years has been to require an up-to-date standard of road repair, and traffic which at one time is extraordinary may become ordinary. Thus motor-cars would probably be considered ordinary traffic now on most roads. See *Hemsworth Rural District Council* v. *Micklethwaite* (68 J.P. 16, 345), *All. Gen.* v. *Scott* (1904, 1 K.B. 404). The result is that claims for extraordinary traffic expenses are liable to be cut down, or even extinguished, if the Court thinks that the traffic in question was not more unusual or onerous than the authority ought to have anticipated and provided for. These cases, however, depend so much on the particular circumstances and the view which the particular judge may happen to take that it is impossible to forecast the result—especially where (as in this instance) the traffic has not yet taken place.

HIGHWAY: WALLS.—"R. C. C." writes: I shall feel obliged for your opinion as to ownership of the walls in sketch. I understand under the Highways Act, 1835, walls supporting a road are considered as "retaining" walls and belong to the road authority. Walls as point B on the sketch, which prevent the soil from




falling on to the highway, and therefore "sustaining," rightfully belong to the owner of the adjoining land. This question, which constantly is cropping up in the maintenance of highways, appears to be a doubtful point, and your opinion will be of interest to many readers of your paper.

Where a highway is supported by a retaining wall it is a "question of fact" whether or not the wall is part of the highway, and as such repairable by the highway authority (Pratt and Mackenzie's "Law of Highways," 15th edition, page 82). Probably the ownership of a wall supporting land adjoining a highway would also be a "question of fact." Practically this means that in case of a dispute arising and proceedings being taken the decision would depend upon all the circumstances of the case, such as how long the wall has been in existence, whether it is necessary for the support or protection of the highway, by whom it has been repaired, &c. It must be borne in mind, however, that, even although a wall supporting a highway may belong to a private person, the public may have acquired the right to its use as a support to the road. In such a case the owner would not be bound to repair it, and even if he does, this will not make him legally liable to keep it in repair. (*Ibid.*)

OFFICER OF LOCAL AUTHORITY: NOTICE TO TERMINATE EMPLOYMENT.—"Feldspar" writes: Will you kindly inform me on the following?—A rural district council advertising for a surveyor states that the engagement will be terminable by three months' notice given on either side. No agreement has been signed by the surveyor, and the council pay his salary monthly. Can the surveyor terminate his appointment by giving a month's notice, or must he give his council three months' notice in writing?

In my opinion the council are entitled to three months' notice, as the surveyor must be taken to have accepted the appointment upon the terms of the advertisement. The notice should be in writing.

SUPPLY OF GAS FOR MOTIVE POWER: AND LIGHTING UNDER THE LIGHTING AND WATCHING ACTS.—"Inquirer" writes: A company was formed in 1892 under the Companies' Acts, 1862 to 1891, to supply gas to a small town. The gas is used for lighting the streets, and as motive power for pumping the sewage to the disposal site. The company have not obtained a Provisional Order. Is the company subject to 34 and 35 Vict., 41, as regards purity and illuminating power?

The Act 34 and 35 Vict., c. 41 (Gasworks Clauses Act, 1871), applies only to gas undertakings authorised by any special Act passed after July 1, 1871, or by any Provisional Order made under the authority of the Gas and Water Works Facilities Act, 1870. Unless the report, the company are authorised by any such special Act or Provisional Order, the Act of 1871 does not apply to them.

ERRATUM.

On page [illegible], in reply to query by "J.C.M." (as to by-product Coke ovens), line 3, for "the" read "two."

**We have to draw the attention of querists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6 in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.**

## MUNICIPAL WORK IN CANADA.

*(From a* SURVEYOR *Canadian Correspondent.)*

A measure which is unusual in Canada has been passed by the Province of Quebec Government. It is of interest to highway authorities, and is the outcome of an agitation in Montreal by those who are promoting town planning. The measure applies to the Island of Montreal and adjacent districts, and is known as the Metropolitan Parks Commission Bill. The commissioners will be appointed by the Lieut.-Governor-in-Council, the powers to be exercised including the right to make and execute plans for the establishment of parks, squares, promenades, boulevards, recreation grounds, streets and public gardens. The commissioners also have the power to acquire by purchase, gift or expropriation the immovable property it deems necessary to carry out the purposes of the Act. Further, the commissioners may inquire into the conditions of housing of the working classes, and offer to the Legislative Assembly whatever suggestions are considered advisable. The commissioners may, with the consent of municipal councils, impose an annual tax of one-twentieth of 1 per cent on all immovable property inscribed on the valuation rolls. Without the consent of the municipal council, the commissioners are powerless, nor can they begin the construction of any works without that consent.

* * * *

Mr. T. Aird Murray, member of the Canadian Society of Civil Engineers, and one of the foremost authorities on sewage and water problems, has written a pamphlet on "The Prevention of the Pollution of Canadian Surface Waters," which has been published by the Committee of Public Health of the Commission of Conservation, appointed by the Federal Government. Mr. Aird Murray starts out with the contention that it is imperative that the Government should establish a central authority having Dominion supervision and direction in questions affecting surface-water pollution, the collection of data, the direction of experimental work, and the diffusion of standardised information throughout the provinces; the establishment of a central authority having Dominion powers relative to interprovincial questions affecting the pollution of waterways which do not at present come under control of provincial authorities; and the establishment of a central authority having Dominion powers relative to international negotiations as between the Dominion and the United States in all questions affecting the purity of the great lakes and their tributaries. Under present conditions of isolated provincial action, only very localised phases of the subject can be dealt with, and it is also quite hopeless to expect any efficient action on the part of provincial legislation with reference to the maintenance of the purity of the great lakes unless there is concerted action taken either by the Federal Government of the United States or by some joint agreement with the various States which adjoin the lakes.

* * * *

Generally, as compared with other populated countries, Canada presents more favourable conditions with reference to its waterways and watercourses. For the most part, however, Canada has to depend more upon its waterways and watercourses for its domestic supply than most other countries. Mr. Aird Murray points out that in Great Britain in very few cases do the cities and towns obtain their water supplies from waterways or watercourses receiving sewage discharges. Limited rainfall, general lack of unpopulated upland districts forming collecting watersheds, excessive evaporation in summer, absorbent subsoils, vegetable and algæ growths peculiar to hot summer regions, all point to the fact that the waterways and watercourses must combine to form the chief sources of domestic water supply in Canada, just as they do in many parts of the States. It is not sufficient to say "it is possible to filter or purify a polluted water." It is better to have an unpolluted water, and it is better to have to filter or purify a slightly contaminated water than an altogether contaminated water. The two countries which represent the highest typhoid rates [illegible] Canada and the United States are practically dependent upon waterways and watercourses for their domestic supply.

* * * *

A Committee of the Canadian Society of Civil Engineers sent out question forms last year to municipalities all over the Dominion with a view to collecting data

The Surveyor
And Municipal and County Engineer.

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respecting the number of sewerage systems in Canada which discharge into waterways, and where and how this sewage is dealt with. Sixty-four places reported combined sewerage systems, thirty-eight separate systems, and sixty-four no sewerage, thus making a total of 102 sewerage systems reported. Of this number, eighty-nine reported discharges into fresh water and thirteen into salt water unfit for water supply. Of this number, only eighteen places reported any kind of attempted purification, and twelve of them were limited to tank treatment for the removal of solids only. Another year, however, will see at least twelve modern sewage disposal installations completed in Canada.

The history of sewage disposal in Great Britain and other countries has been one of experiment. An immense sum of money has been necessarily spent on this work, and many municipalities have passed through three or more stages or methods of sewage disposal in an effort to keep up with modern systems and conclusions. Canada, by a proper and comprehensive grasp of the history and conclusions with reference to sewage disposal in other countries and their proper application to its own conditions, may save in the future enormous sums of money which otherwise would be wasted in going over old ground. Mr. Aird Murray is of opinion that the system of disposing of sewage on land is not suitable for Canada; he advocates the adoption of the biological method, and asks if Canadian citizens are content to allow the stigma of the second highest typhoid death-rate in the civilised world to continue attached to Canada? He urges concerted action which will lead to legislation efficiently applied and generally welcomed.

**L.C.B. and Rat Destruction.**—East Kent Joint Sanitary Committee's appeal to the Local Government Board to sanction expenditure by local authorities for the destruction of rats has been refused.

**London's Proposed New Asylum.**—The London County Council are recommended to proceed at once with the creation on the Horton estate of a new asylum. The estimated capital expenditure on the building, which will have accommodation for 2,066 patients, is £467,970, and another £50,000 is included in the estimate for the equipment of the asylum, which it is expected will be ready for occupation in four or five years' time.

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Basingstoke T.C.** (May 6th. Mr. W. O. E. Meade-King).—£3,200 for works of street improvement and surface water drainage.—The town clerk stated that of the total sum asked for, £2,075 was for drainage and £1,225 for street improvements. The proposed surface-water drainage affected nineteen streets, the main sewer five, and the channelling twenty-one streets. There were no outstanding loans on works of this character. The borough surveyor, Mr. F. R. Phipps, gave particulars with regard to the channelling work. There was no opposition to the proposals.

**Beckenham U.D.C.** (May 7th. Mr. R. H. Bicknell).—£4,404 in respect of road improvement works.—The clerk (Mr. F. Stevens) mentioned that £480 was in respect of Hayes-road, £1,224 for Newlands Park, and £2,700 for Wickham-road. The surveyor, Mr. J. A. Angell, gave evidence as to the necessity for the works, and explained them in detail.

**Bexhill T.C.** (May 2nd. Mr. H. Shelford Bidwell).—£4,580 for works of sewerage and storm-water drainage, £1,110 for laying-out land adjoining Egerton Park as a pleasure ground and tennis courts, and £2,653 for construction of a new road from North-street to Alexandra-road.—There was considerable discussion over the loan for sewerage and storm-water drainage, Mr. S. E. J. Segrave contending that another scheme ought to have been adopted. There was no opposition to the other loans.

**Birmingham Tame and Rea District Drainage Board** (May 17th. Mr. A. A. G. Maleta).—£56,000 for the provision of additional bacteria beds at Minworth Greaves.—The town clerk, Mr. E. V. Hiley, supported the application. He explained that the Drainage Board desired to construct further bacteria beds at Minworth Greaves, on the main disposal works of the board. Originally the board's works were laid out for broad irrigation treatment, but in 1903 they decided to experiment with an installation of bacteria beds. That experiment having proved satisfactory, the area of the beds had been extended from time to time until now there were 54 acres of bacteria beds in full operation. Thirty of them were situate at Minworth Greaves, and the remaining twenty-four were at Saltley. The beds had been extended by the board, and the expense had been defrayed by loans sanctioned by the Local Government Board, the last being sanctioned on December 8, 1908, for £45,000. The Drainage Board now desired to further extend those beds by the construction of an additional 14 acres, 7 acres of which would be put in hand at once and the remainder shortly. The present application was to defray the cost of the first 7 acres, and also to cover the expense of making some of the channels and subsidiary works of the second 7 acres, it being deemed more expedient to do some parts of the second 7 acres during the construction of the first 7. In conclusion, the town clerk asked for a loan the repayments of which might be extended over thirty years. Mr. J. D. Watson, M.INST.C.E., engineer to the Drainage Board, explained the details of the scheme.

**Blackpool T.C.** (May 6th. Mr. P. M. Crosthwaite).—£18,200 for the purpose of carrying out the construction of parade works between the North Pier and Cocker-street, and of a verandah in connection therewith.—The borough surveyor, Mr. J. S. Brodie, submitted a statement showing that the actual cost of the new parade works would be £15,962. The town clerk: If the North Pier works had not been constructed under the scheme we should not have made this application. The surveyor: It would not have been necessary. Proceeding, Mr. Brodie said that the money which had been borrowed in excess of the original £345,000 had been necessitated by the increased width of the promenade.

**Bournemouth T.C.** (May 8th. Mr. W. O. E. Meade-King).—£400 for the construction of a relief sewer in Charminster-road, and £1,280 for alterations at the cliff path at Pokesdown.—Regarding the cliff path, the town clerk said it was an extension of works carried out in 1905. What was now proposed was included in the borough surveyor's original plan and estimate, but the council thought it was only necessary at the time to carry out a certain portion of the work, though they knew that what was now proposed would [illegible] plan had [illegible]

above the path, and the alterations suggested had now become essential. It was also intended to improve the appearance of the slopes of the cliffs and form additional terraces. The inspector's visit to the locality would prove better than any explanation the necessity for the alterations. The assistant surveyor, Mr. F. P. Dolamore, explained that, owing to the fraying of the cliff face by wind and weather, it was necessary to slope back and terrace the portion of the steep cliff immediately above the kiosk at the end of the path. The top path would be set back and fenced. The portion of the cliff face between the lower walk and the "toe" wall at the foot of the cliffs would be "stone-pitched."

**Eastbourne T.C.** (May 2nd. Mr. H. S. Bidwell).—£5,800 for laying a sewer from the Archery to St. Anthony's estate.—The town clerk, Mr. H. W. Fovargue, who explained the application, said the Duke of Devonshire owned most of the land adjoining the road, and the Duke had agreed to contribute £2,000 towards the cost of the sewer, and Mr. Wenham £500. The total estimated cost of the work was £8,300, of which the corporation had to pay £5,800. The borough surveyor, Mr. A. Ernest Prescott, explained the engineering features of the scheme, and expressed approval of its suitability.

**Lichfield R.D.C.** (May 15th. Mr. R. G. Hetherington).—£10,139 for works of sewerage and sewage disposal of Streetly.—Mr. Robert Green, M.INST.C.E. (Birmingham), the engineer of the scheme, explained that it provided sewers in the built-upon portions of Streetly, and involved the construction of a length of about 1,600 yds. of sewer in a deep tunnel, septic tanks, percolating filters, and other works of purification for a population of 1,000 in the first instance; the works being so arranged as to be economically extended and enlarged. Mr. J. Derry, clerk, explained that the total rates for this portion of their district amounted to only 3s. 9d., including 10d. for district council purposes. Dr. Reid, medical officer of health for the county of Stafford, contended that it was an unnecessary expense to construct a humus tank with "fine" filtering medium, and he therefore hoped the Local Government Board would not consider it necessary to put the council to the expense of providing one. There was no opposition.

**Widnes T.C.** (May 17th. Mr. R. G. Hetherington).—£3,000 in respect of the conversion of privies into water-closets. It was stated that the Health Committee has taken this matter in hand, and when it is considered necessary property-owners are assisted with part payment if they desire to convert existing open privies into the water-carriage system.

### APPLICATIONS FOR LOANS.

**Banbury T.C.**—£7,485 for the provision of industrial dwellings.

**Beckenham U.D.C.**—£3,920 for converting flint roads to macadam with tar binding.

**Bournemouth T.C.**—£1,000 for a motor fire-engine equipment.

**Bristol T.C.**—£5,720 for additional plant at the electricity works, and £335 for street widening.

**Chester R.D.C.**—£3,600 for the Sanghall sewage disposal scheme.

**Flintshire C.C.**—£4,650 for a new school at Holywell. £247 for a new school site at Oakenholt, and £1,300 for extensions to the Queensferry School.

**Hastings T.C.**—£806 for creosoted deal-block paving works, and £1,375 for tar-macadam paving.

**Hanwell U.D.C.**—£2,000 for an open-air swimming bath.

**Itchen U.D.C.**—£1,050 for the extension of the cemetery.

**Kent C.C.** £2,850 for a new school at Tonbridge.

**Lowestoft T.C.**—£1,000 for street improvement works.

**Mansfield T.C.** £5,450 for the purchase of land for road improvement purposes.

**Mexborough U.D.C.**—£6,217 for the extension of the sewage disposal works.

**Moira R.D.C.** £450 for water supply purposes.

**Okehampton T.C.** £800 for the purchase of a site for a town hall and public conveniences.

**Radcliffe U.D.C.**—£1,400 for street works.

**Rotherham R.D.C.** £14,027 for water supply works.

**Rushden (Northants) U.D.C.** £12,300 for a sewage work scheme.

**Rye T.C.** £4,000 for the duplication of pumps and main to Codborough waterworks.

**Stone R.D.C.**—£300 for the completion of sewerage connections.

**Surbiton U.D.C.**—£1,300 (instead of £1,454 as originally contemplated) for the making up of Malvern-road with a tar-macadam carriageway on hardcore foundations and tar-paving for the footpaths.

**Swindon T.C.**—£6,050 for new electricity mains, feeders and services.

### LOANS SANCTIONED.

**Bournemouth T.C.** £7,150 for works of sewerage and surface-water drainage.

**Brighton T.C.**—£19,500 for a period of thirty years for the construction of main sewers.

**Dudley T.C.**—£7,583 for a new school, and £907 for works at Northfield-road Schools.

**Hull T.C.**—£16,500 for erecting stables.

**Kent C.C.**—£4,928 for a new school at Maypole.

**Kingston (Surrey) T.C.**—For main roads: £7,579 for wood-blocks, for ten years, £4,921 for concrete foundations for twenty years; for non-main roads: £1,581 for wood-blocks for ten years, £1,069 for concrete foundations for twenty years.

**Kingstown U.D.C.**—£400 for the completion of Dunleary Park.

**Lowestoft T.C.**—£4,462 for extensions to electricity plant.

**Macclesfield R.D.C.**—£750 for sewerage works.

**Mansfield T.C.**—£620 for slipper baths, and £1,225 for street improvement purposes.

**Matlock Bath U.D.C.**—£2,550 for the construction of sewers.

**Radcliffe U.D.C.**—£17,500 for a bulk supply of electricity from Bury.

**Rawtenstall T.C.**—£485 for the purchase of land for road-widening purposes.

**Retford R.D.C.**—£5,200 for a water supply scheme.

**Shildon U.D.C.**—£3,000 for the provision of a recreation ground.

**Swansea T.C.**—£16,717 for the provision of artisans' dwellings.

**Weymouth T.C.**—£300 for the provision of a public convenience.

**Yarmouth T.C.**—£3,000 for paving purposes.

### FORTHCOMING INQUIRIES.

MAY.

| | £ |
|---|---|
| 28.—**Lower Bebington.** For works of drainage (Mr. A. W. Brightmore) ... ... ... | 1,150 |
| 29.—**Abercarn.** For works of sewerage (Mr. R. G. Hetherington) ... ... ... ... | 205 |
| 29.—**Bideford.** For works of water supply (Mr. F. O. Stanford) ... ... ... ... | 19,300 |
| 29.—**Keighley.** For electricity purposes (Mr. H. R. Hooper) ... ... ... ... ... | 6,576 |
| 29.—**Wakefield.** For the extension of the county hall (Major J. Stewart) ... ... | 32,000 |
| 30.—**Congleton.** For the purposes of the gas undertaking (Major J. Stewart) ... ... | 1,700 |
| 30.—**Hendon.** For street improvement purposes (Mr. F. H. Tulloch) ... ... ... ... | 2,562 |
| 30.—**Ogmore and Carw.** For the purchase of a gas and water undertaking (Mr. R. G. Hetherington) ... ... ... ... ... | 21,000 |
| 30.—**Tiverton.** For street widening purposes (Mr. F. O. Stanford) ... ... ... ... | 3,350 |
| 30.—**York.** For electricity purposes (Mr. T. C. Ekin) ... ... ... ... ... | 9,700 |
| 31.—**Brighouse.** For electricity and street improvement purposes (Mr. T. C. Ekin) ... | 7,125 |
| 31.—**Devonport.** For walling and street improvement purposes (Mr. F. O. Stanford) | 4,559 |
| 31.—**Heywood.** For electricity and gas purposes (Mr. H. R. Hooper) ... ... ... | 14,000 |
| 31.—**Maidenhead.** For the provision of public conveniences (Mr. H. S. Bidwell) ... | 200 |
| 31.—**St. Helens.** For privy conversion purposes (Major J. Stewart) ... ... ... ... | 27,000 |

JUNE.

| | |
|---|---|
| 4—**Ongar.** For sewage disposal purposes (Mr. R. G. Hetherington) ... ... ... ... | — |

# Municipal Work in Progress and Projected.

*The Editor invites the co-operation of* Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Dumfries £1,700, Northumberland £800; roads and materials—Blyth £3,174, Deptford £4,071, Epsom £2,882, Beckenham £1,343, Stafford £1,900, Kew £1,100; sewerage and sewage disposal—Daventry £7,603, Rushden £12,291; water, gas and electricity—Ashington £5,485, Winsford £3,420.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

## ADMINISTRATION.

**Kingston (Surrey) T.C.** It was decided on Tuesday to increase workmen's wages as follows: Road foreman, 50s. to 55s. per week; weighbridge man, 24s. to 25s.; nine general labourers, 24s. to 25s.; twenty-two scavengers, 23s. to 24s.; four drainage labourers, 25s. 6d. to 26s. 6d.; gardens superintendent, 42s. to 45s.; nine gardeners, 23s. to 24s.; first-class bath attendant, 24s. to 25s. A committee are further to consider the application for an increase from the rest of the employees, numbering over 100.

## BUILDINGS.

**Dumfriesshire C.C.**—County buildings are to be erected in English-street, Dumfries, at an estimated cost of £1,700.

**East Ham T.C.**—An underground convenience, to cost £500, is to be erected on the Barking-road frontage of the town hall site.

**Holsworthy U.D.C.**—The surveyor, Mr. F. Vanstone, has been instructed to prepare specifications and obtain tenders for the repair of the pavilion.

**Maldens and Coombe U.D.C.**—A sub-committee has been reappointed to consider a report without delay as to the decoration and lighting by electricity of the municipal offices, and has been empowered to carry out the extension building for the department of the clerk, Mr. J. W. Johnson.

**Northumberland C.C.**—Stamfordham Bridge is to be reconstructed at a cost of £800.

**Pembroke U.D.C.**—The council are considering an offer by Mr. Andrew Carnegie to subscribe £700 for building two public libraries.

**Walton-on-Thames U.D.C.**—Tenders are to be obtained for the extension of the bathing pavilion.

## HOUSING AND TOWN PLANNING.

**Brighton T.C.**—With reference to the council's housing estate it was explained at the meeting last week that the deficit was covered by the loan charges. Care and attention have been given to the work of repair, so that there has been no increase in the cost over previous years. Taking the 120 houses, the loss only works out at about £5 each, which includes the loan charges, interest, &c.

**Camberwell B.C.**—The Housing Committee have accepted the tender of Mr. A. E. Wood, at £78, for providing and fixing ten outside staircases in the council's houses in the Hollington-street area, and also the estimate of the borough engineer, Mr. W. Oxtoby, at £41, for the necessary cutting out and making good.

**Coventry T.C.**—The first Coventry scheme under the Town Planning Act has been assented to by the General Works Committee. The plan embraces nearly a thousand acres in the Radford district, and it is proposed to take steps to give effect to the work so soon as the City Council signify their assent to the recommendations.

**Doncaster T.C.**—The Balby and Carr House-road sections of the municipal housing scheme have received the approval of the Local Government Board.

**Exeter T.C.**—Land is to be bought at £200 an acre for the erection of dwellings to house the tenants to be dispossessed by the widening of Bartholomew-street, Paul-street, and Blackboy-road.

**Glasgow T.C.**—What is described as "perhaps the blackest spot in the city," an area bounded by King-street, Dale-street, Nelson-street, and Centre-street, is to be cleared, and the medical officer and sanitary inspector have been instructed to prepare an improvement scheme.

**Kingston (Surrey) T.C.**—The borough surveyor, Mr. R. Hampton Clucas, has submitted a draft plan, which has been approved, for a town planning scheme to include part of Ham and part of Coombe. The town clerk, Mr. H. A. Winser, has been authorised to communicate in the matter with the clerks to the Ham, Maldens and Coombe, Twickenham, and Richmond authorities, and with the Local Government Board.

## PARKS AND OPEN SPACES.

**Kingston (Surrey) T.C.**—The tender of Messrs. Benson has been accepted for bedding plants for the public gardens, at a total cost of £44 10s. 3d.

## REFUSE COLLECTION AND DISPOSAL.

**Horsham (Sussex) U.D.C.**—Steps are to be taken to provide a refuse destructor in connection with the electricity works, on the lines suggested by the electrical engineer in his report and drawing submitted to the joint committee appointed by the council to consider the matter.

**Melton Mowbray U.D.C.**—The Sanitary Committee has been asked to report on the advisability of establishing a refuse destructor.

**Southampton T.C.**—The tender of Mr. H. Plascott, at 4s. 3d. per ton, for the collection of refuse in the Portswood and Bitterne Park districts, has been accepted, this being one shilling per ton cheaper than the corporation has done the work.

## ROADS AND MATERIALS.

**Battle (Sussex) R.D.C.**—Discussion turned at the meeting last week on to a point as to who should be responsible for the stone supplied by the contractors and to certify that it was according to the samples. Mr. J. B. Burton moved that the matter be left in the hands of the surveyor (Mr. H. Blackman). Mr. A. C. Sayer proposed that the council be entirely responsible. The surveyor: There should be in all contracts a clause whereby the contractor was not bound by any person or committee who may be appointed to accept their decision without appeal. The chairman: I think it will come afterwards. The amendment was carried by eight votes to four.

**Belfast T.C.**—The Joint Improvement and Works Committees recommend the council to apply to the Local Government Board for sanction to an expenditure of £45,000 to carry out the works of permanent paving. The committee have also considered the question of the extension of the tar macadamising of streets, and arranged that the superintendent of works and the city surveyor should confer as to the streets which it was most desirable should be so dealt with.

**Blyth U.D.C.**—The tender of Mr. G. E. Simpson, at £3,174, has been accepted for new streets work.

**Bristol T.C.**—The widening of Bond-street is to be completed by the payment of £450 for the setting back of St. James's School.

**Bromley (Kent) T.C.**—The tender of Messrs. Mowlem & Co., at £1,496, has been accepted for making up Shawfield Park.

**Coventry T.C.**—The city engineer, Mr. J. E. Swindlehurst, has prepared a special report upon the traffic problem in the central streets of the city, and by way of remedy for the congestion he suggests that the council may: (1) Widen and improve the existing streets, either on one or both sides; (2) partially improve these streets by widenings, and supplement this by opening new thoroughfares; or (3) leave the existing streets as they are, and by the opening of entirely new thoroughfares relieve the present traffic congestion. It may probably be found in practice, he concludes, that the second alternative suggested will best meet the requirements of the case.

**Cumnock T.C.**—The footpaths scheme commenced two or three years ago is to be completed, the principal streets in the town being formed of granolithic and the footpaths in the outskirts of tarred metal.

**Deptford B.C.**—Grove-street, from Evelyn-street to Junction-road, is to be paved with re-dressed granite setts and wood blocks, at an estimated cost of £1,717, and Speedwell-street, Hales-street, Stanhope-street, Addey-street, the streets leading from Addey-street to Hosier-street, and Hosier-street itself are to be paved with asphalt, at an estimated cost of £2,354.

**East Barnet U.D.C.**—The surveyor, Mr. H. York, has been directed to prepare a list of the streets in the district in respect of which he may consider it desirable that the footpaths should be slab-paved, in lieu of the existing tar-paving, together with an estimate of the cost.

**Epsom U.D.C.**—It is proposed to pave High-street and South-street, at an estimated cost of £2,882.

**Hammersmith B.C.**—The council accepted the tender of the Improved Wood Pavement Company, Limited, at £4,652, for carrying out wood paving works in Hammersmith-road.

**Kent C.C.**—Portion of Beckenham main road is to be paved at a cost not exceeding £1,343.

**Lincolnshire C.C.**—The Road Board have offered £1,000 towards the cost of road improvements, improving four dangerous corners, and surface tarring a number of main roads. The total cost, it is estimated, will be £2,568. It has been decided by the council to accept £800 for surface tarring, and to renew application to the Road Board in respect of the other proposals.

**Maldens and Coombe U.D.C.**—£25 is to be spent on channelling a portion of Kingston-road.

**Middlesbrough T.C.**—The tender of Robert Lauder & Co., of the Newburn Sawmills, West Hartlepool, for the paving with creosoted soft-wood blocks of Marton-road from the York City and County Bank to Gurney-street and Wilson-street, from Marton-road to Linthorpe-road, has been accepted. The price per 1,000 is £6 2s. 6d., and 229,000 wood blocks will be required.

**Northants C.C.**—With reference to the applications to the Road Board for the improvements of district roads which the county council decided to support, the council have been informed "that the board do not regard any of these works as relatively so urgent or important as the improvements proposed on the main roads, and they therefore do not propose to divert any portion of the £5,000 indicated for works of improvement in Northamptonshire to the district proposals. They have, however, intimated to the Raunds Urban District Council that they are prepared to lend them, free of interest, the sum of £150 required for the purpose of widening Hill-street, repayable in three annual instalments of £50.

**Okehampton R.D.C.**—The surveyor, Mr. G. Smale, has informed the council that upon certain district highways it would be necessary to spend £3,000 to repair 8¼ miles of road in order to bring them up to the condition of fifteen months ago. They were not making the roads sufficiently strong to bear the weight of the heavy motor lorries.

**Penge U.D.C.**—The council have been trying Akerita for dust prevention in their district, and the results appear satisfactory.

**Silsden (Yorks) U.D.C.**—Plans and estimates have been passed for making up a large number of streets.

**Stafford T.C.**—The tender of the Improved Wood Pavement Company, Limited, at £1,909, has been accepted for the reconstruction with wood-blocks of the main street from Tipping-street to Goal-square.

**Stone (Staffs) U.D.C.**—It is proposed to demolish several shops and houses in Stafford-street for widening purposes.

**Surrey C.C.**—Kew Bridge approach, an area of 1,996 sq. yds., is to be wood-paved, at an estimated cost of £1,100.

## SEWERAGE AND SEWAGE DISPOSAL.

**Camberwell B.C.**—At the request of this council, the London County Council have agreed to include in the next General Powers Bill a clause for amending the definitions of "sewer" and "drain." The Public Health Committee also recommend the borough council to ask the other metropolitan borough councils to approach the London County Council with a similar request.

**Chester R.D.C.**—The council have approved the plans prepared by Messrs. J. H. Dixon & Son for providing sewerage and local works for Saughall.

**Croston (Lancs) U.D.C.**—The surveyor, Mr. H. Riding, is preparing plans and estimates for the sewerage of Drinkhouse-lane and Grape-lane.

**Daventry R.D.C.**—The tender of Messrs. W. Thompson & Co., of Luton, at £7,603, has been accepted for the construction of sewage disposal works.

**Farnham U.D.C.**—It has been decided to erect public conveniences, one for men, and another for men and women, in East-street, and the south corner of Downing-street.

**Newark U.D.C.**—In his annual report for the year ended March 31st last, the surveyor, Mr. Ralph Oakden, junr., expresses the opinion that the time has arrived when a third primary filter should be constructed, the increase in the volume of flow making it very difficult to secure a good effluent.

**Rushden (Northants) U.D.C.**—The surveyor, Mr. W. B. Madin, has submitted his completed plans of the proposed sewage outfall works, together with an estimate of the total cost, amounting in all to £12,291, including the cost of the additional land and the manager's house, and these have been approved and adopted.

## WATER, GAS, AND ELECTRICITY.

**Ashington U.D.C.**—A sum of £5,485 is to be spent on water mains and machinery for an increased water supply for Hirst.

**Bishop's Castle R.D.C.**—The tenders of Messrs. G. & W. Edwards, of Shrewsbury, at £331, and of Messrs. Lewis, of Clun, at £381, have been accepted for carrying out water supply works.

**Chard T.C.**—The preliminary steps have been taken in the preparation of a water supply scheme, and a report on the subject by Messrs. Dodd & Dodd, engineers, has been submitted to the Local Government Board.

**Leeds T.C.**—The progress of the electric lighting undertaking of the corporation has been greater during the past year than in any previous twelve months, a large increase in the power and heating sales having coincided with the recovery of the lighting business from the revenue-reducing effects of the metal filament lamp, whilst a new item of income appears as a result of a substantial sale of energy to the tramways department for traction purposes. The revenue, £114,846, is £10,378 more than that for the previous year (an increase of 9.9 per cent), and is the greatest on record.

**Llandudno U.D.C.**—Work in connection with the Dulyn reservoir is to be carried out at a cost of £300.

**Malton R.D.C.**—The council have been declared by the Local Government Board to be in default with respect to the water supply to the villages of Appleton-la-Street, Broughton, Swinton, and Slingsby. An intimation has been received stating the board will not make an order if the council will undertake to submit a scheme for a proper supply of water for the villages named, the undertaking to be in the form of a resolution to be passed by the council within a month.

**Moira R.D.C.**—Lord Deramore has given the land on which is situated the well from which it is proposed to supply the village of Moira with water, the only condition attached being that no special water rate should be imposed on the inhabitants. The cost of carrying out the scheme is estimated at £450.

**Settle R.D.C.**—Plans are being prepared for the extension of the water main to Lane Head and Sunderland.

**Silsden (Yorks) U.D.C.**—Extensions are to be carried out at the gasworks at an estimated cost of £480.

**Southampton T.C.**—A report having been received from the waterworks engineer on additional storage accommodation, it has been decided to consider a proposition to enter into a provisional contract, subject to the consent of the Local Government Board, for the purchase of 4½ acres of freehold land at Barnett, for the sum of £1,550, and also for the right of acquiring gravel, at an additional cost of £100.

**Stafford T.C.**—It has been resolved to acquire the gasworks at Penkridge for a sum of £2,250.

**Strabane No. 1 R.D.C.**—It has been agreed to take the necessary steps to acquire urban council powers to enable the council to provide for the public and private lighting of the town of Newtownstewart.

**Surrey C.C.**—It was reported last week that as a result of the opposition to the Wandsworth, Wimble-

don, and Epsom District Gas Company's Bill, there had been secured a decision that all mains must in future be laid at a minimum depth of 3 ft.

**Totnes R.D.C.**—The tender of Messrs. Best Bros., of Teignmouth, at £406, has been accepted for the execution of the Holne water supply works.

**Winsford U.D.C.**—The tender of Messrs. R. Dempster & Sons, Limited, at £3,420, has been accepted for a new gasholder and conversion of tank.

**Wolverhampton T.C.**—The water mains are to be extended to Heath Town at a cost of £400.

## MISCELLANEOUS.

**Bournemouth T.C.**—The tender of Messrs. John Morris & Sons, Limited, for a motor fire engine equipment, has been accepted at the following prices: Ajax turbine fire engine, with hose tender combined, £840; first-aid pump, with cistern, reel and hose, £50; two electric head lamps and one tail lamp, £10; total, £900.

**Bradford T.C.**—For the year ended March 31st last the tramway undertaking shows a record profit of £52,783, compared with £39,374 in the previous year. Consideration is being given to the extension of the tramway system to Wilsden. It is estimated that the preparing of the road and the laying of a single track with passing places will entail an expenditure of close upon £11,000, while interest and sinking fund for thirty years will require £594.

**Harwich T.C.**—A fire engine, with variable expansion gear, is to be purchased from Messrs. Shand, Mason & Co., for £305.


## FOR OTHER ADVERTISEMENTS

See End of Paper.


## BATTERSEA BOROUGH COUNCIL.

GRANITE KERB AND SETTS.

The Council invite Tenders for the Supply of about 6,000 ft. run of 12-in. by 8-in. Granite Kerb and 200 tons of 5-in. by 4-in. Dressed Granite Setts.

Tenders must be made on Forms, containing full particulars, which may be obtained at the Town Hall.

Tenders, sealed and endorsed "Tender for ——," must be delivered to me by noon Monday, 3rd June.

(By order)

W. MARCUS WILKINS,
Town Clerk.

Town Hall, Battersea, S.W.

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SUCCESSFUL COLLECTOR, specialist in collecting overdue Accounts (town or country), could similarly assist another high-class Weekly Journal. Personal attention given to individual accounts. Nominal salary and commission on amounts collected. Apply Box 1,159, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

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WANTED, by a London firm, a thoroughly competent Traveller, with practical knowledge of Road Construction, to obtain business from Surveyors. Applicants to state previous experience, age, salary required, and enclose testimonials.—Box 1,158, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

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## URBAN DISTRICT COUNCIL OF ENFIELD.

BROKEN GRANITE.

The Council invite Tenders for the Supply of 3,300 tons (more or less) of 1½-in. Hand-broken Clee Hill, Dhu, or Best Blue Guernsey Granite, to be delivered free and in such quantities and at such times prior to the 31st March, 1913, as may be ordered by the Council's Surveyor, at the several Railway Stations in the District.

Tenders (on Forms to be obtained only of Mr. Richard Collins, the Council's Surveyor, at these Offices), endorsed "Tender for Granite," together with samples as to size and quality of the Granite proposed to be supplied (no Tender will be considered unless accompanied by samples), to be sent to me not later than noon on Wednesday, the 12th day of June next.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

T. W. SCOTT,
Clerk.

Public Offices, Enfield.
May 24, 1912.

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## URBAN DISTRICT COUNCIL OF ENFIELD.

PUBLIC STREET IMPROVEMENT WORKS.

The Council invite Tenders for Providing and Laying about:—

1,580 yards run of Granite Kerbing,
2,220 yards run of Granite Channelling,
5,000 yards super. of Artificial Stone Paving,
20 yards super. of Granite Crossings,

in various Public Streets within the District of Enfield.

Specifications can be seen, Form of Tender, and all information obtained, on application to Mr. Richard Collins, the Council's Surveyor, any day except Saturday, between the hours of 9 a.m. and 5 p.m.

The Contractor will be required to observe Trade Union hours of labour, and to pay the recognised Trade Union rates of wages in force in the district where the work is to be executed.

Sealed Tenders, endorsed "Tender for Street Works," to be sent to me not later than noon on Wednesday, the 12th June next.

The Tenders must be accompanied by a schedule of hours of labour, and of prices and wages to be paid for different classes of work, which schedule will be embodied in the Contract.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

T. W. SCOTT,
Clerk.

Public Offices, Enfield.
May 24, 1912.

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## DISS URBAN DISTRICT COUNCIL.

The above Council invite applications from persons capable of taking entire charge of the Machinery and Plant at the new Waterworks, Diss, and also of making the connections for house services from the water mains to the stopcocks.

The plant at the works consists of duplicate 6-horse power gas engines, coke-gas producers, pumps, and water softener.

Applications, in candidate's own handwriting, stating age, previous experience, salary required, accompanied by two recent testimonials, and endorsed "Waterworks," to be delivered to the undersigned on or before Saturday, the 8th June next.

ALFRED COOPER,
Surveyor.

The Terrace,
Diss.
May 23, 1912.

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## WOMBWELL URBAN DISTRICT COUNCIL.

TO CONTRACTORS AND OTHERS.

Tenders are invited for the Relaying of about 700 lineal yards of 12-in. Stoneware Pipe Sewer, together with the necessary Manholes, &c., in Station-lane, Wombwell.

Plans and Specifications may be seen, and Quantities obtained, on deposit of £1 1s. (returnable) at the Office of Mr. W. Quest, the Surveyor to the Council, Town Hall, Wombwell.

Tenders, sealed and endorsed "Tender for Relaying Sewer," must be delivered to me, the undersigned, on or before Tuesday, the 4th day of June, 1912, at 12 o'clock noon.

PERCY MILNES WALKER, Solicitor,
Clerk to the Council.

Town Hall,
Wombwell.
May 24, 1912.

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## HANWELL URBAN DISTRICT COUNCIL.

The above Council are prepared to receive Tenders for Supplying and Laying about 1,800 yards of Tar-Paving on the Churchfields Recreation Ground.

Full particulars can be obtained on or after 28th inst. on application to the Surveyor, Mr. S. W. Barnes, ASSOC.M.INST.C.E.

Tenders to be delivered to the undersigned not later than 10th June, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

PERCY SCOTT,
Clerk

Council Offices, Hanwell, W.
May 22, 1912.

# Personal.

*The Editor invites the co-operation of* Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

Prince Arthur of Connaught has consented to become president of the Roads Improvement Association.

Mr. T. Fortune has resigned the position of highways surveyor to the Atcham Rural District Council.

The salary of Mr. A. W. Jakeway, assistant to the city surveyor of Hereford, has been increased to £120 per annum.

Mr. J. W. Pike, assistant surveyor at Alton, Hants, has been appointed surveyor to the Pontypool Rural District Council.

Mr. E. C. Dickinson, of the Nelson borough surveyor's staff, has been appointed assistant surveyor to the Poole Corporation.

Mr. W. Sugars, of the borough surveyor's office, Warrington, has been appointed engineer and surveyor to the Horbury Urban District Council.

Mr. J. A. Spreckley, borough surveyor of Ludlow, has been granted an honorarium of £30 for his work in connection with the water supply scheme.

Mr. Richard Bruce Savage, of the Teignmouth borough surveyor's office, has been appointed general assistant to the Devonport borough surveyor.

Mr. H. H. Pettitt has resigned his position as surveyor to the Clare (Suffolk) Rural District Council, having accepted a sub-surveyorship under the West Suffolk County Council.

Mr. Samuel Wilkinson, surveyor to the Darton Urban District Council, is, we are pleased to state, recovering satisfactorily from the effects of an operation which he underwent recently.

Mr. Joseph Gridley has been appointed by the Kingston (Surrey) Town Council, at a salary of £3 5s. per week, to act as inspector of the wood blocks to be creosoted at the contractors' works.

Mr. T. P. Frank, city surveyor of Ripon, has had his salary increased by £25 this year, and another £25 next year. In consideration of these increases Mr. Frank declined the offer of an appointment in West Africa.

Mr. R. Mayer Smith, surveyor and inspector to the Ottery St. Mary Urban District Council, has been appointed surveyor and sanitary inspector to the Fordingbridge Rural District Council, at a salary of £120 per annum, rising to £140.

Mr. Walter Jessop, superintendent of the Oldham Corporation sanitary department, has been presented by the officials and workmen with a rosewood timepiece in recognition of his thirty-five years' service, and Mrs Jessop received a silver-mounted umbrella.

Mr. T. E. Wilkes, Birmingham, who at present is engaged in carrying out for the Corporation of Birmingham a great amount of practical town planning, has been engaged as town planning expert by the Dunfermline Town Council at a salary of £400 a year.

Mr. S. Gilbert, surveyor to the St. Columb Rural District Council, while cycling, was thrown from his machine, sustaining a dislocated left shoulder and fractured arm. The council have passed a vote of sympathy with Mr. Gilbert, and relieved him of his duties for a month.

Mr. F. Roberts, borough surveyor of Worthing, has been appointed to represent the corporation at the Berlin Congress of the Royal Institute of Public Health in July next. He has been granted an allowance of 5 guineas for expenses, to include the usual subscription to the congress.

Mr. Thomas W. How, M.I.MECH.E., has resigned his position as financial managing director to the Horsfall Destructor Company, Limited, but will continue his practice as consulting and advisory engineer at 17 Victoria-street, Westminster, where all communications should be addressed.

Mr. W. Rees Jeffreys, secretary to H.M. Road Board, is, we understand, leaving England on Saturday for a flying visit to the United States and Canada, where he hopes personally to interview authorities on the interests with which the Road Board is concerned here, particularly in view of the forthcoming International Road Congress and Road Exhibition.

Mr. H. C. Poole, surveyor to the Wath Urban District Council, who has resigned, and is proceeding to Australia for the benefit of his health, has been presented with a silver salver by the members of the council and officials. Other presentations were made to him, including a fitted lunch basket from the town hall staff, and a pair of prismatic binoculars from the council's employees.

Mr. Frederick J. Kelshaw Conway, a member of the professional staff of the Inland Revenue Valuation Department at Liverpool, passed the final examination of the Surveyors' Institution recently held in London in the typical subjects of the "Agricultural Valuations" sub-division. Mr. Kelshaw, it may be mentioned, was for seven years engaged on the staff of the borough engineer of Birkenhead, Mr. C. Brownridge.

Mr. J. T. Eayrs' lamentable death recalls an incident which we record as interesting to those who attach significance to signs and portents. Hanging in our editorial room is a framed photograph of a group of those present at a municipal engineers' meeting at West Bromwich on September 27, 1902. It is at least a curious coincidence that within an hour or two of Mr. Eayrs' death this picture should, from no apparent cause, have fallen from the place it had occupied without mishap for many months.

The *Contract Record and Engineering Review* of Toronto, in its special annual issue, to which we have previously referred, includes, among other interesting features biographical notes (with portraits) of some forty-three Canadian city engineers. We note that nearly one-third of them—thirteen to be exact—are British born—Scotland heading the list with five, England with four, and Ireland and Wales with two each. We hope to refer in these columns from time to time to these oversea engineers who have left the Old Country and made names and positions for themselves in Canada.

Messrs. A. H. Campbell, M.INST.C.E., city engineer, Edinburgh, A. T. Davis, M.INST.C.E., county surveyor, Salop, Percy Griffith, M.INST.C.E., M.I.MECH.E., F.G.S., secretary of the Institution of Water Engineers, J. S. Pickering, borough engineer of Cheltenham, and E. J. Silcock, M.INST.C.E., F.S.I., F.G.S., Westminster, have been elected Fellows of the Royal Sanitary Institute; Messrs. William C. Clifford Smith, M.INST.C.E., engineer to the London County Council Asylums Committee, W. H. McLean, ASSOC.M.INST.C.E., municipal engineer, Khartoum City, and E. P. Richards, M.INST.C.E., F.G.S., have been elected members of the same body.

Mr. C. H. Rust, whose splendid services for Toronto are well known in this country, has resigned the city engineership to accept a similar post at Victoria, British Columbia, at a salary of £1,300 per annum, £100 more than he received at Toronto. Mr. Rust was born in this country—in Essex—in 1852, was educated at Brentwood Grammar School, and began professional work under the late Frank Shanly. In 1877 he entered the city of Toronto's service as rodman, in 1881 was made assistant engineer, and two years later was appointed assistant engineer-in-charge of sewers, which position he held until 1891. In 1892 he was made acting chief engineer, then deputy city engineer, and in 1898 succeeded Mr. Keating as city engineer. Last year he was president of the Canadian Society of Civil Engineers, and he is a member of the American Society of Civil Engineers and of the American Waterworks Association. The city council have given Mr. Rust a bonus of £600, equal to six months' salary, and have expressed their high appreciation of his valuable services as assistant city engineer and city engineer over a period of thirty-five years. Their laudatory resolution on the occasion of his retirement refers to his sound judgment and engineering skill as being of "so high an order as to win recognition for him as one of the most eminent

of authorities on municipal engineering on this Continent."

The late Mr. Lewis Angell, surveyor of West Ham from 1867-99, and first president of the Institution of Municipal and County Engineers, left property of the gross value of £69,560.

**Swimming Bath for Balham.**—The Wandsworth Borough Council decided on Wednesday to erect a swimming bath at Balham at a cost not exceeding £10,000.

**Water Board's Loss.**—Reporting to the Tottenham District Council, its representative on the Metropolitan Water Board states that it is estimated the board has lost £24,500 per annum by the sinking of wells in the City of London.

**Southwark and St. Paul's Bridge Schemes.**—Speaking at a dinner given by him at the Savoy Hotel, Mr. J. W. Domoney, chairman of the Bridge House Estates Committee of the City of London Corporation, stated that the improvement of Southwark Bridge would be begun almost immediately. The tenders would be considered within the next few months, and he estimated that the improvement of the bridge would be completed within two and a-half years. The committee would be able to start St. Paul's Bridge practically as soon as Southwark Bridge was completed, and meanwhile arrangements would be made for the approaches to that structure. With Mr. Basil Mott, the engineer responsible for the improvement of Southwark Bridge, would be associated Sir Ernest George in the capacity of consulting architect. Mr. Mott would also be the engineer for St. Paul's Bridge, and an eminent architect, whose name he could not yet announce, had been approached with a view to assistance.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President*—Mr. ALBERT D. GREATOREX, M.INST.C.E., Borough Engineer and Surveyor of West Bromwich.

### SCOTTISH DISTRICT MEETING AT STIRLING.

(June 7th and 8th.)

PROGRAMME.

*Friday, June 7th.*

11 a.m.—Reception in the Albert Hall, Stirling, by Provost Bayne and the magistrates of Stirling.
11.10 a.m.—District business.
11.30 a.m.—Discussion on paper (which will be taken as read) entitled, "The Municipal Works of Stirling," by Mr. A. H. Goudie, burgh surveyor, Stirling.
12.15 p.m.—Discussion on paper (which will be taken as read) entitled, "Work Carried Out in Central Stirlingshire under the Road Development Grant," by Mr. D. F. Cox, county road surveyor.
1 p.m.—Luncheon, provided by Stirling Town Council.
2 p.m.—Inspection of burgh works, &c., and county improved roads and quarry.
Mr. Morris, town clerk, Stirling, has kindly consented (should a sufficient number so desire) to conduct members and their lady friends through the Castle and upper part of the town, and point out and describe the buildings of historical and antiquarian interest.
6.30 p.m.—Annual dinner, Golden Lion Hotel, tickets 5s. each.

*Saturday, June 8th.*

Circular tour by motor char-a-banc from Stirling to Lochearnhead, *viâ* Callander and Strathyre, and returning by St. Fillans, Comrie and Crieff.

The following is the probable time table of the tour:—
9.30 a.m.—Leave Stirling, Golden Lion Hotel.
12.30 p.m.—Lunch at Lochearnhead Hotel.
1.30 p.m.—Leave Lochearnhead Hotel.
3.15 p.m.—Afternoon tea, Drummond Arms Hotel, Crieff.
3.45 p.m.—Leave Crieff.
5.45 p.m.—Arrive Stirling.

Tickets for the tour, including lunch, 8s. 6d. each (exclusive of tea at Crieff, which can be arranged personally), can be obtained from the honorary district secretary. Those intending to make the tour should intimate their intention at least a week before the date.

DAVID RONALD,
Falkirk, N.B. *Hon. District Secretary.*

The following meetings have also been arranged:—
June 1st.—Council meeting.
June 15th.—East Ham.
June 22nd.—Lowestoft.
June 29th.—Bridlington.
July 6th.—Stourbridge.
July 11th—13th.—Annual meeting, London.

THOMAS COLE,
11 Victoria-street, S.W. *Secretary.*

## INSTITUTION OF MUNICIPAL ENGINEERS.

*President*—Mr. E. A. STICKLAND, ASSOC.M.INST.C.E., Borough Surveyor, Windsor.

A meeting will be held on Wednesday, June 12th, at the London Aerodrome, Hendon, N.W. (by the courtesy of Mr. C. Grahame-White and the directors of the Grahame-White Aviation Company, Limited), at 2.45 p.m., when the following papers will be presented for discussion:—

"THE STRUCTURES OF THE FUTURE IN RELATION TO AVIATION,"

By Horace Cubitt, A.R.I.B.A., P.A.S.I. (Member).

"SOME SUGGESTIONS FOR BY-LAWS AND REGULATIONS IN RELATION TO AVIATION,"

By B. Wyand, secretary of the institution.

The discussion will be open, and many prominent engineers (other than members of the institution) and aviators have signified their intention of taking part in it.

PROGRAMME.

1.45 p.m.—Meet at Charing Cross, on the steps of St. Martin's Church (see Note below).
2 p.m.—Motor vehicles leave Charing Cross.
2.45 p.m.—Arrive at London Aerodrome.
3 p.m.—Meeting for the discussion of the above papers, which will be taken as read.
4.15 p.m.—Tour of inspection of the hangars, workshops, and other buildings, when an opportunity will be afforded of examining many of the most modern types of aeroplanes. It is hoped that Mr. Claude Grahame-White will be able personally to conduct members round the aerodrome.
5 p.m.—Adjourn to the grounds, where exhibition flights will be given (weather permitting).
6.30 p.m.—Motor vehicles leave for Charing Cross. Passengers may alight at points *en route*.

Arrangements have been made for private motor vehicles to convey members and their friends from Charing Cross to the Aerodrome and back, at an inclusive charge of 1s. 6d. per head. This amount must, in every case, be sent to the secretary when applying for ticket of admission, and not later than Thursday, June 6th.

NOTE.—Members are requested to note that admission tickets may be obtained independently of tickets of conveyance, as many might find it more convenient to go direct to the grounds than *viâ* Charing Cross. These would then meet the party at the Aerodrome at 2.45, as set forth above.

Admission to the Aerodrome will be by ticket only, and tickets, price 1s. each, may be obtained from the secretary of the institution. Tickets and copies of papers to be presented will be forwarded as soon as the latter are in print.

Ladies are invited to attend.

A visit will be paid to the show rooms and works of Messrs. Doulton & Co., Limited, Albert Embankment, London, on Wednesday, June 5th, at 2.30 o'clock.

Members will assemble in the show rooms at 2.30, and the processes to be seen during the round of visits will include the manufacture of drain pipes and other sanitary stoneware, fireclay stoves, architectural terra-cotta, and Doulton and other art ware.

B. WYAND,
39 Victoria-street, S.W. *Secretary.*

## INSTITUTION OF WATER ENGINEERS.

### SEVENTEENTH SUMMER GENERAL MEETING.

The seventeenth summer general meeting will be held at Cheltenham on Thursday, Friday and Saturday, the 6th, 7th and 8th of June next, under the presidency of Mr. J. S. Pickering, M.INST.C.E., borough surveyor and water engineer. The meetings will be held in the town hall, and at the opening of the proceedings on Thursday, June 6th, the institution will be welcomed to Cheltenham by His Worship the Mayor (Councillor C. H. Margrett, J.P.) The programme will include the presentation of premiums awarded by the council for papers presented during the year 1911, as well as other business of special interest to members, so that a large attendance is confidently anticipated.

PAPERS AND COMMUNICATIONS.

The following papers have been promised for reading and discussion at this meeting:—

(1) "The New Waterworks for Skegness," by Percy Griffith, M.INST.C.E. (held over from the last winter meeting).
(2) "The Rating of Water Undertakings," by Donald Dinwiddy, F.S.I.
(3) "The Rating of Water Undertakings," by Arthur Valon, ASSOC.M.INST.C.E.
(4) A discussion upon the desirability of standardising the "General Conditions of Contracts" will be introduced by Harold W. Woodall, M.INST.C.E., water engineer, Bournemouth.
(5) "The Hinckley Waterworks," by E. H. Crump, ASSOC.M.INST.C.E.
(6) "The Gloucester Waterworks (Whitcombe Reservoirs)," by R. Read, ASSOC.M.INST.C.E., city engineer.
(7) "The Use of Sulphate of Copper in Purifying Water Supplies," by Geo. Embrey, county analyst of Gloucestershire.
(8) "The Self-pollution of Water by Natural Growths," by Dr. J. H. Garrett, medical officer of health, Cheltenham.
(9) "The Geology of Cheltenham, with Special Reference to the Water Supply," by L. Richardson, F.R.S.(ED.), F.L.S., F.G.S.

NOTE.—Papers (2) and (3) will be discussed together.

The president-elect, Mr. J. S. Pickering, will deliver his presidential address on Thursday, June 6th, and will also supply a description of the Cheltenham Corporation waterworks. Dr. Samuel Rideal will give a few descriptive notes on the pre-filtration process now being introduced at the Tewkesbury works.

VISITS TO WORKS.

On Thursday afternoon a visit will be made to the Tewkesbury waterworks of the Cheltenham Corporation, including pumping station, new pre-filtration plant, &c.

On Friday afternoon a visit will be made to the Dowdeswell reservoir and filters, also the Hewletts reservoirs of the Cheltenham Corporation waterworks.

On Saturday afternoon a visit will be made to the Witcombe impounding reservoirs and filtration works of the Gloucester Corporation waterworks.

SOCIAL FUNCTIONS.

The annual dinner will be held at the town hall on Friday evening, June 7th, when the Mayor of Cheltenham and other distinguished guests of the institution will be present.

On Thursday evening members and their friends are invited by the Town Improvement Committee to attend at Montpellier Gardens from 8 p.m. till 10 p.m., when a concert will be given by the Munster Fusiliers.

On Friday afternoon members and their friends are invited by the Mayor of Cheltenham to attend a garden party in Pittville Park, from 5 p.m. to 6 p.m.

Tea will be provided on Thursday afternoon at the Tewkesbury pumping station, and on Saturday afternoon at the Gloucester waterworks.

The manager of the light railway company has arranged for members and their friends to have free use of the trams during the meeting, on presentation of programme card.

Admission to the public parks and gardens may be obtained free during the meeting on presentation of programme card.

PERCY GRIFFITH,
*Secretary.*

54 Parliament-street, S.W.

## ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

*President*—Mr. J. D. WATSON, M.INST.C.E., F.R.S.I.

### MIDLAND DISTRICT: VISIT TO LICHFIELD SEWAGE WORKS.

By the kind permission of the Mayor (Mr. Councillor C. T. Wigham) and the chairman of the Sanitary Committee (Mr. Councillor H. Y. C. Winterton), a visit of inspection will be paid to the above works to-morrow (Saturday).

PROGRAMME.

3 p.m.—Meet at Guildhall (about three minutes' walk from City Station), where the members will be welcomed by his Worship the Mayor.
3.15 p.m.—Paper to be read by Mr. W. B. Chancellor, city surveyor, on "Lichfield Sewerage and Sewage Disposal."
3.45 p.m.—Proceed to sewage farm, Curborough, by motor brake.
4 p.m.—Arrive at outfall works.
4.45 p.m.—Leave outfall works.
5 p.m.—Arrive at Guildhall, where the members will be entertained by his Worship the Mayor.

### MEETING AT GLASGOW.

A meeting of the association is to be held at Glasgow on Saturday, June 8th.

**Highways in Scotland.**—A communication has been received by the Aberdeen County Road Board reporting that the Secretary for Scotland had informed a deputation from the County Councils' Association which recently waited upon him that he could not see his way to introduce legislation on the subject of the regulation width of highways. A memorial had been submitted to the Lord Advocate, and this, with opinions thereon, was laid before the board. The clerk said it would be remembered that, on account of a decision in a case in court, the opinion of counsel was taken as to whether it really was obligatory that all roads upon the list should have a statutory width of 20 ft., and the county council had received the opinion that such was the state of the law as decided in the case referred to. Last year an action had been brought against two of the county committees in the county of Fife, and the Second Division of the Court of Session held that it was obligatory to have every road on the statutory list 20 ft. wide. The Aberdeen Council therefore resolved to support the County Councils' Association in the deputation to the Secretary for Scotland, asking him to introduce legislation on the subject. He had declined on the ground that the opinion of the House of Lords had not been taken on the question. In the meantime (said the clerk, in conclusion), they should be satisfied with the Lord Advocate's opinion that the provisions of the statute of 1901 were permissive, and not obligatory.

## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

SANITARY INSPECTOR.—May 25th.—Great Driffield Urban District Council. £50 per annum.—Mr. H. Brown, clerk.

INSPECTOR OF NUISANCES. May 25th. Wells-next-the-Sea Urban District Council. £100 per annum.—Mr. E. B. Loynes, clerk, Wells, Norfolk.

ROAD FOREMAN.—May 27th.—Corporation of Lewes. 35s. per week.—Mr. D. Roberts, borough surveyor.

FOREMAN. — May 28th. — Stroud Urban District Council. £104 per annum.—Mr. E. N. Wichell, clerk, 1 Lansdown, Stroud.

BOROUGH SURVEYOR'S CLERK.—May 28th.—Borough of Royal Leamington Spa. 35s. per week.—Mr. Leo Rawlinson, town clerk.

GENERAL FOREMAN.—May 29th.—Corporation of Lewes. 36s. per week.—Mr. David Roberts, borough surveyor.

SURVEYOR.—May 29th.—Carmarthenshire County Council. £200 per annum.—Mr. J. W. Nicholas, clerk, county offices, Carmarthen.

ASSISTANT ENGINEER FOR BUILDINGS AND ARCHITECTURE.—May 31st.—Municipality of Bombay. 600 rupees—800 rupees per month.—Mr. P. R. Cadell, municipal commissioner.

CLERK OF WORKS.—May 31st.—Horsham Rural District Council.—Mr. W. Dengate, surveyor, 58 Park-street, Horsham.

SURVEYOR'S GENERAL ASSISTANT.—May 31st. Maldens and Coombe Urban District Council. £100—£150.—Mr. James W. Johnson, clerk.

SURVEYOR AND INSPECTOR OF NUISANCES.—June 3rd.—Ottery St. Mary Urban District Council. £95—£110.—Mr. Holliday Hartley, clerk.

SURVEYOR AND WATER ENGINEER.—June 6th. Teignmouth Urban District Council. £80 per annum.—Mr. F. W. Knight, surveyor and water engineer.

ASSISTANT SANITARY INSPECTOR.—June 14th.—Heston and Isleworth Urban District Council. £120—£150.—Mr. H. J. Baker, clerk.

## MUNICIPAL COMPETITIONS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1389 Holborn), subject to later confirmation by letter.*

LYMINGTON.—May 25th.—Designs for public offices. Premiums 30 and 15 guineas. Assessor, Mr. R. F. Gutteridge, F.R.I.B.A., town clerk.

LLANELLY.—June 18th.—Designs for school buildings, comprising boys', girls' and infants' departments, for the urban district council. Premium 50 guineas.—Mr. I. W. Watkins, clerk, Education Office, Coles-hill-terrace, Llanelly.

HALE.—June 28th.—Designs for a town planning scheme for the urban district council. Premiums of £50 and £25 are offered.—The Clerk.

REIGATE.—June 29th.—Plans and schemes for laying out and developing part of the Reigate Lodge estate, belonging to the town council. Premiums of 30 and 10 guineas.—Mr. Alfred Smith, town clerk.

PADIHAM.—June 30th.—Designs for town hall and baths. Premiums £40 and £20.—Mr. J. Gregson, surveyor.

DUSSELDORF.—July 1st.—Plan for the extension of the city. Premiums of £1,000 and £375 are offered.—The Chief Burgomaster.

CARDIFF.—August 6th.—Designs and estimates for fire station.—The Town Clerk.

## MUNICIPAL CONTRACTS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1389 Holborn), subject to later confirmation by letter.*

### Buildings.

GLASGOW.—May 27th.—For the erection of a sub-generating station, for the corporation.—Town Clerk.

TURRIFF.—May 28th—31st.—For the erection of a manual instruction room, for the School Board.—Mr. L. Duncan, architect, Turriff.

WEST SUSSEX.—May 28th.—For additions and alterations to school, for the Joint Education Committee.—Mr. Lionel Thompson, secretary, High-street, Worthing.

ESSEX.—May 29th.—For widening the bridge over the river Blackwater, for the county council.—Mr. Percy J. Sheldon, county surveyor.

HARWICH.—May 31st.—For the erection of a fire station and public convenience, for the corporation.—Town Clerk.

BRADFORD-ON-AVON.—May 31st.—For the construction of a retaining wall, for the urban district council.—Mr. James Compton, clerk.

STANLEY.—June 1st.—For the erection of entrance lodge and tool-house at cemetery, for the urban district council.—Mr. Geo. Ridley, clerk.

TRALEE.—June 1st.—For building the Carnegie library, for the rural district council.—The Clerk.

SALFORD.—June 1st.—For the construction of an underground convenience, for the corporation.—Mr. W. Plant, engineer and surveyor.

MANSFIELD.—June 3rd.—For the erection of covered pig shed and iron pens, for the corporation.—Mr. T. P. Collinge, borough surveyor.

CHURCH.—June 3rd.—For the erection of public conveniences, for the urban district council.—Mr. W. Wood, surveyor.

CARMARTHENSHIRE.—June 3rd.—For the demolition of existing bridge and the erection of a new masonry bridge, and constructing embankment, for the county council.—Mr. R. Williams Jones, county surveyor.

WIDNES.—June 3rd.—For removing existing latrines and fixing extensions and additional latrines, for the corporation.—Mr. G. H. Danby, Town Hall.

WEST HAM.—June 4th.—For building extension to electricity generating station and coal bunkers, for the corporation.—Mr. Fred E. Hilleary, town clerk.

BARNET.—June 4th.—For the erection of twenty-two cottages, for the urban district council.—Mr. H. W. Poole, clerk.

WOOLWICH.—June 5th.—For the construction of an underground convenience, for the borough council.—Mr. A. B. Bryceson, town clerk.

RAWTENSTALL.—June 5th.—For alterations at the market hall, for the town council.—Mr. J. Johnson, borough surveyor.

WEST HAM.—June 5th.—For the erection of refuse destructor and steam-raising plant, for the corporation.—Mr. Fred. E. Hilleary, town clerk.

SOUTHEND-ON-SEA.—June 6th.—For the construction of a new loading pier (580 ft. in length), for the corporation.—Mr. H. J. Worwood, town clerk.

WEST RIDING.—June 7th.—For the erection of a school, for the Education Committee.—Mr. Francis Alvey Darwen, clerk, County Hall, Wakefield.

ALTRINCHAM.—June 8th.—For the erection of thirty-two cottages, for the urban district council.—Mr. W. S. Stokoe, clerk.

DERBYSHIRE.—June 10th.—For the erection of a secondary school at New Mills, for the county council.—Mr. G. H. Widdows, architect, County Education Offices, St. Mary's-gate, Derby.

MERTHYR.—June 10th.—For the erection of forty-eight workmen's dwellings, for the corporation.—Mr. T. A. Rees, town clerk.

ALTRINCHAM.—June 10th.—For the erection of shelter and conveniences, for the urban district council.—Mr. W. S. Stokoe, clerk.

STRETFORD.—June 10th.—For alterations and additions to town hall and erecting new baths, for the urban district council.—Mr. Geo. H. Abrahams, clerk.

EVESHAM.—June 10th.—For the erection of ninety cottages, for the rural district council.—Mr. E. H. Wadams, clerk.

HANWELL.—June 10th.—For the construction of a refuse destructor, for the urban district council.—Mr. Percy Scott, clerk.

SOUTHALL-NORWOOD.—June 11th.—For the construction of an open-air swimming bath, for the urban district council.—Mr. R. Brown, engineer, Town Hall.

LANCASHIRE.—June 12th.—For alterations and additions to council schools, for the Education Committee.—Mr. Harcourt E. Clare, clerk, County Offices, Preston.

CHESHIRE.—June 15th.—For the erection of a school at Haslington, for the Administrative Sub-Committee.—Mr. C. E. Speakman, clerk, Education Office, Crewe.

ESSEX.—June 24th.—For repairs and alterations to schools, for the Education Committee.—Mr. D. T. Williams, clerk.

### Iron and Steel.

BRADFORD.—May 25th.—For the steelwork required in erection of warehouse, for the corporation.—Mr. Frederick Stevens, town clerk.

HARRINGTON.—May 27th.—For laying new water mains, for the Joint Water Committee.—Mr. W. White, clerk, Council Offices, Harrington.

BRIDGWATER.—May 27th.—For the supply of and laying 3-in. cast-iron water pipes, for the rural district council.—Mr. T. M. Read, solicitor and clerk.

NEWPORT (Mon.).—May 28th.—For the supply of 50 tons of tramway rails, for the corporation.—Mr. H. Tremelling, borough engineer.

LARNE.—May 29th.—For the erection of spiked iron railing and gate, for the urban district council. Mr. F. Stevens, town clerk.

ISLE OF WIGHT.—May 29th.—For laying a water main, for the rural district council.—Mr. H. Eldridge Stratton, clerk.

LEIGHTON BUZZARD. May 29th.—For supply and fixing artesian-bored tube well, for the urban district council.—Mr. Reginald F. A. Tutt, clerk.

CLITHEROE.—May 30th. For laying 700 lin. yds. of 5-in. cast-iron water pipes, for the rural district council.—Mr. Thomas Eastham, clerk and solicitor.

CHEPSTOW.—June 3rd.—For the construction of fifty-six additional iron pens in the cattle market, for the urban district council.—Mr. G. W. Sargent, surveyor.

CHESHUNT.—June 7th.—For laying cast-iron and steel conduits, for the Metropolitan Water Board.—The Clerk, Savoy-court, Strand, W.C.

ASHTON-UNDER-LYNE. — June 10th. — For the supply of cast-iron pipes and special castings, with bolts, nuts and washers, for the corporation.—Mr. Fred. J. Dixon, water engineer, Town Hall Chambers.

HOWRAH (India).—June 18th.—For the supply of steel pipes, cast-iron specials, sluice valves and air valves, for the municipality.—The Chairman, Howrah Municipality, India.

## Roads.

LANCASHIRE.—May 25th.—For repaving 1,800 sq. yds. with granite setts, for the county council.—Mr. Harcourt E. Clare, clerk, Council Offices, Preston.

NELSON.—May 25th.—For making up several streets, for the corporation.—Mr. W. Shackleton, borough engineer and surveyor.

ROSS AND CROMARTY.—May 25th.—For widening and repairing 3¾ miles of road, for the county council.—The District Clerk, Fortrose.

NORTH WALSHAM.—May 25th.—For work of tar-paving, for the urban district council.—Mr. H. W. T. Empson, clerk.

WEST RIDING.—May 25th.—For works of excavation and rubble pitching, for the Highways Committee.—Mr. F. G. Carpenter, county surveyor, County Hall, Wakefield.

WISHAW.—May 27th.—For the supply of blue whinstone, screened blue whinstone chips, laying new kerbs, water channels and whinstone crossings, and lifting and relaying kerbs, water channels and crossings, for the corporation.—Mr. A. G. Stewart, town clerk.

GODSTONE.—May 27th.—For the supply of broken granite, Kentish ragstone, Chichester gravel and chippings, tar-macadam, consolidation of tar-macadam, kerb, channelling, and hire of steam roller, for the rural district council.—Mr. Geo. E. Crowter, engineer and surveyor.

GREENOCK.—May 27th.—For the construction of kerbs, water runs, and gravel footpaths, for the corporation. Master of Works.

YORK.—May 27th.—For channelling and laying tar-macadam over cobbles in thirty-six streets, for the corporation.—Mr. F. W. Spurr, city engineer.

WEST ASHFORD.—May 27th.—For the supply of blue basalt and quartzite, for the rural district council.—Mr. A. Sims, surveyor, 3 Queen-street, Ashford.

KINGSBURY.—May 27th.—For tar-painting 17,500 super. yds. of road, for the urban district council.—Mr. J. D. Newton, clerk.

MELKSHAM. May 27th. For steam rolling and scarifying, for the rural district council.—Mr. F. U. Greenhill, district surveyor.

BRAINTREE. May 28th. For the supply of broken granite and use of steam roller and scarifier, for the urban district council. Mr. H. H. Nankivell, surveyor.

COLWYN. May 28th. For widening a road and forming foo'path, for the urban district council.—Mr. James Ampthett, clerk.

PONTEFRACT.—May 28th.—For the supply of broken granite, unbroken whinstone and broken dross or limestone, for the corporation.—Mr. John E. Pickard, borough engineer and surveyor.

BELFAST. May 28th. For paving and sewering new streets, for the corporation. Mr. R. Mayer, town clerk.

RAUNDS May 29th. For the supply of broken granite and slag, for the urban district council. Mr. W. F. Corby, clerk.

GREETLAND.—May 29th.—For the supply of Lancashire setts, broken granite macadam, knotted random flags, and dressed kerb, for the urban district council.—Mr. F. J. Mallinson, surveyor.

SCUNTHORPE.—May 29th.—For the supply of broken whinstone, basalt or granite, and chippings, for the urban district council.—Mr. C. C. Gray, engineer and surveyor.

BEDFORD. May 29th.—For paving and road-making, for the corporation.—Mr. Chas. Stimson, town clerk.

MIDDLETON.—May 29th.—For private street works, for the corporation.—Mr. Frederick Entwistle, town clerk.

BISHOP AUCKLAND.—May 29th.—For making up a road, for the ubran district council.—Mr. J. T. Proud, clerk.

TOTTINGTON.—May 29th.—For paving work, for the urban district council.—Mr. L. Kenyon, surveyor.

LLANTRISANT AND LLANTWIT.—May 29th.—For the completion of the new Ely Valley-road and branch roads, for the rural district council.—Mr. Gomer S. Morgan and Mr. Thomas Saunders, engineers, School-street, Pontyclun, Glam.

BOLLINGTON.—May 29th.—For paving on concrete with granite setts, for the urban district council.—Mr. Samuel Knight, clerk.

WANSTEAD.—May 30th.—For widening, kerbing and channelling, for the urban district council.—Mr. Bruce Blewitt, clerk.

ASHFORD.—May 30th.—For the supply of gauge-broken granite, for the urban district council.—Mr. W. Terrill, surveyor, 5 North-street, Ashford, Kent.

WIDNES.—May 30th.—For works of making up and paving, and the supply of granite setts or syenite cube setts, for the corporation.—Mr. H. S. Oppenheim, town clerk.

CHURCH.—May 30th.—For making up a road, for the urban district council.—Mr. J. R. Reddish, clerk.

KINGSTOWN (Co. Dublin).—June 1st.—For laying 17,000 sq. yds. of tar or bituminous macadam, for the urban district council.—Mr. J. Sherlock Vaughan, town clerk.

BLACKROCK.—June 1st.—For laying 30,000 sq. yds. of tar or bituminous macadam, for the urban district council.—Mr. R. Finlay Heron, town clerk.

ELY.—June 1st—3rd.—For the supply of machine-broken Leicestershire granite, for the urban district council.—Mr. G. M. Hall, clerk, Market-square, Ely.

MALDENS AND COOMBE.—June 3rd.—For kerbing, channelling, and paving works, for the urban district council.—Mr. J. W. Johnson, clerk, Municipal Offices, New Malden.

SUTTON-IN-ASHFIELD.—June 3rd.—For making up several streets, for the urban district council.—Mr. W. Burn, surveyor.

BILSTON.—June 3rd.—For making up and sewering, for the urban district council.—Mr. J. D. Wassell, clerk.

ROMFORD.—June 3rd.—For the supply of blue Guernsey granite, for the rural district council.—Mr. T. W. A. Greenhalgh, clerk.

HASTINGS.—June 3rd.—For the supply of 2,000 tons of broken granite, for the corporation.—Mr. P. H. Palmer, borough engineer.

EALING. June 4th.—For making up part of Pitshanger-lane, for the corporation.—Mr. Geo. E. Brydges, town clerk.

HOVE.—June 5th.—For executing paving and laying wood paving upon present concrete foundation, for the corporation.—Mr. H. Endacott, town clerk.

BLYTH.—June 6th.—For the construction of two streets, for the urban council.—Mr. Robert Grieves, surveyor.

WAKEFIELD. June 10th. For the execution of private street works, for the corporation.—Mr. J. P. Wakeford, city surveyor.

FAREHAM. June 10th. For the supply of granite, basalt, or other road stone, for the rural council.—Mr. J. F. Whitear, surveyor.

STANLEY. June 10th. For making up roadways, for the urban district council.—Mr. A. Routledge, surveyor.

COLCHESTER. June 11th. For sewering, metalling, kerbing, channelling, paving and making good, for the corporation.—Mr. H. Goodyear, borough engineer and surveyor.

RYTON.—June 12th.—For the construction of street works, for the urban district council. Mr. Henry Dalton, clerk.

EPSOM.—June 17th.—For making up a road, for the rural district council.—Mr. T. R. Ware, surveyor of highways, Waterloo-road, Epsom.

LEWES.—June 22nd. For scarifying and steam rolling, for the corporation.—Mr. Montague S. Blaker, town clerk.

## Sanitary.

FOLKESTONE.—May 25th.—Offers for a steam motor lorry used for the collection of house refuse. Mr. A. F. Kidson, town clerk.

GRIMSBY.—May 25th.—For the construction of stoneware pipe sewer, for the rural district council. Mr. J. F. Wintringham, clerk.

GREENOCK.—May 25th.—For the supply of coals, cement, lime, fireclay pipes, pavement, whinstone setts, road metal, pitch, oil and cartage, for the corporation.—The Town Clerk.

MACCLESFIELD.—May 27th.—For laying sewers and water mains, for the rural district council.—Mr. Frederick May, solicitor and clerk.

ALNWICK.—May 28th.—For the extension of a sewer, for the rural district council.—Mr. H. W. Walton, clerk.

HAWARDEN.—May 29th.—For scavenging work, for the rural district council.—Mr. H. G. Roberts, clerk, Broughton, near Chester.

DRIFFIELD.—May 29th.—For cleaning drain and construction and repair of culverts, for the rural district council.—Mr. H. Botterill, clerk, 23 Exchange-street, Great Driffield.

STAINES.—May 30th.—For the supply of galvanised round sanitary pans, for the rural district council.—Mr. G. W. Manning, surveyor, London-road, Ashford, Middlesex.

VALETTA (Malta).—May 30th.—For the supply of stoneware pipes and specials.—Crown Agents for the Colonies, Whitehall-gardens, S.W.

BONNYBRIGG.—May 30th.—For the construction of sewers, sewage tanks and filters, for the corporation.—Mr. James G. Forbes, town clerk.

BRIGHTON.—May 31st.—For the construction and maintenance of brick and pipe sewers, and other works, for the corporation.—Mr. Hugh Talbot, town clerk.

RAWMARSH.—June 1st.—For the construction of sewage outfall works, for the urban district council.—Mr. J. W. Bellamy, clerk.

OAKHAM.—June 1st.—For scavenging and removal of house refuse, for the rural district council.—Mr. W. Batts, clerk.

DUNDALK.—June 3rd.—For constructing new sewer, for the rural district council.—The Clerk.

BILSTON.—June 3rd.—For laying pipe sewers and manholes, and making up and sewering, for the urban district council.—Mr. V. Turner, surveyor.

BEDFORD.—June 5th.—For laying sewers, for the town council.—Mr. C. Stimson, town clerk.

SEGHILL.—June 7th.—For the removal of house refuse, for the urban district council.—Mr. T. Spencer, clerk, Seghill, Northumberland.

LINLITHGOWSHIRE.—June 7th–17th.—For the construction of 2½ miles of sewers and other works, for the Bathgate District Committee.—Mr. J. G. B. Henderson, district clerk, Linlithgow.

CHESHAM.—June 8th.—For construction of outfall works and laying out additional land for sewage disposal purposes, for the urban district council.—Mr. Percy C. Dormer, engineer.

GOSFORTH.—June 11th.—For constructing rain-water sewer, for the urban district council.—Mr. G. Nelson, engineer and surveyor.

SOUTHALL-NORWOOD.—June 11th.—For extensions to the sludge-press house, for the urban district council.—The Clerk.

## Stores.

CLECKHEATON.—June 1st.—For the supply of granite, dross, lime, cement, cartage, stoneware pipes, kerbs, setts, fodder, tar, pitch and oil, for the urban district council.—Mr. John H. Linfield, clerk.

CHURCH.—June 3rd.—For the supply of flags, kerbs, setts, grit, granite, limestone, pitch, creosote oil, salt-glazed socket pipes, scavenging brooms, manhole covers, lamphole covers, step-irons, street grates and disinfecting powder, for the urban district council.—Mr. J. R. Reddish, clerk.

PAIGNTON.—June 3rd.—For the supply of coal, coke, granite, lamp columns, gully gratings, oil and firewood, for the urban district council.—The Surveyor.

## Miscellaneous.

DARTFORD.—May 25th.—For the supply of disinfectants and broken granite, for the urban district council.—Mr. W. Kay, clerk.

GAINSBOROUGH.—May 27th.—For the supply of tar and gas coal, for the urban district council.—Mr. John Baldwin, manager, gas department.

SHREWSBURY.—May 28th.—For rebuilding wall, laying concrete paving, erecting unclimbable fencing, and other works, for the corporation.—Mr. W. Chapple Eddowes, borough surveyor.

BEDLINGTONSHIRE.—May 29th.—For the supply and erection of electricity poles and cables, for the urban district council.—Mr. Charles D. Forster, joint clerk.

TYLDESLEY.—May 31st.—For the supply of goods, for the gasworks.—Mr. W. J. Matthews, clerk.

CLECKHEATON.—June 1st.—For the supply of tar and ammoniacal liquor, for the urban district council.—Mr. John H. Linfield, clerk.

BARRY.—June 1st.—For the supply of general haulage, small castings, fodder, lime, and general stores, for the urban district council.—Mr. T. B. Tordoff, clerk.

NEWBURY.—For a complete gas plant to run three existing Crossley gas engines.—Mr. S. J. L. Vincent, borough surveyor.

# TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

ASHINGTON.—For drainage works, for the urban district council.—Mr. G. Beaty, surveyor.—

G. E. Simpson, Newcastle-on-Tyne, £530.

BRADFORD.—For the reconstruction of conveniences, for the education committee.—

W. Booth, Odsal.

BRIXTON.—For the erection on the "Reay" site, Brixton, of a school for 125 physically-defective children, for the London County Council:

| | |
|---|---|
| G. Parker & Sons, Peckham | £6,445 |
| Triggs & Co., Clapham | 6,323 |
| J. Garrett & Son, Balham-hill | 6,259 |
| J. Smith & Sons, Limited, South Norwood | 6,109 |
| W. Downs, Walworth-road | 6,100 |
| R. Cook & Sons, Crawley, Sussex | 6,099 |
| J. & M. Patrick, Wandsworth | 5,910 |
| Rice & Son, Stockwell-road | 5,785 |
| T. D. Long, Deptford | 5,697 |
| W. Smith & Son, Harleyford-road | 5,695 |
| J. C. Bowyer, Limited, Upper Norwood | 5,694 |
| Lole & Co., Chelsea | 5,670 |
| E. Lawrence & Sons, Limited, City-road | 5,570 |
| W. Johnson & Co., Limited, Wandsworth-common† | 5,477 |

Architect's estimate, £5,568.

CAMBERWELL.—For rebuilding Leipsic-road School, Camberwell, for the London County Council—

| | |
|---|---|
| J. Allen & Sons, Limited, Kilburn | £19,419 |
| W. King & Son, Vauxhall Bridge Road | 18,587 |
| J. Carmichael, Wandsworth | 18,490 |
| Patman & Fotheringham, Limited, Islington | 17,968 |
| W. Smith & Son, Harleyford-road | 17,598 |
| C. Wall, Limited, Fenchurch-street | 17,586 |
| J. Appleby & Sons, Southwark-park | 17,541 |
| W. Downs, Walworth | 17,447 |
| J. Marsland & Sons, Walworth | 17,025 |
| G. Godson & Sons, Kilburn | 16,980 |
| W. Johnson & Co., Limited, Wandsworth-common | 16,944 |
| H. L. Holloway, Deptford | 16,700 |
| J. & C. Bowyer, Limited, Upper Norwood | 16,379 |
| Holliday & Greenwood, Limited, Brixton | 16,378 |
| E. Lawrence & Sons, Limited, City-road | 16,305 |
| T. D. Long, Deptford* | 16,302 |

Architect's estimate, £16,278.

DAVENTRY.—For the construction of sewers and sewage disposal works, for the rural district council:—

| | |
|---|---|
| J. Kirk & Randall, Woolwich | £12,313 |
| J. Young, Rugby | 11,379 |
| W. Cunliffe & Sons, Birmingham | 10,666 |
| Franklin (Deddington) Limited, Deddington | 10,240 |
| J. McCarthy & Pitt, Reading | 9,915 |
| A. Hill & Co., Kidderminster | 8,963 |
| G. P. Trentham, Birmingham | 8,958 |
| H. Martin, Limited, Northampton | 8,954 |
| A. H. Price & Co., Nottingham | 8,582 |
| W. Higgins, Northampton | 8,480 |
| W. G. Wilmott, Rushden | 8,057 |
| Martin & Element, Birmingham | 7,993 |
| R. Cosford, Northampton | 7,857 |
| W. Thompson & Co., Luton* | 7,093 |

CAMBRIDGESHIRE.—For the supply of steam rollers, for the county council:—

Pamplin Brothers, Cherryhinton, 19s. 9d. per day; S. E. Coville, Ely (one roller only, scarifier included), £1 2s.; Eddison Steam Rolling Company, Dorchester (without fuel), £1 1s.; Oxford Steam Plough Company, Cowley, £1 8s.; and Mr. J. J. Prior, Limehouse, £1 12s.

The Roads and Bridges Committee reported in favour of the acceptance of Pamplin Brothers at 19s. 9d per day.

The county surveyor, Mr. J. E. Blackwall, reported that he had recently tested a mileage recorder upon a steam roller for recording the distance covered by the roller, and considered the same satisfactory. It was accordingly resolved to purchase three mileage recorders for use on one roller in each division at an estimated cost of £7 each.

The county surveyor produced the following alternative tenders for steam rolling on the basis of mileage as tested by the recorders:—Pamplin Brothers, Cherryhinton, 15s. per day and 1s. 6d. per mile; S. E. Coville, Ely (one roller only), 12s. and 2s.; J. J. Prior, Limehouse, 32s. and 2s. 6d.

It was resolved that one steam roller be hired of Mr. S. E. Coville at 12s. per day and 2s. per mile, and one of Pamplin Brothers at 15s. per day and 1s. 6d. per mile, and that the third recorder be placed on one of Pamplin's steam rollers working by the day.

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DURHAM.—For the construction of detritus, storm-water and sedimentation tanks, and filter beds, for the rural district council.—Mr. G. Gregson, surveyor:—

| | |
|---|---|
| R. Oliver, Durham | £878 |
| J. Carrick, Durham | 735 |
| F. Sowerby, Bishop Auckland | 700 |
| J. & R. Wood, New Brancepeth | 684 |
| J. W. Henderson, Gosforth | 669 |
| Walton Brothers, Crook S.O., Co. Durham * | 668 |

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EASINGTON.—For making up a private street, for the rural district council:—

Back Hartlepool-street, South Thornley.—G. A. Reevell, Stockton on-Tees, £438.

Back Woods-terrace, Murton.—G. A. Reevell, Stockton-on-Tees, £686.

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FINSBURY.—For providing at the Moreland-street School, Finsbury, E., a manual training centre for 20 boys, a new house for the schoolkeeper, and a larger boys' playground, for the London County Council:—

| | |
|---|---|
| Brand, Pettit & Co., Tottenham | £2,522 |
| Woodward & Co., Finsbury | 2,494 |
| J. Grover & Son, Islington | 2,464 |
| F. Smith & Co., City | 2,455 |
| McCormick & Sons, Limited, Essex-road | 2,361 |
| W. Reason, Rosebery-avenue | 2,360 |
| G. S. S. Williams & Son, Thornhill-square | 2,304 |
| L. H. & R. Roberts, Rheidol-terrace | 2,290 |
| E. Lawrance & Sons, Limited, City-road | 2,256 |
| G. Godson & Sons, Kilburn | 2,189 |
| E. A. Roome & Co., Basinghall-street † | 2,173 |

Architect's estimate, £2,235.

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LEVEN (Fifeshire).—For the widening of Branch-street, for the corporation:—

| | |
|---|---|
| A. M'Ruvie | £247 |
| L. Swinton | 245 |
| J. Wilkie † | 227 |

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MALDENS AND COOMBE.—For works of road construction, for the urban district council:—

J. Mowlem & Co., Limited, Westminster.—Alric-avenue (road making), £850; Beresford-road (road making), £580; Kingston-road (part, road making), £144.

J. Wainwright & Co., Limited, Shepton Mallet.—Artificial Stone Paving in Alric-avenue, Beresford-road and Kingston-road (part), £400.

F. W. Streeton, New Malden.—12-in. stoneware pipe surface water sewer, adjoining council's sewage works, £83.

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NEWRY.—For the construction of a new sewer, for the urban district council:—

| | |
|---|---|
| J. Hughes, Newry | £245 |
| W. J. Campbell & Sons, Belfast | 220 |
| J. Ross & Son, Belfast | 239 |
| J. Graham, Dromore* | 211 |

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NUNEATON.—For additions to the engine-house at electricity works, for the corporation.—Mr. F. C. Cook, borough surveyor:—

| | |
|---|---|
| C. W. Streather, Nuneaton | £1,468 |
| T. Smith, Nuneaton | 1,457 |
| T. Smith & Sons, Nuneaton | 1,425 |
| T. Barker & Sons, Loughborough | 1,368 |
| G. Smith & Sons, Nuneaton* | 1,365 |
| H. Dorse, Cradley Heath | 1,341 |

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PLOMESGATE (Suffolk).—Accepted for the supply of broken granite and flint, for the rural district council:—

E. H. Woodmancy, Felixstowe.—3,000 tons granite at 12s. 6d. a ton, average.

C. R. Ayton, Wymondham.—1,250 tons flints at 6s. 6d. a ton, average.

C. W. Parker, Bradwell-on-Sea.—200 tons Red Pitt flints at 5s. 6d. per ton.

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RAWTENSTALL.—Accepted for works of paving and sewering, for the corporation:—

Hawley & Heaton, Stacksteads.

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RICHMOND (Surrey).—For paving with wood blocks the carriageway of Kew-road, from the existing wood paving on the railway bridge at Richmond to the existing wood paving on King Edward VII. Bridge at Kew, for the corporation:—

| | |
|---|---|
| Wimpey & Co., Hammersmith | £21,229 |
| W. Griffiths & Co., Bishopsgate-street Without | 20,054 |
| Acme Flooring and Paving Company, Victoria-park | 19,163 |
| J. Mowlem & Co., Westminster | 17,999 |
| Improved Wood Pavement Company, Queen Victoria-street * | 17,646 |

Borough surveyor's estimate, £20,990.

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RICHMOND (Surrey).—For the reconstruction of surface water sewers in Kew-road and Stanmore-road, and for the execution of the works in connection therewith, for the corporation:—

| | |
|---|---|
| A. Brierley, Kent | £1,315 |
| E. Parry & Co., Putney | 925 |
| S. Kavanagh & Co., Surbiton | 916 |
| Wimpey & Co., Hammersmith | 890 |
| Jarman & Co., Richmond | 770 |
| J. Mowlem & Co., Westminster * | 720 |

Borough surveyor's estimate, £960.

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RICHMOND (Surrey).—For the construction of a new roadway to connect Ennerdale-road with Lion Gate-gardens, for the corporation:

| | |
|---|---|
| E. Parry & Co., Putney | £242 |
| S. Kavanagh & Co., Surbiton | 230 |
| J. Mowlem & Co., Westminster | 211 |
| G. Wimpey & Co., Hammersmith* | 171 |

Borough surveyor's estimate, £200.

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SOUTHGATE.—Accepted for carrying out private street works, for the urban district council.—Mr. C. G. Lawson, surveyor:—

Belsize-avenue.—A. Thompson, Whetstone.

Burford-gardens, Cranley-gardens and Elm Park-road.—W. & C. French, Buckhurst-hill.

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SOUTHGATE.—Accepted for work of surface tarring, for the urban district council.—Mr. C. G. Lawson, engineer and surveyor:—

10,000 gallons distilled tar.—Catchpole & Son, Rotherhithe.

30,000 gallons distilled tar and the distribution by steam tractor.—Taroads Syndicate, Westminster.

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STIRLING.—For laying cast-iron water pipes and constructing foundation for steel tank, for the county council:—

F. Flaherty, Camelon, £1,569.

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ST. PANCRAS.—For remodelling the Hawley-crescent school, St. Pancras, W., for the London County Council:—

| | |
|---|---|
| Brand, Pettit & Co., Tottenham | £12,142 |
| McCormick & Sons, Limited, Essex-road | 11,922 |
| F. & T. Thorne, Isle of Dogs | 11,600 |
| G. S. S. Williams & Son, Barnsbury | 11,360 |
| McLaughlin & Harvey, Limited, Brecknock-road | 11,331 |
| G. Godson & Sons, Kilburn | 11,143 |
| L. H. & R. Roberts, Islington | 11,037 |
| Rowley Brothers, Wood Green | 10,972 |
| J. & C. Bowyer, Limited, Upper Norwood | 10,889 |
| W. Johnson & Co., Limited, Wandsworth-common | 10,878 |
| E. Lawrance & Sons, Limited, City-road * | 10,651 |

Architect's estimate, £10,649.

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SUDBURY.—For the supply of road materials, disinfectants, and stoneware pipes, for the corporation.—Mr. W. J. Tait, borough surveyor:—

Broken Granite.—Lavender & Bateman, Sutton Bridge; Croft Granite Company, Leicester.

Disinfectants.—A. Young & Co., London.

Bricks (blue).—Young & Sons, London.

Bricks (local).—Grimwood & Sons, Sudbury.

Pipes.—Knowles & Co., London.

Tools.—Portway & Co., Sudbury; Dupont & Orttewell, Sudbury; F. W. Page, Sudbury.

Engine Oil.—Reliance Lubricating Company, London.

Cement.—Allen & Boggis, Sudbury.

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WOOLWICH.—For the erection of four new hostels to accommodate fifty students each, and a corresponding enlargement of the existing Southwood House hostel, at the Avery-hill Training College, Woolwich, for the London County Council:—

| | |
|---|---|
| W. Mills & Sons, Blackheath | £50,119 |
| E. Proctor & Sons, Plumstead | 45,566 |
| E. Lawrance & Sons, Limited, City-road | 44,504 |
| T. Crossley & Son, Bromley, Kent | 44,245 |
| F. & T. Thorne, Isle of Dogs | 42,267 |
| Rowley Brothers, Wood Green † | 42,141 |

Architect's estimate, £42,534.

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WORTHING.—The corporation have received tenders for the following works:—

Firemen's Cottages.

| | |
|---|---|
| F. Sandell & Son | £1,190 |
| Herbert & Sparkes | 1,140 |
| Peskett & Son, Crawley | 1,095 |
| H. Paine | 1,019 |
| J. W. Greenfield * | 970 |

Painting Shelters and Seats.

| | |
|---|---|
| H. W. Sandell | £111 |
| A. Churcher & Son * | 109 |
| A. Crane | 85 |

Timber for Sea Defence Works.

| | |
|---|---|
| J. Eede Butt & Son, Littlehampton | £112 |
| Woollard & Shoesmith * | 102 |

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# MEETINGS.

*Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.*

## MAY.

24-29.—Institution of Municipal and County Engineers: Visit to Paris.

24.—Royal Sanitary Institute: Meeting at Blackpool; Mr. A. Hindle, Assoc.M.Inst.C.E., on "The Joint Scheme of Sewerage for Thornton-le-Fylde, Bispham-with-Norbreck and Carleton;" Mr. E. W. Rees Jones on "The Card Index System as Applied to Public Health Work," Town Hall, 7.30 p.m.

25.—Association of Managers of Sewage Disposal Works: Visit to Lichfield Sewage Works.

30-31.—Surveyors' Institution: Country Meeting at Nottingham.

## JUNE.

1.—Institution of Municipal and County Engineers: Council Meeting.

3.—Royal Institute of British Architects: Mr. W. Woodward on "The Responsibilities of Architects and the Case of Minter v. Waldstein."

6-8.—Institution of Water Engineers: Summer Meeting at Cheltenham.

7-8.—Institution of Municipal and County Engineers: Meeting at Stirling.

8.—Association of Managers of Sewage Disposal Works: Meeting at Glasgow.

12.—Institution of Municipal Engineers: Meeting at London Aerodrome, Hendon, N.W. 2.45 p.m.

15.—Institution of Municipal and County Engineers: Meeting at East Ham.

22.—Association of Managers of Sewage Disposal Works: Metropolitan District Meeting, Southall Norwood and Hanwell.

22. Institution of Municipal and County Engineers: Meeting at Lowestoft.

29. Institution of Municipal and County Engineers: Meeting at Bridlington.

## JULY.

6. Institution of Municipal and County Engineers: Meeting at Stourbridge.

11-13.—Institution of Municipal and County Engineers: Annual Meeting, London.

## APPOINTMENTS OPEN.

BOROUGH ENGINEER AND SURVEYOR (A.M.Inst.C.E.) of large town in the Midlands (40,000) has vacancy for Pupil. Address Box 1,144, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

BOROUGH OF LEWES.
GENERAL FOREMAN.

The Town Council of this Borough invite applications for the appointment of General Foreman, at a commencing wage of 35s. per week, who must devote all his time to the duties of the office. Practical experience in the construction, maintenance and cleansing of roads and sewers, and supervision of labour is essential.

Applications to be in Candidate's own handwriting, addressed to the undersigned, stating age, accompanied by copies of three testimonials, on or before Monday, the 27th May, 1912, endorsed "General Foreman." Canvassing will be a disqualification.

DAVID ROBERTS,
Borough Surveyor.

Town Hall,
Lewes, Sussex.
May, 1912.

OTTERY ST. MARY URBAN DISTRICT COUNCIL.
APPOINTMENT OF SURVEYOR AND INSPECTOR OF NUISANCES, &c.

The above Council invite applications for the appointment of Surveyor and Inspector of Nuisances, at a salary of £95 per annum, rising (subject to satisfactory services) by annual increments of £5 to a maximum of £110 per annum. Age between 28 and 50.

Preference will be given to Candidates possessing the Certificate of the Sanitary Institute or other similar body.

The appointment will be subject to one month's notice by either party.

Applications must be made upon printed forms, which can be obtained at my office by sending a stamped addressed foolscap envelope, and must be returned before 2 p.m. on Monday, 3rd June.

Canvassing any Members of the Council will be a disqualification.

HOLLIDAY HARTLEY,
Clerk.

Ottery St. Mary.
May 18, 1912.

FAREHAM RURAL DISTRICT COUNCIL.
TENDERS FOR MACADAM.

Tenders are invited by the above Council for the Supply of Granite, Basalt, or other Hard Stone, required for the year ending March 31st, 1913.

Form of Tender may be obtained on application from the undersigned.

Tenders, sealed and endorsed "Tenders for Macadam," together with samples of Stone, to be delivered to me on or before 10th June, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

J. F. WHITEAR,
Surveyor.

Southampton-road,
Fareham, Hants.

TEIGNMOUTH URBAN DISTRICT COUNCIL.

The above Council invite applications for the position of Assistant in the Office of the Surveyor and Water Engineer, at a salary of £80 per annum.

Applicants must be good Draughtsmen and experienced Surveyors and Levellers.

Applications, stating age, past and present employment, accompanied by copies of not more than three recent testimonials, to be delivered to the undersigned not later than Thursday, 6th June, 1912, endorsed "Assistant." Canvassing, directly or indirectly, will be deemed an absolute disqualification.

F. W. KNIGHT,
Surveyor and Water Engineer.

Town Hall,
Teignmouth.
May 22, 1912.

THE MALDENS AND COOMBE URBAN DISTRICT COUNCIL.
SURVEYOR'S GENERAL ASSISTANT.

A General Assistant is required in the Engineer and Surveyor's Department of the above Council, who must have a thorough knowledge of Shorthand and the routine duties of such office, together with the keeping of books and conducting correspondence.

He must also be a good Surveyor and Draughtsman, used to taking levels, and have a thorough knowledge of Building Construction.

Preference will be given to Candidates who have obtained the Testamur of the Institution of Municipal and County Engineers.

Commencing salary £100 per annum (payable monthly), rising by annual increments of £10 to £150.

The engagement to be determinable by one month's notice on either side.

Applications to be on prescribed form, which may be obtained from the undersigned, upon receipt of a stamped and addressed foolscap envelope, stating age (which must not be under 24), qualifications, and accompanied by copies of three recent testimonials, endorsed "Surveyor's Assistant," and addressed to the undersigned, to be delivered at the Municipal Offices, New Malden, on or before the 31st instant.

Canvassing, directly or indirectly, will be a disqualification.

JAMES WM. JOHNSON,
Clerk to the Council.

Municipal Offices,
New Malden, Surrey.
May 17, 1912.

WANTED—a young man to superintend road spraying. Preference given to one with county experience.—Apply Box 159, c/o A. J. Wilson & Co., Limited, 154 Clerkenwell-road, London, E.C.

## COMPETITIONS OPEN.

BOROUGH OF REIGATE.
TO SURVEYORS, ARCHITECTS AND OTHERS.

The Council of the Borough of Reigate invites Competitive Plans and Schemes from Surveyors, Architects and others for Laying-out and Developing part of the Reigate Lodge Estate, belonging to the Council.

Two premiums are offered—namely, one of Thirty Guineas for the Plan and Scheme which the appointed Assessor shall adjudge the best, and Ten Guineas for the Plan and Scheme which such Assessor shall adjudge to be the next best.

Conditions of Competition, together with a copy of the Plan of the said Estate, can be obtained on application at my Office, at the Municipal Buildings, Reigate.

All Plans and Schemes must be sent to me, in accordance with the said Conditions, not later than Saturday, the 29th day of June next.

Dated this 20th day of May, 1912.

(By order)
ALFRED SMITH,
Town Clerk.

## SALE BY AUCTION.

WEYBOURNE, NORFOLK.—SPECIAL NOTICE.
To be SOLD, by AUCTION, by

E. A. STAUGROOM, Auctioneer, Cley, Norfolk, at WEYBOURNE SPRINGS HOTEL, WEYBOURNE, nr. SHERINGHAM, NORFOLK, on May 29,

WEYBOURNE SPRINGS HOTEL (FREEHOLD).

Superb and healthy situation, overlooking sea (and about 1½ mile distant). Close to Weybourne Station (M. and G.N. Ry.), in direct touch with London, Midlands, and North by fast trains. Suitable for HOME, HOTEL, SANATORIUM, SCHOOL, or INSTITUTE. 38 bedrooms, 5 reception-rooms. Well fitted with bath and service rooms, kitchens, &c. Verandah round each floor. Fully furnished and ready for immediate occupation. FURNITURE included.

Mortgage of £3,000 at 4 per cent. per annum can be left on freehold, fixed for five years to a purchaser.

For further particulars apply direct to E. A. Staugroom, auctioneer, Cley-by-Sea, near Holt, Norfolk.

## TENDERS WANTED.

### CHESHAM URBAN DISTRICT COUNCIL.
TENDERS FOR WORKS OF SEWERAGE AND SEWAGE DISPOSAL.

The Chesham Urban District Council hereby invite Tenders for the following works:—

CONTRACT No. 1.

The Construction of New Outfall Works, including Precipitation and Sludge Tanks, Cast-Iron Distributing Mains, and the Laying Out of Additional Land for Sewage Disposal Purposes, at the Sewage Farm, Latimer-road, situate within the Urban District of Chesham and the Rural District of Amersham.

CONTRACT No. 2.

The Reconstruction, with 9-in. Cast-Iron Pipes, of the Existing Stoneware Pipe Sewers in Sunnyside and Higham roads, and the Construction of a New Cast-Iron Sewer in Fullers Hill, all situate within the Urban District of Chesham.

Plans, Sections and Specification may be seen, and Forms of Tender obtained, upon application to the undersigned any morning between 9.30 and 10.30.

The persons whose Tenders are accepted will be required to enter into a contract, and bond in an approved guarantee society, as surety for the due performance of the contract, a copy of which may be seen at the office of W. J. Standring, Esq., Clerk to the Council, High-street, Chesham.

Tenders, duly sealed and endorsed "Contract No. 1, Tender for Sewage Disposal Works," or "Contract No. 2, Tender for Reconstruction of Sewers," as the case may be, to be delivered to me not later than Noon on Saturday, June 8, 1912.

The Council does not bind itself to accept the lowest or any Tender.

PERCY C. DORMER,
Engineer to the Council.

Urban District Council Offices,
Chesham, Bucks.
May 3, 1912.

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THE BLYTH URBAN DISTRICT COUNCIL invite Tenders for the Construction of Wharton-street at Newsham (36 feet wide and 370 yards in length, and Princess Louise-road (40 feet wide and 600 yards in length); also for the Construction of about 928 lineal yards of 36-inch diameter Concrete Pipe Culvert, and for about 1,020 lineal yards of 30-inch, 24-inch and 9-inch diameter Sanitary Pipe Sewers, and other works in connection therewith, all within their district.

Plans, Sections and Specification may be seen, and Form of Tender obtained, at the offices of the undersigned, Seaforth-street, Blyth.

Tenders, endorsed "Tender for Streets and Sewers," must be delivered not later than 4 p.m. on Thursday, 6th June, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

ROBERT GRIEVES,
Surveyor to the Council.

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### ASHTON-UNDER-LYNE, STALYBRIDGE AND DUKINFIELD (DISTRICT) WATERWORKS.

ANNUAL CONTRACTS.

CAST-IRON PIPES AND SPECIAL CASTINGS.

The Joint Committee invite Tenders for the Supplying of the necessary Cast-iron Pipes and Special Castings, together with all Bolts, Nuts, Washers, &c., required during the ensuing twelve months.

Copy of Specification, Condition of Contract, and Form of Tender can be obtained at the Offices of the Water Engineer.

Sealed Tenders, endorsed "Tenders for Cast-iron Pipes, 1912-1913," must be addressed to the Chairman, Town Hall Chambers, Ashton-under-Lyne, on or before 10 a.m. on Monday the 10th June, 1912.

The Joint Committee do not bind themselves to accept the lowest or any Tender.

FRED. J. DIXON, ASSOC.M.INST.C.E.,
Water Engineer.

Engineer's Office,
Town Hall Chambers,
Ashton-under-Lyne.

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### COUNTY BOROUGH OF WEST HAM.
TO CONTRACTORS.

The Council hereby invite Tenders for the following Works:—

(1) Building of Extension to Electricity Generating Station, Quadrant-street, Canning Town.

(2) Coal Bunkers (Steelwork) in connection therewith.

Plans may be seen, and Forms of Tender, Specifications, and further particulars obtained, at the office of Mr. John G. Morley, Borough Engineer, Town Hall, West Ham, E., upon payment of a deposit of One Pound in respect of each Form of Tender, which deposit will be returned upon receipt of a *bonâ-fide* Tender.

NOTE.—No Tender will be considered unless the same is delivered at the Office of the Town Clerk, Town Hall, West Ham, E., in the envelope supplied, by registered post, not later than 12 o'clock noon on Tuesday, 4th June, 1912.

The Council do not bind themselves to accept the lowest or any Tender. The Contractor will be required to enter into a bond, with one surety, for the due performance of the contract, and no work will be ordered under the contract until such bond has been duly executed.

The Contractor whose Tender is accepted, and with whom a Contract is entered into, will be required to pay the whole of his workmen such rate of wages, and observe such hours of labour, as are recognised by the Workmen's Trade Unions, and shall not assign, nor underlet, or make a sub-contract with any person or persons for the execution of any part of such work. In the event of any breach of such agreement the Council will enforce the penalty clause in its entirety.

(By order of the Council)
FRED. E. HILLEARY,
Town Clerk.

Town Hall,
West Ham, E.
May 10, 1912.

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### BOROUGH OF EALING.
PRIVATE STREET IMPROVEMENTS.

The Town Council of this Borough hereby invites Tenders for the Making Up of the following:—

Pitshanger-lane (from Prince's-gardens to Woodfield-road).

The Drawings and Specifications may be seen, and Form of Tender, together with Schedule of Quantities and other particulars, obtained from Mr. Charles Jones, M.INST.C.E., Borough Engineer, Town Hall, Ealing, W., any day during office hours, upon payment of a deposit of 10s. 6d., which will be returned upon receipt of a *bonâ-fide* Tender.

Sealed Tenders, in the envelopes provided, endorsed "Tender for Making Up ," must be delivered at my office not later than 9.30 a.m. on Tuesday, the 4th day of June, 1912.

The Council does not bind itself to accept the lowest or any Tender.

Dated this 17th day of May, 1912.

(By order of the Council)
GEO. E. BRYDGES,
Town Clerk.

Town Clerk's Office,
Town Hall, Ealing, W.

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### ESSEX COUNTY COUNCIL.

HIGHWAYS COMMITTEE.

ST STEPHEN'S BRIDGE, COGGESHALL.

Tenders are invited from Contractors for the Execution of the necessary works involved in Widening the above Bridge over the river Blackwater at Coggeshall.

Drawings and Specification may be seen at the County Surveyor's Office, Chelmsford, on and after Monday, the 20th inst.

Sealed Tenders are to be delivered not later than Wednesday, the 29th inst., at 12 noon.

The lowest or any Tender not necessarily accepted.

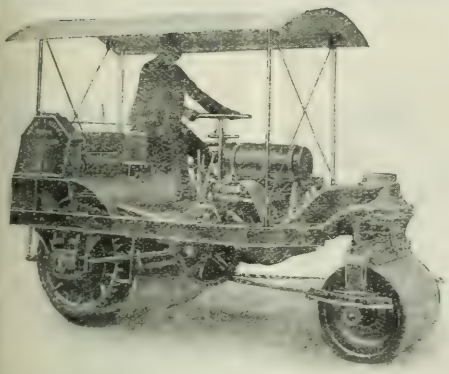
PERCY J. SHELDON, M.INST.C.E.,
County Surveyor.

County Surveyor's Office,
Chelmsford.
May 16, 1912.

BARFORD & PERKINS'

Patent Water Ballast

# MOTOR ROLLERS



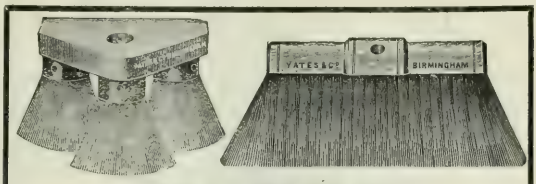
**Latest Pattern for Tarmacadam and all kinds of Street and Road Work.**

**Petrol or Paraffin. 3 to 10 tons in weight.**

*In Regular Use by—*

H.M. Government (several); The India Office; The County Council of Northumberland; The West Lancashire R.D.C.; The Corporations of Westminster, Hornsey, Southport, Beverley, Croydon, West Bromwich, Hull, &c.; The Willesden and Llandudno U.D.C.; The Shepherd's Bush Exhibition (three), &c. &c.

FULL PARTICULARS FROM THE WORKS AT **PETERBOROUGH.**

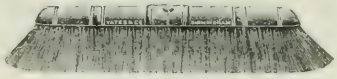



JOHN **YATES** & CO., Ltd.,

**Aston Manor, BIRMINGHAM.**

TELEGRAMS: "Yatonian, Birmingham."
TELEPHONES: Birmingham East 400, 401 & 402
(Private Branch Exchange.)

Est. 1804.

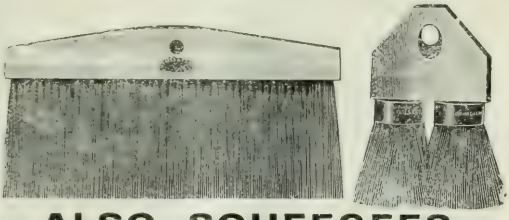


Est. 1804.

ALL KINDS OF **BROOMS** BOTH FOR

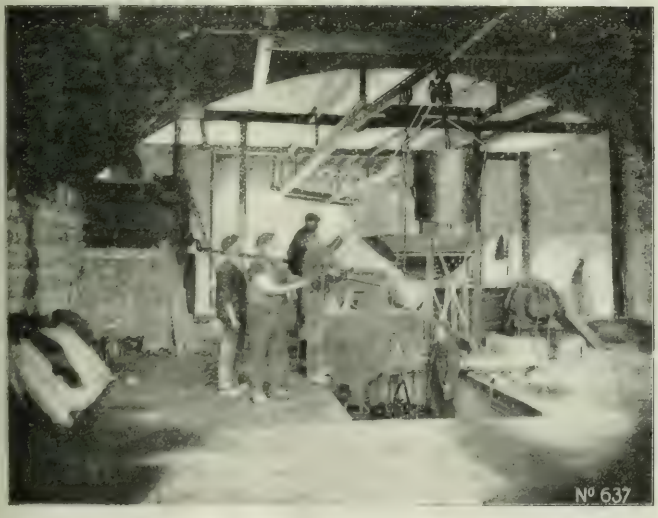
**TAR & SCAVE WORK**

**BASS, HAIR and WIRE.**



**ALSO SQUEEGEES.**

# RANSOME TAR-MACADAM MIXERS




Photograph of Machine in use, supplied to the SOUTHPORT CORPORATION.

PERFECT MIXING WITH ANY SIZED MATERIAL.

*All particulars from*

**RANSOME-verMEHR MACHINERY COMPANY, Ltd.,**

TELEGRAMS: "VERMEHRICO, LONDON."

**509 Caxton House, LONDON, S.W.**

TELEPHONE: 2188 VICTORIA.

THE RURAL DISTRICT COUNCIL OF GODSTONE.

HIGHWAYS AND BRIDGES DEPARTMENT.

The above Council are desirous of receiving Tenders for the following:—

1. Supply of Broken Granite, Kentish Ragstone, Chichester Gravel and Chippings.
2. Supply of Tar-Macadam and Supply and Consolidation of Tar-Macadam.
3. Supply of Kerb and Channelling.
4. Hire of Steam Rollers.

Forms of application can be obtained after the 18th instant from the undersigned upon the receipt of a stamped and addressed foolscap envelope.

Tenders must be sealed and endorsed "Tender, Highways," and must be delivered to me not later than 12 noon on Wednesday, the 29th day of May, 1912.

The Council will not bind themselves to accept the lowest or any Tender.

GEO. E. CROWTER,
Engineer and Surveyor.

High-street,
Godstone,
Surrey.
May 12, 1912.

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BRIDGWATER RURAL DISTRICT COUNCIL.

WATER SUPPLY.

CONTRACT No. 1.

The Bridgwater Rural District Council are prepared to receive Tenders for the Laying of 11,788 yds., or thereabouts, of Cast-iron Pipes, 3 in. in diameter, and other works appertaining thereto, in accordance with the Drawings, Specifications and Instructions of their Engineer, Mr. W. Alexr. Collins, 56A Eastover, Bridgwater.

Drawings may be seen, and copies of the Specification and Bill of Quantities obtained, at the Rural District Council Offices in Bridgwater on and after the 15th inst., and on payment of Two Guineas, to be returned on the receipt of a *bonâ-fide* Tender.

Sealed Tenders, addressed to me, and endorsed "Tender for Water Supply Works," are to be delivered, by post or otherwise, at the Rural District Council Offices in Bridgwater on or before Monday, May 27th, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(Signed) T. M. REED,
Solicitor and Clerk to the above Council.

Bridgwater.
May, 1912.

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BRIDGWATER RURAL DISTRICT COUNCIL.

WATER SUPPLY.

CONTRACT No. 2.

The Bridgwater Rural District Council are prepared to receive Tenders for about 210 tons of 3-in. Cast-iron Pipes and other Castings, to be made in accordance with the Specification of their Engineer, Mr. W. Alexr. Collins, 56A Eastover, Bridgwater.

Persons desirous of tendering may obtain a copy of the Specification by application to me, at the Rural District Council Offices in Bridgwater, on and after the 15th inst., and on payment of Two Guineas, to be returned within a fortnight of the receipt of a *bonâ-fide* Tender.

Sealed Tenders, addressed to me, and endorsed "Tender for Cast-iron Pipes," are to be delivered, by post or otherwise, at the Rural District Council Offices in Bridgwater at or before noon of Monday, May 27th, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(Signed) T. M. REED,
Solicitor and Clerk to the above Council.

Bridgwater.
May, 1912.

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# TECHNICAL EXAMINATIONS.

The test of any course of Preparation is by

## RESULTS.

At the recent examinations of the Institution of Civil Engineers, and the Surveyors' Institution, the two Chief Prizes were obtained by

## Mr. G. P. KNOWLES' PUPILS

In addition to the usual percentage of successes, his pupils obtained the

**BAYLISS PRIZE** at A.M.Inst.C.E., February, 1912.

**PENFOLD GOLD MEDAL** at F.S.I., March, 1912.

These were for first places in the respective examinations.

Preparation for the next Examinations may be commenced at any time.

*For all information call upon, or write to:—*

**G. P. KNOWLES**, B.Sc., A.M.Inst.C.E., F.S.I., M.R.San.I, &c.,
**39 Victoria Street, WESTMINSTER, S.W.**

TELEPHONE 1402 VICTORIA.

# The Surveyor

And Municipal and County Engineer.

Vol. XLI. MAY 31, 1912. No. 1,063.

## Minutes of Proceedings.

**Portland Cement as a Road Binder.**

In our issue of last week, p. 759, we referred briefly to the use of Portland cement in the manner described by Mr. Ralph Oakden, junr., surveyor to the Newark Rural District Council. We hope to obtain further particulars as to the way in which the cement was applied, merely noting in the meantime that the quantity used per square yard was quite small, precluding the idea that what was aimed at was the production of a kind of concrete crust. Apart from such a use of Portland cement—which is not favoured in this country and has many serious disadvantages—it seems that the material might be used to give temporary firmness to a top layer, so that it would resist ravelling under the stiff brushing desirable as a preparation for tarring; or it might be employed as a sealing coat to last through a dry spell in spring before tarring is done. As regards the former of these possibilities it would, of course, be undesirable to stiffen a freshly rolled coating before it had settled under traffic. Suppose, however, that a coating of stone which was rolled in in the winter has settled well, but is a little out of shape and a little inclined to ravel in March or early April. If it be now rolled when plastic after heavy rain, and then, when dry, thoroughly brushed, it may be worth while to grout it with a binder of high tenacity, assuming, of course, that the crust is sufficiently porous to admit of the effective entrance of the grout. In that case Portland cement might be a suitable binder. A small quantity of it would do no harm if prolonged wet weather rendered it ineffective, and if the weather remained dry until tarring took place it might serve a useful purpose in keeping the upper layer of stones steady. We are deliberately making out a case for the use of Portland cement with the idea that some of our readers may be in possession of facts which will lead them to find our arguments more convincing than they are to ourselves. It is understood that after the grouting a blinding or sealing coat would be applied, consisting of a material which would be removed by the traffic, or by brushing, before the road was tarred.

As regards the use of cement as a sealing coat, the procedure would, one may assume, be to brush the road first in the dry lightly, and then to brush in a mortar of cement and sand, working it in with the roller. This seal might prevent the road from ravelling during a spring drought, and before tarring, and by the time the tarring was done the sealing material would be beaten into powder, except in so far as it might have penetrated between the stones. The road could then be brushed and tarred in the usual way.

There is an important principle which is against the use of cement as the main binder in a road crust. This is that a binder, to be successful, must be capable of passing through phases of temporary weakness in order that the crust may reform itself, or be reformed at small cost, under the influences of traffic, of diurnal or weather changes, or of small, constant repair, including light rolling. In the case of water-bound crusts, wetness and the subsequent plastic state allow of reformation of the crust as a whole, or of its upper layers, while droughts followed by heavy rain tend to keep down humps, fill up hollows, and, under favourable conditions, to transfer some of the detritus into the body of the crust. In the case of a crust with a tar binder or a tar film, occasional high temperatures lead to the re-establishment of lost cohesion, and frequent softening of the surface, followed by gradual re-hardening, allows of the rolling out of dents, wheel marks, and small injuries to the surface. If, however, we provide a binder such as a cement which, having once set, will not allow of the re-establishment of broken bond, we can only look upon the later phases of its existence as those of an inert binder, useful as a dead binder, but definitely not a live binder. A lime mortar, on the other hand, does not lose the property of re-setting for a long time. Mortar from an old brick wall will sometimes set to an extent which is quite useful in making paths and, it may be presumed, road crusts.

But in spite of what we know about the behaviour of lime compounds in road crusts, little attention has been given to the use, or possible use, of lime as a road binder. We find, however, in "The King's Highway" (Ryves) the following sentence: "Probably lime as an ingredient of the road crust—of more than one type—has not been sufficiently studied." What is referred to here is lime itself, not merely lime compounds. While

these opening pages of The Surveyor are, from time to time, used for the expression of definite opinions upon matters of highway engineering when the data is sufficient, the present occasion is rather one on which we are inviting our readers to share our thoughts on the subject suggested by Mr. Oakden's report. We have to remember the importance of bulk in a road crust, and the small bulk of Portland cement in proportion to its strength and its cost. We have also to remember that Portland cement has neither chemically nor physically the property of re-setting for more than a short period or to a very limited extent. But we have to consider the possible valuable effects of this material during a short life coinciding with an important period in the life of a road crust.

* * *

**American Sewerage Statistics.**

*Engineering and Contracting* contains some very important statistics given in a report on sewers and sewage disposal issued by the Bureau of the Census of the United States. The figures relate to cities having populations of over 30,000. The mileage of sewers is given, for 157 cities, exclusive of house and road-gulley connections, as 25,011·2 miles. Of these 18,361·5 miles were designed to take both domestic sewage and storm water, and 5,258·3 miles for domestic sewage only, and 211·4 miles for storm water only. There are 129·9 miles of stone sewer, 6,295·4 miles of brick sewer, 220·5 miles of brick and concrete sewer, 96·2 miles of brick and stone sewer, 217·6 miles of concrete sewer, 101·1 miles of reinforced concrete sewer, 16,844·0 miles of vitrified pipe, 864·3 miles of cement pipe, and 241·1 miles of sewers constructed of other material. The average cost of sewer service per 1,000 persons served was £60 12s. 1d., but individual cities show large variations from these figures; for instance, the cost of sewer service at Newton, Massachusetts, is £282 per 1,000 persons. Of course, the cost of the working depends very largely upon the necessity for pumping or for purifying the sewage. The average cost of maintenance and operation per mile of sewer is £50 18s. 2d., while in Baltimore this cost is £244 12s. 6d. This certainly is a very high figure.

It appears that practically all the cities flush their sewers. Nearly all flush part of their system by means of hose attached to fire hydrants, but 65 cities use automatic flushing tanks and 14 have portable flushing tanks. Some cities do all their sewer cleaning by means of flushing, some cities reported absolutely no cleaning of sewers, and other cities clean their sewers with jointed rods. The cost of cleaning sewers per mile where reported varied from 9s. 4½d. for Salt Lake City to £84 14s. at Chicago. The average daily discharge of sewage per head is estimated at 164 gallons. This figure includes a large volume of storm water, trade wastes, and water used for sewer flushing. As an example of the volume of the trade waste, two-thirds of the Paterson sewage comes from factories. It is estimated that for many cities the daily discharge of domestic sewage does not exceed 75 gallons per head, and it is pointed out that for most English towns this figure is about 25 gallons per head, while in London it is 34 gallons. Also that for Edinburgh the combined estimate of sewage and rainfall was taken to be 42 gallons per head when the new system of sewers was constructed. From this it is argued that there is much freer use of water for domestic purposes in the United States than in Great Britain, and we would add much greater waste of water, which is undoubtedly among the reasons why the supply of water per head is so great in America. It is strange to note that only nineteen cities reported purification of any portion of their sewage, and of these only eight purified more than 20 per cent of the total flow. Of the nineteen cities, four had chemical precipitation works, six used septic tanks, and five used settling tanks. Ten of these cities used sand filter-beds, two used sprinkling filters, and four used contact beds. The cost per 1,000,000 gallons of sewage treated on sand filters varied from 7s. 1½d. at Altoona, Pennsylvania, to £24 19s. for Pawtucket, Rhode Island.

It cannot be said that these figures do more than show the enormous variation in the cost of work under different conditions. They bring home the fact that estimates based on average prices are of little value, and that sewerage and sewage disposal work requires special treatment at every place. Conditions must always differ, and the fact that such work should always be designed, constructed and managed by engineers who are qualified by long experience in sewerage work is once again forcibly demonstrated.

* * *

**The Chief Cause of Typhoid.**

"The law still holds that the prevalence of typhoid fever is a measure of the purity of the water." This statement is made in the March Bulletin of the New York State Department of Health, dealing with the relation between the typhoid death-rates in forty-nine New York cities and their water supplies. This bulletin gives the average typhoid death-rate for the years 1900 to 1909, and also the total deaths from typhoid and the corresponding rates for 1910 and 1911. Details as to the character of the supplies are given in many cases, with information as to their sources. This bulletin follows upon a table presented by the department some time ago, showing the deaths from typhoid fever during the ten years from 1897 to 1907.

A summary of the death-rates taken from the March Bulletin is given in the *Engineering News* of May 9th, and this shows that the deaths from typhoid have certainly decreased during the last two or three years. The average number of deaths from typhoid fever in those districts where unfiltered water from streams and reservoirs is used was 26 per 100,000 in the years 1900-09, and this fell to 10 in 1911; these were supplies from relatively small streams, generally if not always impounded in reservoirs, and thus having more or less benefit from storage. New York City is also included in this list, the supply of which is derived partly from wells and also partly from filtered surface water. Those cities using unfiltered lake water had, in 1900-09, an average typhoid death-rate of 26 (which was reduced in 1911 to 18·6). Seven cities whose supply consisted of filtered water from streams and reservoirs reduced their typhoid death-rate to 23·0 in 1911, whereas in 1900-09 the average figure was 27. A death-rate of 32 in 1900-09 was brought down to 25·0 in 1911 by cities using well or spring water, and in those using filtered river water the death-rate fell from an average of 37 in 1900-09 to 25·0 in 1911. The only instance of a rise in the rate was in those cities dependent upon unfiltered river water for their supply, where the average was 56 in 1900-09, and increased to 64·0 in 1911. No statement appears to be made in the summary as to any improvements in the water supply which would account for the decrease in the death-rate, but it is evident that an improvement has taken place since 1909, even if this is only due to precautions taken by individuals and not to any movement on the part of the authorities.

The bulletin clearly states that the water supplies are "the chief cause of typhoid." The death-rate for 1911 for those cities using unfiltered river water is 64·0, while that for the cities deriving their supply from filtered river water is 25·0. In the previous report of the department conclusive evidence was given as to the effect of improved conditions of water supply upon the typhoid death-rate. In one case, after the installation of sand filters, the rate dropped from 88·8 to 23·7 per

100,000. Looking at these results alone, it is clear that the conditions of the water supply exercise an enormous influence over the typhoid death-rate, and that the better the source and method of treatment of the supply the lower will be the number of deaths from typhoid.

* * *

**The Cost of Filtration.**

Mr. J. Winthrop Pratt, chief engineer of the Cleveland Board of Health, has presented to the Cleveland Engineering Society a paper on the subject of water filtration, which is dealt with in *Municipal Engineering*. The author states that the cost of installing filter plants may range from about $10,000 to $40,000 or more per 1,000,000 gallons capacity, say from £2,100 to £4,200, the pumping plant required, the size of the filters, the character of the raw water and other local conditions affecting the cost in each case. Figures are given relating to eleven filter plants in Ohio, the cost per 1,000,000 gallons being £10,381 at Cincinnati, £5,416 at Dennison, £2,083 at Elyria, £2,500 at Lorain, £2,708 at Geneva, £2,083 at Marietta, £2,916 at Rocky River, £3,125 at Upper Sandusky, £1,666 at Vermilion, £2,708 at Warren and £2,708 at Youngstown. The average cost per 1,000,000 gallons capacity is therefore £3,541, or, excluding Cincinnati, £2,708. The average cost per head for the installation of filters, excluding Cincinnati, was found to be about 5s. 3d.

The author states that slow sand filters are generally more costly to build than mechanical filters, but are cheaper to operate. It should be observed that this is in agreement with what is stated in a report recently issued in relation to the Edinburgh waterworks, in which the cost of sand filtration is found to be 20s. per 1,000,000 gallons and the cost of mechanical filtration 23s. 9d.

Muddy waters are the most expensive to treat; special treatment may be needed to remove colour or odour, and water softening may increase the cost two or three times. Filtered water may be obtained generally at a cost of £2 1s. 8d. per 1,000,000 gallons, a figure also adopted by Mr. Charles B. Burdick in a paper on "The Value of Pure Water," read before the Indiana Sanitary and Water Supply Association. This cost includes interest and depreciation, but the figure may vary from £1 0s. 10d. to £4 3s. 4d. The chief working cost with sand filters is the washing of the sand. With mechanical filters the cost of chemicals and labour are about equal. The author draws special attention to the fact that in considering the cost of maintaining the plant there is comparatively small increase in the cost of supplying filtered water over that of supplying unfiltered water. The increase is rarely more than from 25 to 30 per cent, and is frequently only 10 or 15 per cent. In any case, the increase should not be more than from 2s. 1d. to 8s. 2d. per head per year. It should be noted that Mr. Burdick, in his paper on "The Value of Pure Water," reckons the total cost of filtration at about 1s. 6d. per head per year. It is evident that there is and must be a wide difference in the cost of filtration per head at different places, but taking the highest figures the price is a very small one to pay in proportion to the benefits received.

* * *

**Sterilisation by Ultra-Violet Rays: City Installations in France.**

It is stated in *The Engineering Record* of New York that two of the largest French cities are installing water purification plants, utilising the bactericidal powers of the ultra-violet rays for the purpose. A considerable amount of experimental work giving good results has been done with the ultra-violet rays, and the results of works carried out on a commercial scale will be looked for with considerable interest. In these new French installations the quartz mercury lamp will be used without any glass enclosure, so that the water will be exposed at short range. At the average distance of a few inches from the lamp all bacterial life is destroyed almost instantaneously.

The bad reputation which the water in French towns has had in the past has led to considerable activity among municipal and other water authorities. The same thing is apparent in America and elsewhere. The result is that the work of ultimate purification has been worked out with the greatest care, and if one would study the latest methods one must do so abroad. However, in the face of the facts that many of our own supplies are capable of improvement, and that even for London Dr. Houston's recent reports demonstrated that further purification is a matter calling for immediate attention, it would be well if the newer methods received more attention. It is therefore to be hoped that the method adopted in France will receive a trial in this country, while it is equally to be hoped that the methods which have found general acceptance in the United States and Canada will also receive a more serious trial than has yet been given. It is not right to ignore progress made in water purification, as all are vitally interested in obtaining the most simple and effective process possible for this purpose.

* * *

**Misguided Litigation.**

We cannot congratulate the Kingston (Surrey) Corporation—and we imagine the ratepayers will share our views—on their resorting to litigation in the side-issue of the Gloucester-road apportionment case which was decided at the County Court last week. The corporation resolved to make up the road under the Private Street Works Act, 1892, and the frontagers objected on the ground that it was a highway repairable by the inhabitants at large. The justices for the borough decided in their favour, and their decision was confirmed on appeal to the Divisional Court. The corporation then took steps to go to the Court of Appeal, but in the meantime negotiations with a view to compromise resulted in the frontagers agreeing to pay at the rate of 7s. 10d. a foot in respect of their properties, and in due course paying this cost into a bank in the joint names of the borough treasurer and a representative of themselves. By the time the corporation had executed the work this cost, totalling to £1,553, had earned as a deposit £37 12s. 4d. by way of interest. It was this latter small amount that the corporation "went for," litigiously and rather graspingly, though to the plain man it would appear rather obvious that it belonged to the frontagers. So Judge Harrington held, crystallising the obvious by pointing out that "it was not contemplated by the contracting parties that any sum over and above the amount set forth in the schedule should be payable by the frontagers."

* * *

**Mutual Aid Security of Tenure.**

Time did not last week permit us to draw special attention to the letter from Mr. H. T. Wakelam, the county surveyor of Middlesex, which appeared on p. 767 of the issue of May 24th. Provided Mr. Wakelam received sufficient evidence of support, he is willing to take the trouble and responsibility of forming an advisory committee of engineers and surveyors with a view to formulation, for consideration by the Institution of Municipal and County Engineers, of a scheme for mutual aid and protection in particular and for the eventual obtaining of security of tenure of office. As Mr. Wakelam points out, there are many instances of need which the Institution have not funds to meet, and if something could be done to meet these promptly if only partially—it would surely be a great boon. Donations from sympathisers will be necessary to start the movement, and we trust they will be generously forwarded to Mr. Wakelam, together with encouraging offers of personal service where possible. If we are eligible we should be glad to be among the first of those to help so good a cause.

# The Joint Scheme of Sewerage of Thornton-le-Fylde, Bispham-with-Norbreck, and Carleton.*

By ARTHUR HINDLE, M.INST.C.E.

During the years 1895, 1896, and 1897 a great revival in the building trade was experienced in the well-known seaside resort of Blackpool, the number of houses erected in the borough in these three years being respectively 531, 744, 884. One natural effect of this "boom" was the large demand for land for building purposes, not only in the borough, but in the adjacent rural districts of Thornton and Bispham, as a consequence of which the local sanitary authority (the Fylde Rural District Council) were called upon to consider the best means of providing adequate and efficient means of sewerage and sewage disposal to meet the growing needs of these areas.

The fact that Thornton, Bispham, and Carleton are adjacent townships and practically in one watershed led the district council to the opinion that a comprehensive scheme for the three townships would be worthy of consideration, and after discussing various proposals eventually adopted the one submitted by the author in 1899, who was instructed to proceed with the preparation of the requisite plans and information to enable the council to obtain the approval of the Local Government Board thereto.

When the scheme for draining these districts was adopted by the Fylde Rural District Council no system of sewerage was in existence, excepting at Bispham, where there was a short length of sewer in the main road, which discharged into a primitive settling tank and thence on to a small area of land.

The plans and estimates for the scheme having been forwarded to the Local Government Board, an inquiry was held in March, 1901, at which there was some opposition, mainly on the question of the sea outfall. The Local Government Board subsequently directed that a comprehensive series of float tests should be taken to determine the ultimate destination of the sewage, which it was proposed to discharge into the Irish Sea, at dead low water, almost opposite Cleveleys Hydro in the Bispham township. These tests were conducted under the personal supervision of the author in 1901, and extended over a period of three months; much useful information as to the tidal currents on this coast was thereby obtained and recorded on charts and maps, a copy of which was forwarded to the Local Government Board, who subsequently expressed their approval to the proposed scheme, and sanctioned the borrowing of a loan to execute the work. In the meantime Thornton and Bispham had each been formed into separate urban district councils. In 1902 a joint committee was formed by agreement with the approval of the Local Government Board, the parties thereto being the Thornton Urban District Council, the Bispham Urban District Council, and the Fylde Rural District Council (representing Carleton), for the execution of the scheme.

Subsequently working drawings of the scheme were prepared, tenders for the work were from time to time invited, the first contract (for the construction of the outfall sewer and contingent works) being let in December, 1902. The first pile was driven by the chairman of the joint committee, Mr. J. Crabtree, on January 21st, 1903.

The population provided for in the scheme was: Thornton, 6,000; Bispham, 5,000; Carleton, 1,000; total 12,000; thus allowing for a future increase of double the population at the 1901 census. The dry-weather flow was assumed to be 300,000 gallons per day. The scheme was designed to exclude storm and surface water, and to deal only with the dry-weather flow, plus rain water, from yards of houses and the back roofs. No storm overflows could not be provided; this condition was deemed necessary to obviate constructing sewers of large capacities, and also to minimise the provision of storage capacity of the outfall storage culvert, as well as to save the cost of pumping. Beyond the Ammonia Soda Works of the United Alkali Company at Thornton there are no works or manufactories, so that the problem of dealing with trade waste does not here apply. The Blackpool and Fleetwood tramroad runs through the districts of Thornton and Bispham, the generating station being situate in Bispham.

* From a paper read at a sessional meeting of the Royal Sanitary Institute held at Blackpool on Friday last.

### DESCRIPTION OF OUTFALL.

The outfall works commence in the Fleetwood-road at Anchorsholme, Bispham, at which point the main sewers from Bispham and Thornton unite. The works comprise: (*a*) storage culvert, (*b*) valve chambers, (*c*) cast-iron pipe outfall sewer.

The storage culvert is about 300 yards long, built of engineering brickwork and surrounded with concrete, the internal dimensions being 5 ft. by 3 ft. 4 in. (the invert is designed of a section to carry the normal flow), and so arranged as to permit of its being duplicated.

At the sea end of the storage culvert is a valve chamber built in two sections, the outer one containing a tidal flap valve and the inner a sluice valve, the latter to be available in case the tidal flap valve should fail to operate.

The sewage discharges both on the flood and ebb tides, and commences and ceases at about Ordnance datum, or mean sea level. From the valve chamber last referred to a line of 24-in. cast-iron pipes extends under the foreshore to a point below dead low water of a spring tide, the last 75 feet of the outfall sewer being constructed of wrought-iron tubing in three lengths, each of 25 ft. with flanged ends; the three lengths were bolted together on shore, floated into position and secured to guide piles which had been previously driven. This method of construction was adopted to ensure the end of the outfall being, as far as one could reasonably foresee, in permanent low water, but those acquainted with the vagaries of this shore will know its liability to change.

So far as the author is aware no complaints have been received by the local authority as to any nuisance arising by reason of the untreated sewage discharging from this outfall.

The range of a spring tide is 27½ ft., and it is no unusual occurrence for the ebb of a spring tide to extend over half a mile from high-water mark. Where depressions in the foreshore or other local circumstances demanded, the cast-iron outfall sewer was carried on piles and secured thereto by straps. During the construction of the storage culvert, springs and large quantities of subsoil water were encountered. These became such a source of difficulty to deal with that the author decided to collect the principal springs by conveying them in cast-iron pipes to a corner of the valve chamber (before referred to), and inserting a vertical pipe, in which the spring waters were allowed to rise and fall.

### THORNTON SEWERAGE.

Having regard to the flat and extensive nature of the district, it was decided to lift the sewage at two points by Shone ejectors, worked by compressed air from a central station, this system being decided upon as readily lending itself to extensions, which it was felt were bound to take place in such a rapidly growing district.

Main and subsidiary sewers of cast iron and stoneware, varying in diameter from 21 in. to 9 in., have been laid over the whole area (with the exception of Little Thornton), and extend from the outfall storage culvert to and along the main road at Cleveleys, thence to and past Thornton railway station, and branching north and south to deal with various building estates, which are now being developed. They are provided with manholes at every change of direction and inclination. Lamp-holes have not been constructed.

### EJECTORS.

Ejector stations have been constructed at Four Lane Ends and at Sandyforth Bank, the former being provided with ejector in duplicate, each capable of lifting 500 gallons per minute, fitted with alternating gear, so that whilst one ejector is discharging the other is filling. The ejector station at Sandyforth Bank is provided with two ejectors, each of 100 gallons, and also fitted with alternating gear. The chambers are built of brickwork surrounded with concrete, and provided with ready means of access.

Provision was made for an air lift to deal with the small quantity of water which was found to accumulate in the chambers.

One little difficulty was experienced in the silencing of the exhaust from the ejectors, and about which complaints were received from drivers of vehicles, who stated that the noise of the exhaust when the ejectors were discharging startled the horses, although the exhaust discharged through a vertical shaft erected at a height of about 35 ft. above the ground. The author, after consideration, laid the exhaust from the ejectors through enlarged pipes before reaching the base of the vertical shaft, and this appeared to remove any cause of complaint that had previously existed. It was originally intended to use cast-iron segmental tubing for the ejector chambers, but the weather was so favourable at the time of executing this branch of the work that it was decided to adopt the less expensive method of brickwork and concrete.

AIR-COMPRESSING STATION.

The power house is situate at a convenient position fronting the main highway leading from Blackpool to Fleetwood. The installation comprises engine house with engines and air compressors in duplicate, boiler house with two Lancashire boilers, chimney shaft, and working engineer's cottage. Each compressor is provided with steam cylinders 9 in. diameter, and stroke of both 14 in. Each is capable of drawing in and compressing 270 cubic feet of air per minute to 9 lb. per square inch above atmosphere at a normal speed of 126 revolutions per minute. The compressors are designed to be capable of running up to 180 revolutions per minute. The air receiver is of wrought steel, and is fitted with gauge, drain cocks, valves, &c.

Two Worthington feed pumps and feed water heater are provided in suitable positions, and a reserve tank of water is placed under the engine-house floor capable of holding two days' supply of water in case of failure of the public supply. The compressor valves of air cylinders are of Hughes' patent Corliss type, and contain many important features combining simplicity with efficiency. Sight feed lubricators are provided. The compressors are arranged in duplicate, and as a rule both are kept working so as to ensure their being in condition but they can be readily disconnected. The steam cylinders are constructed for a working pressure of 80 lb. per square inch, and capable of running compressors at the specified speed when compressors are compressing air to 9 lb. per square inch.

The boilers are in duplicate, supplied and erected by Galloways, Limited, Manchester, and are provided with the usual mountings, feed valves, safety valves, dampers, blow-off taps, gauges, &c. They are each 14 ft. long by 5 ft. 6 in. diameter, of ⅝-in. lap-jointed, double-welded steel plates, and fitted with Galloway's patent flues. The two furnaces to each boiler are 2 ft. 1¼ in. diameter. The air mains, varying in diameter from 2½ in. to 5 in., were provided and laid by the makers and erectors of the air-compressing plant.

Originally it was intended that the ejectors at Sandyforth Bank and Four Lane Ends should each discharge through a separate rising main into the main outfall gravitating sewer in Victoria-road, but, having regard to the fact that the scheme was designed on the partially separate system, the author decided to lift the sewage at Sandyforth Bank into the nearest main, whence it gravitates to the Four Lane Ends ejectors, to be there again lifted, this method enabling the lifted sewage to be utilised for flushing the sewers.

The strata met with in the trenches were treacherous in character, consisting principally of alluvial deposit with "potholes" of wet and running sand. It was not difficult to handle if the weather was favourable, but, as illustrating the differing effects of wet and dry weather, the author has only to name that the length of sewer from the outfall culvert to Cleveleys Hotel (about 666 yards in length), which was done in very wet weather, necessitated close timbering the whole of the trench, and leaving every piece of timber in, at a cost of about £1,000 whereas the length in Thornton from Four Lane End, parallel to the railway station which was in similar strata and about the same length and depth, was executed with very little timbering, the whole of which was taken out after the trench was filled in.

There is an important crossing of the Lancashire and Yorkshire and London and North-Western Railway Companies' main railway and the crossing of the several streams and watercourses, but no unusual engineering difficulty was encountered.

BISPHAM.

The sewage of Bispham gravitates to the outfall culvert at Anchorsholme. The main sewer commences at the head of the storage culvert, extending along Blackpool-road to a point a little to the south of the Albion Hotel, and thence westwards along the main road to the Irish Sea.

As the sewer in the village was in places over 20 ft. deep, a 9-in. top sewer about 8 ft. deep was laid to receive the house connections, so as to avoid the necessity of sinking down to the deep main sewer to make connections. The top sewer was connected with the main at every alternate manhole by means of properly constructed drop pipes. Running sand was encountered in several places, and further difficulties were experienced in dealing with old water mains which had been laid for a great number of years, when apparently the present main highway was an old lane, judging by the tortuous manner in which the water pipes were laid.

CARLETON.

Main sewers have been laid in the Blackpool and Poulton roads, uniting at the Castle Gardens Hotel, and from there gravitating to the ejector station near the Norcross Farm. This station is provided with two ejectors, each of 150 gallons capacity, fitted with alternating gear and constructed in the manner previously described. The sewage is lifted into the rising main, which discharges into the main ejector station at Four Land Ends at Thornton.

The first length of main sewer constructed at Carleton from the ejector station in a southerly direction was in bad ground, being wet alluvial deposit overlying running sand, and resulted unfortunately in the contractor who undertook the work having to abandon it for financial reasons. The work when he left it was in such a condition that the author asked his committee to complete the section by administration, and it was at once taken in hand and completed. Apparently the state of the ground conveyed the impression that the subsoil in this district was all bad and treacherous, so that when tenders were invited for the remainder of the work they were priced accordingly; but on the work being executed by the contractor whose tender was subsequently accepted, it was found to be solid and firm ground. The work proceeded in an expeditious manner, satisfactory to the committee, and undoubtedly so to the contractor.

The power to work the Carleton ejectors is supplied by the Thornton Urban District Council from their air-compressing station, under agreement between the two councils.

The works were completed and formally handed over to the respective councils in May, 1907, the cost having been about £42,000.

The following table will show the growing population of the districts:

| | 1891. | 1901. | Population provided for in the scheme. | Census, 1911. |
|---|---|---|---|---|
| Thornton ... | 996 | 3,108 | 6,000 | 4,665 |
| Bispham ... | 407 | 985 | 5,000 | 2,244 |
| Carleton ... | 417 | 500 | 1,000 | 600 |

The works have been in successful operation since their inauguration, considerable extensions having from time to time been made by the surveyors of the three councils concerned. It has come to the author's knowledge that the storage culvert at Anchorsholme is apparently not of sufficient capacity to deal with the whole of the flow, but this condition is undoubtedly owing to the fact that storm and surface waters are not excluded as rigorously as it was intended when the sizes and capacities of the culvert and storage sewers were designed. Since the scheme was completed Thornton has under Act of Parliament constructed its own gas works, and Bispham has, under Board of Trade Order, constructed its own electric supply works.

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**Dee Navigation Improvements.**—A conference of local municipal authorities have unanimously approved the scheme for improving the navigation of the river Dee and passed the necessary resolution for the promotion. A large and representative committee has been appointed to assist the Dee Conservancy Board. It is understood that £75,000 will be required to carry out the scheme. It is expected that the Development Commissioners will make a grant of £30,000, and the remaining £45,000 will have to be raised by the authorities.

# Institution of Municipal and County Engineers.

## THE PARIS MEETING: VISITS TO WORKS.

No engineering department of municipal work of the city of Paris would seem to have been overlooked by those responsible for the organisation of the meeting of the Institution of Municipal and County Engineers which opened there on Friday of last week. Highways, sewerage and sewage disposal, waterworks, electricity, destructor and gas plants, and tramways have all come in for a share of attention at the hands of the members who attended the gathering, and in what was seen during a four-days' inspection included little from which any considerable amount of instruction was to be derived, the visit has been none the less interesting to those participating, and one that will, particularly in view of the hospitable reception of the authorities, be long remembered with feelings of deep pleasure.

Leaving Victoria on the morning of Thursday, the party reached the French capital shortly before eight o'clock in the evening, after an altogether pleasant journey by way of Newhaven and Dieppe. Bright, sunny weather gave way in the course of the afternoon to more unsettled conditions, but, from the first to the last day of the meeting, rain was fortunately conspicuous by its entire absence, allowing of a somewhat strenuous round of visits to be carried out according to the programme laid down. In the arrangement of the meeting the committee appointed by the institution had the valued assistance of a number of the chief officials of the Paris Municipality, whose keen interest in the proceedings was made evident not only at the official reception of the party, but from day to day during the inspection of the various works which were thrown open to the members.

### OPENING PROCEEDINGS.

The inaugural meeting took place on Friday morning, in the hall of the Société des Ingénieurs Civils, 19 Rue Blanche, those present including:

Mr. A. D. Greatorex, the president (West Bromwich), Sir James Lemon, Messrs. H. Percy Boulnois (Westminster), P. G. Killick (Finsbury), W. J. Dunning (Colwyn Bay), R. J. Thomas, vice-president (Bucks), W. Strickland (Ramsbury, Wilts), J. T. Landless (Burnley), F. Oscar Kirby (Doncaster), Ernest B. Martin, Julian Julian (Cambridge), Thomas A. Clare (Rotherham), A. T. Bridgewater (East Ham), F. W. Richardson, A. Hosken (Smethwick), W. H. Goodyear (Mayor of Smethwick), R. Grieves (Blyth), R. Guthrie (clerk to the Blyth U.D.C.), J. B. Wilson (Cockermouth), W. J. Steele (Newcastle-on-Tyne), K. F. Campbell (Huddersfield), Henry B. Lees (Ceylon), J. P. Spencer, John Parker (Hereford), W. H. Savage, J. W. Hipwood (Morecambe), Norman Scorgie (Hackney), H. Tremelling (Newport), F. Woodward (Stourbridge), A. H. Walker (Loughborough), H. J. Grace, C. Lund (Cleckheaton), H. T. Chapman (Somerset), J. Lobley, past president, Alderman Inman, Messrs. A. S. Richards, W. C. King, Charles S. Cole, Mrs. Killick, Mrs. Grace, Mrs. Hipwood, Mrs. Tremelling, Mrs. Woodward, Mrs. Walker, Miss Cole, and Mr. Thomas Cole (secretary).

The PRESIDENT said he should like to say at once that the arrangements for the meeting had been largely facilitated by the energetic co-operation of a committee of French engineers, who had been elected honorary members of their institution, and their thanks were due to those gentlemen for all they had done on their behalf. Mons. Bechmann, engineer of the Metropolitan Railway of Paris, who had long been connected with them, was present that morning to explain some of the works which they were to visit during their stay. He was asked to apologise for the absence of Mons. de Pontich, Directeur Administratif [illegible] of Paris, and of the other gentlemen on the committee. Mons. Bechmann, chief engineer for the maintenance, cleaning, and lighting of public streets, and Mons. Colmet Daage, chief engineer, distribution of water, sewers and canals. All of them were, of course, extremely busy men, with important duties requiring attention. He should like to take the opportunity of thanking all of those who had come to take part in that visit. The journey across had been a pleasant one, and he was sure they would thoroughly enjoy their stay in the French capital.

At the close of the President's remarks Mons. Bechmann proceeded to explain the water supply, sewerage, and tramway systems of the city.

In moving a vote of thanks, the PRESIDENT said the information supplied would enable the visitors the better to appreciate the works they were about to see.

Mr. H. PERCY BOULNOIS, in seconding the vote of thanks, referred to the existence of separate supplies of water for drinking and other purposes, and inquired whether it was not possible for mistakes to arise by the confusion of the two services. One would like to know what precautions were taken to prevent this occurring, and whether outbreaks of typhoid fever could be traced to this cause.

The vote of thanks was accorded with acclamation, and Mons. BECHMANN, in acknowledging the compliment, explained, in answer to Mr. Boulnois's question, that it was impossible for what he had suggested to happen. The drinking water supply was, necessarily, a high-pressure one, in order to permit of the highest buildings in Paris being served. The other supply was mainly employed for road purposes, and, by reason of its low pressure, could not reach the levels of the domestic supply. Moreover, the pipes of the two services were quite separate and distinct.

Mr. BOULNOIS asked whether it would not be possible for a domestic to make use of the wrong water, but Mons. BECHMANN stated that the whole of the domestic supply—including that used for baths—came from one source. Different coloured pipes were, however, used in large buildings where baths were supplied from the street water mains.

On the proposition of Mr. R. J. THOMAS, a hearty vote of thanks was afterwards passed to the Société des Ingénieurs Civils for allowing the use of their hall for the purposes of the meeting, and for the several other facilities which they had granted.

### OFFICIAL RECEPTION.

Following luncheon, the members were taken to the Hotel de Ville, in one of the magnificent salons of which a most cordial welcome was extended to them by the deputy prefect, the deputy president of the Municipal Council, and a representative of the Syndic. Paris, the visitors were told, would offer many points of engineering interest, and it was hoped that their visit would tend to their own individual improvement, and, what was uppermost in all minds, a sealing of the happy conditions which existed between the two countries.

The PRESIDENT acknowledged the kindly reception, and requested the secretary to address the authorities in reply.

Mr. COLE, at the outset of his remarks, said he had to convey to the three gentlemen who had spoken the regrets of the president that his limited acquaintance with the language of their charming country prevented his expressing adequately his appreciation of the cordial welcome given to them that day. He (Mr. Cole) submitted himself well assured beforehand of their indulgence, but conscious nevertheless of the importance of the duty entrusted to him. The Institution of Municipal and County Engineers, Mr. Cole proceeded to explain, held meetings from time to time in those towns in which, by reason of their progressive character, it was possible for the members to add to their knowledge of the matters in which they were interested—road construction, sewerage, water supply, lighting, and so forth—in a word, all that tended to the comfort of life in the various communities. The formation of the institution dated from the year 1873, and the results of their investigations and deliberations since that time were shown in their volumes of proceedings, which were now among the treasured possessions of municipal engineers in every part of the world. But, notwithstanding this accumulation of knowledge, it had long been felt that the store of information would not attain the desired completeness until the day came when they would be able to visit the beautiful and hospitable city of Paris—at once one of the most ancient towns of the two hemispheres and assuredly one of the most progressive—and he wished, in the name of the president and of all his colleagues, to

offer to their Parisian friends sincere thanks for the truly fraternal reception they had accorded them and for the trouble they had taken to arrange such an interesting programme.

## VISITS.

The reception was followed by an inspection of highway work, the new conduit tramways coming in for special examination. The remainder of the afternoon was spent at the reservoirs of Montmartre, to which, as with other works seen by the visitors, we propose to make detailed reference in a future issue.

### THE PARIS SEWERS.

Saturday's proceedings commenced with a visit to the famous sewers of the city. Although not a few of the party embarked on the inspection with feelings of no little uncertainty as to the pleasure to be derived from it, the experience proved to be one totally devoid of unpleasantness. The size of the sewers is such that, in addition to receiving the whole of the sewage of the city and accommodating water pipes, telegraph and telephone wires, pneumatic tubes and compressed air pipes it has been possible to instal a system of electric cars, by which movement from one part of the system to another is facilitated. Capacious boats, likewise power-driven, are also to be found in operation, and it was by these convenient means of transport that Saturday's inspection was carried out.

The sewage of Paris is, at the outset, received by small sewers from the main drains of houses and street gullies. It is afterwards directed into larger sewers, described as collectors, in which it flows outside the city to the north-western suburbs for treatment. The sewage of the left bank of the river and the water of the Bièvre, a small tributary of the Seine, which has long since been converted into a sewer, cross the Seine in two large syphons laid under the bed of the river, above the Alma and Concord bridges, and join the sewage on the right bank. The crude sewage as it arrives at the outfall works is first deprived, by the process of screening, of the coarser matters, and passes partly on to farms by gravitation, the remainder being raised by pumping stations at Clichy, Colombes, and Pierrelaye.

The total length of sewers now in use is about 1,000 miles, and the quantity of sewage dealt with daily is 174,000,000 gallons.

### WATER SUPPLY.

An inspection of the Montsouris reservoirs occupied the remainder of the morning, and after lunch at the Lyons Railway Station the members left for St. Maur, where an extensive filtration plant, including apparatus for treatment by ozone, is in course of construction. Ferro-concrete, it is interesting to note, is being employed throughout these works.

The sterilising plant, when completed, will have a daily capacity of about 20,000,000 gallons.

At Ivry, to which town the party were next conveyed, an opportunity was afforded of witnessing the process of treatment by ultra-violet rays. An interesting address, in regard to this much-discussed method of destroying organisms in water, was given by Mons. RECLINGHAUSEN, and listened to with close attention.

Great Britain, said the speaker, was the country in which originated the first ideas of the purifying effects of ultra-violet rays on water, experiments having for their object the sterilisation of Thames water by this means, being carried out by Downs and Blunt in 1877. The mercury arc of Way was also a British discovery. In the mercury quartz lamp which was now used the quality of the rays depended mainly on the temperature of the lamp; the greater the heat of the lamp, the more rays there were produced, but it had been found that above a temperature of 1,000 deg. Cent. the quartz disintegrated and the lamps suffered. By keeping the lamps below the temperature mentioned, the life of the lamp was many thousand hours, and in the experimental laboratory in the Sorbonne, in Paris, some of the lamps had been running for the past three years. In their first apparatus lamps of the straight type, having enlarged ends to contain the electrodes, were employed, but in the modern apparatus there was a so-called pistol-shaped lamp, in which the electrodes were brought to one side and the luminous tube bent in a U shape. In regard to the method of application, the lamp was inserted in a casting through which the water, broken up by means of baffle plates, flowed and came three times in contact with the rays from the lamp. The

THE INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS IN PARIS.
Group Photographed on Tuesday on the Steps of the Opera House.

lamp itself was boxed in hermetically, and the light shone through three quartz windows into the water.

This apparatus, Mons. Reclinghausen recalled, successfully underwent test at Marseilles in 1910, and it had been in operation for over a year at Marommes, a suburb of Rouen, a later installation being one at Isle-sur-Sorgues, the apparatus in all these cases sterilising from 90,000 to 130,000 gallons per 24 hours, with a consumption of 3·5 amperes and 220 volts—*i.e.*, about one horse-power. When the apparatus was first tried on Seine water at Ivry, it was found, as previously anticipated, that the speed of the water had to be reduced on account of its occasional very dark colour. Even then they were in many cases unsuccessful, this being found to be due to the slow internal motion of the water when running through the steriliser at low speed. This illustrated the necessity for agitating the water violently while it was passing through the light of the lamp, so that every part was at some time submitted to the rays. Experiments, however, had shown that the annihilation of a microbe took probably not more than one-twentieth of a second. The apparatus they had seen that day had a capacity of 440,000 gallons for twenty-four hours.

Mons. Reclinghausen was cordially thanked for his explanation, and the members, having completed their tour of the works, left for Paris.

Space does not permit of our doing more in the present issue than mentioning that in the course of Monday and Tuesday the undertakings visited included the electricity works of Paris at St. Denis, a well-equipped works for the manufacture of paving blocks at the Quai de Javel, and an up-to-date gas plant at Landy. The city's methods of refuse disposal, as seen at Romainville on Tuesday afternoon, were somewhat in the nature of a revelation to the members, who, fully expecting to find in operation a system that would compare not unfavourably with those of the more important English towns, were astonished to discover that the refuse on arrival is submitted to a process of sorting by men and women, who carry on their unhealthy occupation standing, in many cases, waist deep in the mass of filth. The eventual destination of the refuse is somewhat uncertain; but one thing at any rate seems to be clear, and that is that not a single ounce of the great mass of material which goes daily to the Romainville works is at present being submitted to the modern process of destruction by fire.

## FAREWELL DINNER.

The members dined together on Tuesday evening at the Hotel Terminus, and before the company separated the President said he would like to take the opportunity of proposing the health of and giving expression to the debt of gratitude which they owed to their good friend Mons. le Conte for the part he had taken in arranging what he (the president) ventured to suggest had been a very successful meeting, and for the way in which he had come forward and explained the various undertakings which they had seen during their stay in Paris. It would, Mr. Greatorex remarked, have been very difficult for them to have understood the information supplied during the inspections of works unless they had had the assistance of Mons. le Conte, and they were deeply grateful to him for giving up his time as he had done on their behalf. He trusted that when the engineers of France, Belgium, and Switzerland, who had an association—of which Mons. le Conte was president—similar to their own, went to England in October next, as they proposed to do, their good friend would be able to go with them. He would then, he was sure, receive as loyal a welcome as their French *confrères* had given them in Paris. He (the president) would like to thank all those who had joined in the Paris visit, which he might tell them had originated in a suggestion he had made to Mr. Cole, the secretary. Mr. Cole immediately fell in with the idea, and a week later accompanied him to Paris, where they met Mons. le Conte and others, who at once promised to give every assistance in their power to make the visit a success. Taking everything into consideration, he thought he could say that success had rewarded their efforts, that their stay in Paris had been an enjoyable one, and that they would take back to England many happy recollections of the occasion.

The toast was drunk with musical honours, and Mons. le Conte acknowledged the compliment in a few appreciative remarks.

Mr. H. Percy Boulnois afterwards rose and said that, being the last evening on which those attending the meeting would be together, he was sure they would not like to part without passing a hearty vote of thanks to the president and secretary for the splendid entertainment they had given them in Paris. Of the things which had struck him during their stay there, one had been the manner in which their secretary, Mr. Cole, with his intimate knowledge of the French language, had been able to speak on their behalf. They had had, without doubt, a most successful meeting, though he was afraid that, owing to the number of things they had seen, his mind was a perfect blank at present. One thing, however, which many of them had missed—and he was glad for their sakes that they had—were the destructor works, a greater abomination than which, owing to the manner in which the refuse was sorted and turned over, he did not think ever existed. He could hardly believe Paris would be guilty of such an offence, and he hoped Mons. le Conte would convey to his French friends his (Mr. Boulnois's) disgust of the manner in which the refuse was dealt with.

Sir James Lemon, in seconding the vote of thanks, remarked that he had attended many meetings of the institution, and he could honestly say that he had never been to one which had been so admirably arranged and carried out. One fault was—and it often occurred—that they had perhaps tried to do too much, but it was doubtless better than doing too little. They had seen a great many of the works of Paris and neighbourhod, and he thought they would go home with a better knowledge of the way things were done there than they had had before. Great credit was, he agreed, due to the president and secretary for the manner in which the arrangements had been carried out. The speech of the secretary at the official reception at the Hotel de Ville reflected great credit on the institution, and he (Sir James) felt prouder than ever of his connection with the institution.

The vote of thanks was carried.

The President, in response, said there was no necessity to thank him as they had done. He was well satisfied at seeing so many present. He had already told them how the idea of going to Paris arose, and he was very delighted they had had such a successful gathering. In order to attain that success it was necessary not only that there should be a good attendance, but, what was equally important, satisfactory weather, and in the latter respect he thought it could be safely said that they had been most fortunate. The success of the arrangements had been due entirely to their friends in Paris. They had done what they had always tried to do—too much—but he was pleased to see that they had got through everything so satisfactorily. He had been especially gratified that so many ladies had honoured them with their presence; their attendance had contributed largely to the success of the gathering, and he would like to see them present at future meetings, both annual and district. He wished to take the opportunity of thanking their dear old friend Sir James Lemon for the kind way in which he had seconded the proposition before them, and to say publicly that he owed some part of any success he (the president) had attained in his profession to the early days he spent in Southampton when he was borough engineer and Sir James was deputy-mayor of the town. In conclusion, Mr. Greatorex expressed his cordial thanks to the secretary for the valuable assistance rendered by him in connection with the meeting.

Mr. Cole, in replying, said he could assure those present that the visit to Paris had been a matter of very great interest to him, and he was glad to think he had done anything for the institution.

Mr. W. J. Steele proposed "The Ladies." It was the first time he recollected seeing ladies at any meeting of the institution, but there was no doubt that much of the success of the visit to Paris had been due to their presence.

Mr. F. W. Richardson having made an appropriate response, the company shortly afterwards separated, Paris being left on the following morning.

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**Waterloo Bridge Paving.**—Waterloo Bridge is to be repaved with wood, at a cost of £2,000, the work to be done within ten days under a penalty of £25 a day. If less time is taken a daily bonus of £25 is to be allowed.

# Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

## QUESTIONS.

This week answers are invited to the following questions:—

**246. Reinforced Concrete.** — A reinforced concrete beam 10 in. deep by 5 in. broad carries a load of 3 tons, distributed over a span of 12 ft. The two reinforcing rods have a united area of 1·2 sq. in., and the centre of them is 1 in. from the bottom of the beam; find the unit stresses in the concrete and in the steel rods at the centre of the beam. Do you consider either of the ascertained stresses excessive. (M.R.S.I.)

**248. Pumping.** What power engine is required to pump 160,000 gallons per day of ten hours through ¼ mile of 5 in. diameter main against 8 ft. head suction and 90 ft. head delivery? Also state size and kind of pump. There are three right-angle bends in the main, in addition to those in the pump-house at connections. If a 4-horse power turbine and 6½-horse power engine, which will be used as a lay-by, be provided, and the figure given (160,000 gallons) is twice a day's supply, is this a reasonable margin when the storage capacity is 60,000 (fire contingency being considered)? (Hack.)

**249. Applied Mechanics.**—What is meant by the reciprocal of a point, and a pair of reciprocal figures?

**250. Pier Pavilion Roof.**—Show by sketches how you would roof a pier concert room 60 ft. by 40 ft. If desired, there may be two columns 20 ft. apart below each truss.

**251. Disinfection.**—Distinguish between disinfectants, antiseptics, and deodorants, and name some examples of each. ("Sanitary.")

## REPLIES TO QUESTIONS.

**245. Pumping.**—What is the discharge in gallons per hour from a single-acting pump, 6 in. in diameter, working thirty strokes per minute, length of stroke being 12 in.? Allow 10 per cent for loss due to friction, leakage, &c. (B. M. R.)

Since the pump is single acting, its capacity for one stroke is $0{\cdot}5^2 \times 7854 \times 1$ cub. ft. equals 0·19635 cub. ft.

The pump works at 30 strokes per minute.

Therefore discharge of pump, allowing 10 per cent for loss due to friction and leakage, equals

$$0{\cdot}19635 \times 30 \times \frac{90}{100} \text{ cub. ft. per minute,}$$

i.e., 5·30145 cub. ft. per minute.

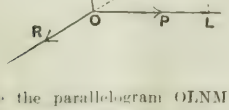
A cubic foot of water contains 6·24 gallons.

Therefore, discharge equals $5{\cdot}30145 \times 6{\cdot}24 \times 60$ gallons per hour = 1984·86288 gallons per hour. (E.F.S. = B.)

**247. Statics.**—Prove that if three forces acting on a particle keep it in equilibrium, each is proportional to the sine of the angle between the other two. (T. R.)

Let the forces P, Q, and R be in equilibrium.

Measure off lengths OL and OM to represent the forces P and Q.




Complete the parallelogram OLNM.

Then NO represents R.

Since the sides of the triangle OLN are proportional to the sines of the opposite angles.

$$\frac{OL}{\sin LNO} = \frac{LN}{\sin LON} = \frac{NO}{\sin OLN}$$

But

$$\sin LNO = \sin NOM = \sin (180 - QOR) = \sin QOR$$
$$\sin LON = \sin (180 - LOR) = \sin ROP$$
$$\text{and } \sin OLN = \sin (180 - POQ) = \sin POQ$$

Also LN = OM.

Hence

$$\frac{OL}{\sin QOR} = \frac{OM}{\sin ROP} = \frac{NO}{\sin POQ}$$

$$\therefore \frac{P}{\sin QOR} = \frac{Q}{\sin ROP} = \frac{R}{\sin POQ}$$

Q.E.D.

## SOME RECENT PUBLICATIONS.*

Meteorological Instruments and Weather Forecasts. By H. T. Davidge, B.Sc., M.I.E.E. Price 1s. 6d. London: Percival Marshall & Co.

This book is one of a series of handbooks called the "Model Engineer" series. Nearly all of these, if one may judge by their titles, are of some direct interest or value to the mechanical amateur and to young mechanical and electrical engineers; for instance, "Simple Mechanical Working Models" and "Small Dynamos and Motors: How to Make and Use Them." But the volume now before us does not contain detailed instructions for the making of meteorological instruments; the instruments are described, and the physical facts upon which their working and use depend are explained in a manner which suggests that the book is intended as a guide to the use of instruments by meteorological observers. The fifty-three small pages allowed for this hardly provide, however, sufficient space in which to do any part of it thoroughly, and some of the descriptions are so short as to be almost useless. Without comparing this little handbook with any costly book it may be pointed out that the whole ground of Chapters II. to V. inclusive has been covered in a thoroughly satisfactory manner in Mr. Marriott's authoritative and excellent work, "Hints to Meteorological Observers." Mr. Davidge's introduction of fifteen pages, and the chapter on "Weather Forecasts," eighteen pages, hardly demand serious consideration; the former is too short and too scrappy to be of any value, while in the latter some decidedly wild statements, and some that are very misleading, occur. In conclusion, it may be remarked that there are passages in the book which suggest that the author would be a competent and illuminating writer on a congenial and familiar subject.

The Transit Theodolite. By H. W. Vallé. Price 2s. 6d., post free. Brisbane: H. W. Vallé.

In this little pamphlet the author, who has had a long experience as instrument maker with Messrs. W. F. Stanley & Co., and other firms of standing, deals with the transit theodolite and other instruments from a mechanical point of view. The object is to give practical hints as to the preservation and adjustments of the various instruments, while much useful information is also given as to the best means to adopt temporarily for overcoming difficulties due to mishaps in the field. The pamphlet may best be described as essentially a practical work by a man having a thorough practical acquaintance with his subject.

**Royal Sanitary Institute.**—Next year's congress of this body will be held in Exeter, where the fourth congress of the institute was held in 1880.

**Nottingham Municipal Undertakings.**—Nottingham Corporation have voted £71,850 in relief of rates from the estimated profits on the gas, tramway and electricity undertakings.

*Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

# Institution of Municipal Engineers.

## SOUTH-EASTERN DISTRICT MEETING.

On the 22nd inst., in the council chamber, 4 Southampton-row, London, W.C., a meeting was held of the South-Eastern District of the Institution of Municipal Engineers, at which Dr. J. F. Meyer read a paper entitled "Notes on Water Softening," accompanied by an experimental demonstration of the text. The chair was taken by Mr. Henry C. Adams (chairman of the South-Eastern District), and the attendance included E. A. Stickland (president of the institution), E. W. Veale (Farnham), W. Louis Carr (Ruislip-Northwood), F. S. Cutler (Deptford), A. Winter Gray (Lambeth), H. C. H. Shenton (Westminster), J. W. Brook (East Ham), G. R. Shankland (London), H. J. Magrath (London), A. M. Neel (London), G. V. Cole (East Ham), O. Hjort (London), W. R. Beckton (Catford), A. Reid (London), G. Gray (London), Percy Griffith (Westminster), J. P. O'Callaghan (London), W. R. Ormandy (Manchester), E. Stephenson (Westminster), L. R. Morshead (London), R. Birkett (Southend), F. Puzey (London), C. E. Stromeyer (Manchester), C. Chambers Smith (Westminster), G. T. Derry (Sutton), E. J. Wilson (Bradford), J. J. Lassen (London), C. Erith (London), H. J. Lenfestey (Wolverhampton), C. S. Boog (Putney), S. W. Revill (London), S. J. Croucher (London), M. Singleton (London), W. L. Cameron, Geo. Radmore, and Bernard Partridge (hon. secretary of the South-Eastern District) and B. Wyand (secretary of the institution). A number of other gentlemen were present, but their signatures on the attendance sheet are undecipherable.

The Chairman said he did not propose to open a discussion in the sense of giving a technical contribution, but he might say he had read the paper and found that it contained matter which ought to evoke a very worthy discussion. As municipal engineers they were concerned with the scientific and practical sides of water softening. The commercial differences that existed with respect to it did not interest them, and he trusted reference to them would be avoided in the discussion. Although the Permutit system reduced the water to zero, in the ordinary way in towns they would mix it with crude water, with the result that they got three degrees of hardness or over, and the question was how this affected water in practical use. It might appear that as municipal engineers they were only concerned with the domestic use of water, but in nearly all cases steam boilers were installed for trade, and they were thus equally interested in the application of water for trade as well as for domestic purposes, and they recognised that whatever water was supplied must be suitable for all purposes. Permutit water contained bicarbonate of soda, and what they wanted to know was the effect of that from both the trading and the domestic point of view. It was, of course, entirely a question of degree. Deadly poisons were practically harmless in small quantities, and it was no good saying Permutit water would do or not do certain things unless the statement was qualified by a statement of the degree or amount of deleterious matter present.

### NOTES ON WATER SOFTENING.

By Dr. John F. Meyer.

As far back as 1756 the natural zeolites are first described in the "Transactions" of the Academy of Sciences at Stockholm; but it was not until 1850 that Theodor Way, consulting chemist to the Royal Agricultural Society in London, established the fact that the zeolites placed in contact with salt solutions were capable of absorbing the bases contained in the dissolved salts, at the same time yielding up into solution the bases which they themselves contained.

Let me here repeat one of Way's experiments:—

In this small glass filter you see a layer of natural zeolites; for convenience I took fuller's-earth. I will pass through it a water of 10 deg. hardness, and as you will see from the test I now make the hardness of the filtered water has been reduced.

The following reaction took place: The bases contained in the hard water, calcium and magnesium, have been absorbed by the zeolites, and the latter [illegible] the [illegible] bases (sodium) to the water. This experiment explains to a certain degree why a hard water of perhaps 7 deg. is very often found at a depth of, say, 500 ft., while at a depth of 100 ft. the hardness of the water out of the same borehole is 50 deg.

The explanation is that rain water passing through a strata of limestone, and thus becoming hard, afterwards passes through a layer of these natural zeolites, whose softening action you saw just now.

Dr. Gans, Professor at the Mining Academy of Berlin, and president of the Laboratory of Geonomy at the Berlin University, made a thoroughly scientific research of the natural zeolites, classified them, and published the constitution formulæ. I shall not bother you here with all the chemical formulæ; but anybody who cares to have them I refer to the March number of the "Journal" of the Society of Dyers and Colourists.

Ultimately Prof. Gans succeeded in producing zeolites artificially, and took out a patent to manufacture artificial zeolites on a commercial scale in the year 1906.

He named his artificial zeolites "Permutit" from the Latin "permutare," to exchange.

The great outstanding property of Permutit, against the natural zeolites, is its greater power of exchanging its own base against other bases. This process of exchange follows closely the stochiometric law of chemistry, and you can readily convert sodium-permutit into calcium-permutit, magnesium-permutit, ammonium-permutit, potassium-permutit, &c., by passing through it solutions of calcium, magnesium, ammonia potassium.

The proof that only an exchange of bases takes place is shown by the fact that if you pass through a layer of calcium-permutit, magnesum-permutit, &c., a salt solution which contains the base sodium, you convert the calcium and magnesium permutit back into sodium-permutit.

The following experiments will illustrate my previous remarks:—

I have here in this glass tube a layer of sodium-permutit, which, as you see, is a grey, porous silicate (pass samples to the members), and will pass a hard water of 20 deg. through the permutit. (The hardness consists of 10 deg. bicarbonate of calcium and 10 deg. sulphate of calcium.) You see the exchange takes place. The sodium-permutit has absorbed the calcium from the hard water and yielded its own sodium basis to the water. The filtered water is 0 deg.

To illustrate this further, I will pass a water of 20 deg. through the same filter; the hardness in this case is due to magnesium sulphate.

You see, again, the filtered water is 0 deg., showing that the exchange of the base magnesium took place as readily as when calcium was removed.

The next filter contains a layer of calcium-permutit. Now, if I pass a solution of common salt (the basis of which is sodium) through the filter, the base calcium from the calcium-permutit enters the common salt solution and the sodium enters the permutit. As you will see, the solution leaving the filter contains the calcium which has been turned out of the permutit, as I will show you by adding ammonium-oxalate, which, in the presence of calcium, will form a white precipitate.

These experiments disclose the whole Permutit process for water softening down to 0 deg., and the procedure of regeneration.

Let me repeat in words what we saw, and so describe this new process:—

If a water of a given hardness is passed through a bed of sodium-permutit, the sodium in the permutit is replaced by the calcium and magnesium taken from the water giving a calcium-magnesium-permutit, while the acid radicales formerly united to the calcium and magnesium in the water unite with the sodium which is turned out of the permutit. There will obviously come a time when all the sodium in the sodium-permutit has been replaced by calcium and magnesium from the treated water. When this period is reached it is not necessary to renew the permutit which has become exhausted, but to regenerate or revivify it. This is done by the action of a solution of common salt on the exhausted permutit. The laws of chemical exchange again come into play, the interchange being in this case in the opposite direction, sodium from salt driving out the calcium and mag-

nesium from the exhausted permutit and converting it back to sodium-permutit.

It is obvious that all the manufacturer of sodium-permutit plants has to do is to calculate how much sodium-permutit is necessary to take out the hardness of the water per hour and per day, and then to place the permutit into a cylinder.

Many methods have been, and still are, employed to soften a water—one precipitates the lime and the magnesia in the water by addition of lime and soda, the other by addition of lime and baryta, the third by addition of caustic soda.

But all these processes suffer from the disadvantage that in the softening of cold water the precipitation of the lime and magnesia does not take place instantaneously, but only after a comparatively long time. It is also impossible to obtain a complete softening down to zero degrees by any one of the said processes.

If you take into account the fact that most of the water supplies in England are of a variable nature, the constituents changing daily, in some cases hourly, then you will agree with me that by the aid of a fully trained water chemist only is it possible to use any of the above-mentioned processes for softening water down to 4 deg. without making it more injurious than the crude water, on the one hand, through an excess of the reagents used, and, on the other hand, by an insufficient quantity of chemicals, resulting in a partially treated and invariably turbid and cloudy water.

I have nothing to say against the above-mentioned three processes when they are worked by a trained water chemist, who makes the analysis of the water every hour and adjusts the amount of reagents according to his analysis, testing at the same time the composition of his reagents and controlling the softened water. If this trained water chemist is to succeed in softening the water down to 4-5 deg., and keep its alkalinity down, then his time is fully occupied the whole day long.

What I absolutely deny is the possibility of an automatically working lime and soda water-softening plant. This plant is built of invariably stock sizes for all waters, irrespective of their composition, although an analysis is generally made in the laboratory of the seller of the plants. The manufacturer is told to add so much lime and so much soda to the water, the settling time being generally calculated as sufficient with one hour, which is totally inadequate. The manufacturer is very often left alone with it, and finds perhaps after six months that the scale in his boilers is not quite as thick as before, but hard like enamel. The economisers are choked up with a very fine powder, in the washing machines he finds a layer of a fine powder, the pipes are filled with this fine powder, the dyed goods are inferior to when using hard water, the wool washed with the softened water has become harsh, &c.

The manufacturer requires these defects to be put right, and owing to this being impossible comes to the conclusion that water softening is a thing not sufficiently advanced to be of any value. The manufacturer finds this automatically working apparatus cannot produce automatically a soft water, because the crude water changes every day, making it necessary to add different quantities of reagents, because the reagents have changed their composition, all of which he learns by experience; in the meantime, he has bought new machinery to put the first plant right, in order to do the impossible.

This goes on as long as the patience of the manufacturer lasts. In many cases the automatically worked water-softening plant ends in the works as a storage tank.

Every chemist can tell you that the composition of the permutited water is such that these dangerous troubles which I have mentioned just now cannot possibly occur. It is chemically impossible, because there is no lime and magnesia left in the permutited water, and this is the reason why the Permutit process for water softening claims superiority.

Please understand, however much the water may vary in hardness, it is always reduced to 0 deg., and therefore no incrustation can take place in economiser tubes or boilers, as always occurs in waters partly softened by other processes.

The permutited water effects the largest possible saving in those industries or places where soap is used, and it is, along with distilled water, the only water which prevents the formation of sticky, insoluble lime, and magnesia soaps and the objectionable lime lakes in dyeing and finishing.

Permutited water is further an excellent water for drinking purposes, confirmed by the most eminent medical doctors of to-day. Let me please explain why I say that a water-softening plant of the lime and soda system should not be installed without giving the buyer the chemical explanation why his plant cannot fulfil the claims made for it except under certain strict conditions, and why it happens that sometimes it cannot fulfil them at all.

There is no other country in Europe with such an enormous and flourishing industry as England. The consequence of which is that the available water becomes worse and worse, compelling the manufacturer to treat it artificially to make it suitable for his purposes. He knows full well that the question of water is a most serious one upon which his entire business depends, and should be made aware of the whole of the difficulties and troubles liable to arise with any system of softening under all conditions and at all times.

If some of you had been with me during the last nine months through factories and mills in this country, you would have received ample proof of my statement that I did not in one single case come across a lime-soda plant automatically worked which was working satisfactorily, or giving for the manufacturer constant results. It is not always the fault of the seller of lime-soda plants, but he should acquaint the purchaser what to expect. He is not the only sufferer. Water softening gets an undeserved bad name, and I am sure there would not be half the failures there are with lime-soda plants were all points laid clear from the beginning as to what actual, not theoretical, results would be.

A further phase of the Permutit process is the manganese permutit, manufactured by precipitating heptoxide of manganese on a permutit by permanganate of potassium.

If I pass a water which contains iron or manganese through this filter all the iron and manganese salts will be oxidised and kept back in the permutit. The regeneration of the filter takes place by using a solution of permanganate of potassium. These manganese permutit filters work excellently in those cases where every trace of iron and manganese has to be taken out of the water, and further to eliminate organic matter.

Another application of the manganese permutit filters is to sterilise waters which contain harmful germs. Since these plants can be worked at a high rate of filtration, the initial and working costs are very small, the working costs being about ¼d. per 1,000 gallons of water treated.

It would be beyond the scope of this paper to deal with all the uses that permutit can be put to. Among many uses are: Manufacturing of salts of a certain base by double exchange. The eliminating of dangerous alkaline salts from the diffusion juice in the sugar industry. The obtaining of gold from very dilute solutions; and in different combinations permutit practically possesses an unlimited field.

I wish to thank you for the interest you have shown and the attention you have given me, and shall be pleased to answer any questions that any gentlemen wishes to have further explained.

## DISCUSSION.

The PRESIDENT proposed a vote of thanks to Dr. Meyer for his very interesting notes, and for, as far as he was able to judge, the interesting experiments he had carried out. Personally he was not interested in the question of softening water, but he dared say there were many present who were, and probably they would be prepared to do what Englishmen were keen to do—run themselves against a system. He gathered that it was almost a new thing to use Permutit, and doubtless there would be members of the older school who would be prepared to stand up against Dr. Meyer in the same way as that gentleman was standing up against others. He was unable to go into the chemical analysis of the subject, but there was one thing he could do, and that was to say that he had been much interested in the paper, while as regarded others he would venture to say that, whether they agreed with Dr. Meyer or not, they had no doubt enjoyed the paper, and would extend to the author a hearty vote of thanks. Dr. Meyer had been at a disadvantage inasmuch that he had had to make use of the English language; but he (the president) would like to know how many Englishmen would be able to go to Germany and make themselves as well understood as Dr. Meyer had done in English that evening.

The Hon. District Secretary (Mr. Bernard Partridge) here stated that he had received a letter from Dr. Thresh, medical officer of health for Essex, saying how greatly disappointed he was at not being able to be present, and that in the circumstances he had committed what he intended to have said to writing. The communication was as follows:—

The subject under discussion has always had a great fascination for me, and it happens that during the last two or three years I have had to advise some of the largest water companies in the county on the subject of "softening," and have carried out in my laboratories, with my partner (Dr. Beale), many hundreds of experiments with various processes, and for some time past have been making daily examinations, chemical and bacteriological, on the unsoftened and softened waters at a very large works with one of the largest softening plants in the kingdom. We have exhaustively experimented with Permutit, making analyses of the water before and after treatment. In fact, we conducted all the experimental work for a water company which has decided to install a plant capable of softening about 1,000,000 gallons of water per day with Permutit. Chalk waters, or waters with little hardness beyond that of a "temporary" character, are easily softened by any of the modifications of Clarke's process, and there is only one objection to this process as generally applied. The softened water varies very much in bacteriological quality; some days it is nearly sterile, on others it is loaded with bacteria. Many of our experiments were conducted with a view of getting over this difficulty, and there is now no doubt that if the lime process is scientifically carried out great purification of the water results. This is an exceedingly important matter, since many of the chalk wells yielding large public supplies rest under grave suspicion of being liable to pollution. They often contain the B. coli, and usually when this is found the medical officer of health is greatly alarmed, often unnecessarily so. When the Amines process for purifying sewage was introduced the extraordinary results obtained were at first attributed to the herring brine, but those of us who had the opportunity of making the necessary examination soon found that the same results ensued if lime alone were used; and recently Dr. Houston has suggested this method for purifying Thames water when turbid. But to produce excellent results it is not necessary to add any excess of lime; the amount necessary to soften an ordinary chalk water can, if properly applied, be utilised for effecting bacteriological improvement. Apparently all the bacteria are reduced in number, but those especially affected are the objectionable bacteria which grow at blood heat, of which the B. coli is an excellent example. I will not weary you with a long table, but I will give the average results of the examination of daily samples extending over the past month, and also the best and the worst results during that period. The unfiltered water is derived from chalk wells, and after softening it is used for supplying a population of many thousands. Albuminoid ammonia per 100,000—hard water average, ·005; soft water average, ·003; improvement, 40 per cent. Albuminoid ammonia per 100,000—hard water worst sample, ·0121; soft water, worst sample, ·0064; improvement, about 50 per cent. Albuminoid ammonia per 100,000—hard water, best sample, ·0020; soft water, best sample, ·0016; improvement, 20 per cent. The oxygen-absorbed figures need not be quoted, as they give similar results. Bacteriological results: Bacteria growing on gelatine in three days per c.c.—hard water average, 1,961—soft-water average, 352; improvement, 82 per cent. Bacteria growing on agar in one day per c.c.—hard water, 192; soft water, 12; improvement 94 per cent. Bacillus coli—hard water, worst sample examined B. coli in 0·1 c.c.; best sample examined B. coli in 100 c.c. Softened water, worst sample, B. coli was absent in 60 c.c.; best sample, B. coli were absent in 100 c.c. Every sample of water of treatment was really of excellent quality the B. coli never being found in 60 c.c., and only four times in 100 c.c. all the other samples during the month not containing the B. coli in 100 c.c. It is seen therefore that with a water of doubtful quality the lime treatment practically applied has the enormous advantage of not only softening the water but of very greatly improving its quality. With reference to the Permutit system, its great advantage is the facility with which it removes "permanent" hardness and all hardness due to magnesian salts. The hardness can be reduced to zero, and usually it will not be found necessary to treat the whole of the water, but only a definite proportion, and this absolutely softened water can be used to dilute a proportion of the hard water without risk of any decomposition occurring in the mains or the formation of any deposit. It is true that it substitutes soda salts for the lime and magnesia salts removed, but from the health point of view this is quite immaterial. In Essex some hundred thousand people use water which Nature has softened in this way, and which consequently contains considerable quantities of sulphate and carbonate of soda, but we find them perfectly wholesome and well adapted for all the purposes of a public supply. It has been alleged that these soda salts have an injurious effect upon boilers. This part of the question is probably only of secondary importance to municipal engineers, but I may add that a great many high-pressure tubular boilers in Essex are fed with this water, and the owners and engine drivers assure me that it has no ill-effect, unless the water also contains a large quantity of common salt, and to this rather than to carbonate and sulphate of soda I attribute the effect on brass fittings which such waters produce. I would not have troubled the meeting with these notes had it not been that I think the municipal and water authorities ought to be made acquainted with the fact that water can be softened and purified with a single process, assuming that process is properly applied, as there are many places depending upon supplies which require both softening and purifying. In any case when considering what process to adopt, other things being equal, preference should be given to a process which can be depended upon also to improve the chemical and bacteriological quality of the water.

Mr. C. E. Stromeyer (Manchester) said he gladly accepted the invitation to attend, because it was the Manchester Steam Users' Association, with which he was connected, that had given on several occasions an impetus to water softening. Fifty years ago they asked Dr. Angus Smith to investigate the question of corroding and incrustation, and, as a result, the association published a valuable report, which had been the groundwork upon which many water-softeners were constructed. When he (the speaker) joined the association fifteen years ago it seemed to him that the softening of water had not been much done, and when he sent his chemist round to various works to make careful inquiries into the systems in operation he published the results, not only of those investigations, but also of the recommendations then made as to how the water should be softened. The results, in addition to being sent to the members of the association, were published by the Institution of Mechanical Engineers. Since then manufacturers both here and abroad had been induced to go into the question of water softening, and for the second time the Manchester Steam Users' Association had given an impetus to the matter, with the result that he thought they had done a considerable amount of good. They did not trouble much about the softening of the drinking water, which was seldom done; he had only seen one place where it was done. They wished particularly to soften water for boilers, and he must say that, so far as their association was concerned, where the softening appliances had been installed the condition of the boilers had been improved—the scaling in the boilers had been reduced. With respect to the author's statements in the paper with reference to the manufacturers, being of German descent himself and being in touch with Germans, he could say that he did not think these statements would have been made in Germany without being challenged—he meant the assertion that the manufacturers made misstatements. He did not think it was fair that such statements should be made. He held no brief for the manufacturers—in fact, they criticised them pretty severely——

The Chairman pointed out that the author had omitted that passage from his paper.

Mr. Stromeyer said he was glad to hear that, and that that particular statement would not be published. It would entail his cutting out some of his intended remarks, but he would say that, generally, manufacturers were very heavily hit, and he did not think that Dr Meyer would have gone for them in the way he did, because he himself was sitting in a glass house. The water-softening question was a comparatively open field for everybody, and, as a matter of fact, there were not very many plants in the country. They had induced people to go in for water softening, and were surprised to find there were so few plants, which was due, perhaps, to the difficulties of dealing satisfactorily with the matter, and

also to the fact that people were very conservative. But he did not feel quite sure that the Permutit process contained nothing but virtues. They were not told anything about the cost of that process. It seemed to him that lime must be very much cheaper, and that if the users were to be informed about everything, that was one of the things they should be informed about. He could quite believe all the same that it was an excellent method. It was very ingenious, and there was not the least doubt it would find its way into this and every other country. There were, however, still improvements to be made. One of these, which he believed might be of advantage, but of which he was not sufficiently a chemist to know enough, was that in places like London, where there were chiefly carbonate of lime waters and cheap softening with lime, the Permutit system might be used to get rid of the remainder of the hardness. With lime treatment they could not get much below 3 deg. of hardness—cases were rare where they got below—but if they wished to get below he should say a system which would deal with small towns might be of great advantage. And in manufacturing districts the Permutit process might be of very great advantage, but in cases where they were quite satisfied if they got down to 5 deg. or 6 deg. he did not think people would go in for the more costly process. He assumed, of course, it was costly, and he thought he was right.

Mr. PERCY GRIFFITH (Westminster) remarked that the question of treating water was, of course, interesting not only to the manufacturer, as the last speaker had stated, but also to the water engineer who had to provide water for domestic use. Arising out of what had been said, he should like to say that there was a question of principle underlying the position of a gentleman being interested in the trade plant which he described. He had heard criticisms of such a practice, and he was connected with societies where it was continually resisted by the council. He was bound to say such a policy was a mistake, because where an interested and expert person described a process which he knew more about than anyone else, he thought they could only be grateful to him for giving them all the details he possibly could, and in the discussion it was open for others to claim advantages for other systems. He would suggest that they should drop the question of personality and look upon the paper as a description of the plant and system, and not make remarks on the expressions used by the author with respect to rival manufacturers. The first point that struck him was that nearly one-half of the paper was occupied with a critical reference to existing systems, and he was bound to judge in principle of the value of anything thus affected by the fact that, in advocating the merits of one thing, it would be necessary to discount the value of others. He was afraid, therefore, the author had induced him to be a little more critical of the prospects of the Permutit plant than he otherwise would have been. He should like to ask the author for a little more information with regard to the use and value of water treated by the process he described. He seemed to have been singularly reticent with respect to the application of the water to various purposes, and, as a water engineer, he (the speaker) he felt bound to say that the author's statement that the doctors had described the water as satisfactory did not seem to go far enough. He did not feel quite sure that the plant removed the whole of the hardness, and it would be interesting to have a chemical analysis of the water so treated. He was not an expert in chemistry, and it was, perhaps, a little out of his line to raise this question, but he hoped others would deal with it. He would like to ask whether the substitution of sodium for caustic was likely to produce the effect of common salt by combination with chlorine. Would sodium, if left in the water, be likely to cause trouble through the existence of chlorine in any proportion? He should also like to know if, in removing the properties which produced hardening, there was any effect upon the pipes. He knew such action had been generally traced to the softness of the water, so much so that water had been treated for re-hardening in order to prevent reaction. Of course, if the author agreed with Dr Thresh that only a proportion of the treated water was involved, and that the hardness was reduced within stated limits and not altogether, his query would be answered. He thought there were many who, like himself, would like to know something about the practical application of the process to popular water supplies, and perhaps the author would also add something about the capital outlay which the plant involved.

Mr. CHARLES ERITH (London) raised a question with respect to the statement that the water treated by the Permutit process cost ¼d. per 1,000 gallons. He was not quite clear whether this referred to water as sterilised, town water, or water with half a degree of hardness, or whether it was supposed to be the treatment of boiler water. He need hardly say that no such cost for ordinary hard boiler water was known. The first thing that struck him with respect to the paper, from an engineering point of view, was the total absence of figures of any kind. He had taken some trouble to form an idea of the size and cost and commercial working of the system, and the only information he had obtained was in an article in *Engineering* in 1911, dealing with works in Berlin. This stated that after three working days, with a nominal quantity of 22,000 gallons of water, the boiler had to be shut down for regeneration, which took ten hours and involved the use of 28 lb. of salt. If this was so the system was hardly practicable from an engineering point of view. Was not the process, he would ask, essentially that of decomposing soda? So far as he could see, it was a process for decomposing salt and wasting the chlorine. Was it a proposition that could be commercially acceptable? Then they had not been told anything as to the high cost of this patented material. All other softeners could be obtained in the open market, but the royalty on Permutit was £14 a ton, which appeared to prove that the poor consumer would have a frightful price to pay for the material.

Mr. J. J. LASSEN (London) observed that it was a difficult thing to address a meeting on the somewhat complicated subject of water softening, and it was more difficult when it was necessary to refer to complicated chemical formulæ, and so forth. That was, doubtless, the reason why the author of the paper had carefully avoided formulæ or scientific data. Stripped of verbiage, this compound was nothing but ordinary soda compound. If water was treated with set lime and soda, or with caustic soda—an excess of soda as in the Permutit plant—salts were obtained which were Permutit. He had made analyses for the last half-year with a view to investigating the subject, and he could guarantee the accuracy of the following results:

*Analysis of Kent Water Supply (Metropolitan Water Board).*

| | Grains per gallon. |
|---|---|
| Silica ... ... | 1·18 |
| Oxide of iron, &c. | ·28 |
| Sulphate of lime | 1·70 |
| Carbonate of lime ... | 16·09 |
| Nitrate of lime ... ... ... | 4·19 |
| Sulphate of magnesia | 1·14 |
| Nitrate of sodium ... | ·40 |
| Chloride of sodium ... | 3·68 |
| | 27·66 |
| Hardness ... ... ... ... | 20·88 deg. |

*Analysis of Kent Water after Treatment by Permutit.*

| | Grains per gallon. |
|---|---|
| Silica ... ... ... ... ... | 1·06 |
| Oxide of iron, &c. ... ... ... | ·18 |
| Carbonate of lime ... ... ... | ·20 |
| Sulphate of magnesia ... ... | ·36 |
| Nitrate of sodium ... ... ... | 4·76 |
| Sulphate of sodium ... ... ... | 2·72 |
| Carbonate of sodium ... ... | 4·45 |
| Bicarbonate of sodium ... ... | 27·75 |
| Chloride of sodium ... ... ... | 3·68 |
| | 44.16 |
| Hardness ... ... ... | ·50 deg. |

*Analysis of Kent Water after Treatment by Lime and an excess of Soda corresponding to that employed in the Permutit process.*

| | Grains per gallon. |
|---|---|
| Silica ... ... ... ... ... | ·54 |
| Oxide of iron | ·12 |
| Carbonate of lime | ·60 |
| Nitrate of sodium | 3·57 |
| Sulphate of sodium | 6·04 |
| Carbonate of sodium | 12·72 |
| Chloride of sodium ... ... ... | 3·68 |
| | 27·26 |
| Hardness ... | ·60 deg. |

*Kent Water treated with Permutit.*

| | Grains per gallon. |
|---|---|
| Silica | 1·06 |
| Oxide of iron | ·18 |
| Carbonate of lime | ·20 |
| Sulphate of magnesia | ·36 |
| Nitrate of sodium | 4·76 |
| Sulphate of sodium | 2·72 |
| Carbonate of sodium | 4·45 |
| Bicarbonate of sodium | 27·75 |
| Chloride of sodium | 3·68 |
| | 44·16 |
| Hardness | 0·50 deg. |

*Kent Water treated with Caustic Soda.*

| | Grains per gal'on. |
|---|---|
| Silica | 1·06 |
| Oxide of iron | ·18 |
| Carbonate of lime | ·30 |
| Sulphate of magnesia | ·26 |
| Nitrate of sodium | 5·00 |
| Sulphate of sodium | 2·72 |
| Bicarbonate of sodium | 27·10 |
| Chloride of sodium | 3·25 |
| | 39·87 |
| Hardness | 0·00 deg. |

*Analysis of naturally occurring Waters containing Bicarbonate of Soda.*

(A) Town Supply (Essex).

| | Grains per gallon. |
|---|---|
| Silica | ·25 |
| Oxide of iron | ·03 |
| Bicarbonate of lime | 9·13 |
| Bicarbonate of magnesia | 6·42 |
| Bicarbonate of soda | 18·26 |
| Sulphate of sodium | 16·69 |
| Nitrate of sodium | ·74 |
| Chloride of sodium | 28·67 |
| | 80·19 |

(B) Well Water (London).

| | Grains per gallon. |
|---|---|
| Bicarbonate of soda | 12·82 |
| Sulphate of soda | 16·63 |
| Chloride of soda | 17·61 |
| Bicarbonate of lime | 4·40 |
| Bicarbonate of magnesia | 3·37 |
| Nitrate of magnesia | ·06 |
| Silica | ·99 |
| Oxide of iron | ·80 |
| | 56·68 |

(C) Well Water (London).

| | Grains per gallon. |
|---|---|
| Bicarbonate of soda | 10·58 |
| Sulphate of soda | 8·62 |
| Chloride of soda | 14·20 |
| Bicarbonate of lime | 5·90 |
| Bicarbonate of magnesia | 2·20 |
| Nitrate of magnesia | ·10 |
| Silica | ·25 |
| Oxide of iron | ·10 |
| | 41·95 |

These waters in the untreated state all produced the same trouble—namely, the extensive corrosion of pipes, cisterns, corrosion of fittings and joints of boilers, pitting and priming. When treatment was resorted to which had the effect of eliminating the bicarbonate of soda the trouble entirely ceased.

*London Water Supplies (Metropolitan Water Board).*

East London Water.

| | Grains per gallon. |
|---|---|
| Silica | ·18 |
| Oxide of iron | ·08 |
| Sulphate of lime | ·95 |
| Carbonate of lime | 17·50 |
| Sulphate of magnesia | 1·74 |
| Nitrate of sodium | 2·08 |
| Sulphate of sodium | 1·97 |
| Chloride of sodium | 3·27 |
| | 27·77 |
| Hardness | 19·65 deg. |

New River Water.

| | Grains per gallon. |
|---|---|
| Silica | ·22 |
| Oxide of iron | ·13 |
| Sulphate of lime | ·53 |
| Carbonate of lime | 15·41 |
| Sulphate of magnesia | 1·44 |
| Nitrate of sodium | 1·78 |
| Sulphate of sodium | ·81 |
| Chloride of sodium | 3·28 |
| | 23·60 |
| Hardness | 17·00 deg. |

West Middlesex Water.

| | Grains per gallon. |
|---|---|
| Silica | ·17 |
| Oxide of iron | ·11 |
| Sulphate of lime | ·67 |
| Carbonate of lime | 12·72 |
| Sulphate of magnesia | 1·98 |
| Sulphate of sodium | ·98 |
| Chloride of sodium | 3·68 |
| | 20·31 |
| Hardness | 14·85 deg. |

*Analyses of Typical Water Supplies.*

Town Supply (Yorkshire).

| | Grains per gallon. |
|---|---|
| Silica | ·19 |
| Oxide of iron | ·13 |
| Carbonate of lime | 11·39 |
| Carbonate of magnesia | 2·77 |
| Sulphate of magnesia | 7·68 |
| Sulphate of sodium | 15·37 |
| Chloride of sodium | 5·33 |
| | 42·86 |
| Hardness | 21·09 deg. |

Town Supply (Wales).

| | Grains per gallon. |
|---|---|
| Silica | ·24 |
| Oxide of iron | ·18 |
| Carbonate of lime | 18·81 |
| Carbonate of magnesia | 5·36 |
| Sulphate of magnesia | 3·57 |
| Nitrate of sodium | 2·97 |
| Chloride of sodium | 4·10 |
| | 35·23 |
| Hardness | 28·16 deg. |

Well Water (Surrey).

| | Grains per gallon. |
|---|---|
| Silica | ·78 |
| Oxide of iron | ·19 |
| Carbonate of lime | 14·35 |
| Sulphate of lime | 4·15 |
| Sulphate of magnesia | 1·14 |
| Sulphate of sodium | 4·68 |
| Chloride of sodium | 2·36 |
| Nitrate of sodium | 4·40 |
| | 32·05 |
| Hardness | 18·35 deg. |

Well Water (Battersea).

| | Grains per gallon. |
|---|---|
| Silica | ·25 |
| Oxide of iron | ·15 |
| Sulphate of lime | 24·38 |
| Carbonate of lime | 15·50 |
| Nitrate of calcium | 5·77 |
| Carbonate of magnesium | 4·85 |
| Nitrate of sodium | 23·45 |
| Chloride of sodium | 14·33 |
| | 88·68 |
| Hardness | 47·73 |

He did not want to go against the opinion of Dr. Thresh, and if that gentleman was satisfied that bicarbonate of soda did not do any harm he would accept it. His experience, however, went in another direction. With respect to the lime and soda process, it was to be noted that Dr. Meyer seemed to have a better opinion of it when he read a paper at

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Bradford, on which occasion he dealt very fully with the whole question of Permutit. In this paper he (Dr. Meyer) declared that the only scientific process was soda and lime. That was two or three years ago, and the fact that the author of the paper had gone a long way since then should not make the soda and lime process less scientific. The speaker added that it was due to Dr. Thresh that water softening in this country reached the position among manufacturers it had done. The paper by him on the subject was read years ago, but it was still quoted as an authoritative pronouncement.

Mr. W. R. Beckton (Catford) said there were a great many lime and soda plants in this country, and for all he knew they might be all working efficiently and well. He had one in his mind which after fifteen months' working still showed as steady results as when it started, bringing the softness down to 5 deg.

Mr. R. Birkett (Southend) stated that they had had a great amount of trouble with the water at Southend, and they were given to understand that the whole of the trouble was caused through salt in the boilers. They put in a lime plant, and that helped them along until they got a new condenser, the result being quite satisfactory.

Mr. H. J. de Q Lenfestey (Wolverhampton) mentioned an instance in which water from a colliery in South Wales was treated with calcium chloride, with the result that the trouble they had previously had entirely ceased. Permutit water cost eight times as much for temporary hardness, and four times as much for permanent hardness as the lime and soda process.

Dr. W. R. Ormanby (Manchester) said they had less trouble with water softening in Germany than in England, because in the former country chemists were employed, whereas in England they did not employ them. The soda and lime process could be used to great advantage where the hardness of the water varied from 12 deg. to as high as 40 deg., when the flow down the river was small. As to the question of cost, it was entirely a matter of efficiency, for a plant was dear at any price if it would not fulfil the object for which it was put down. Any inefficiency there might be in the lime and soda plant was due to the fact that the management of it required an amount of skill which was not available in the average works in this country.

Mr. O. Hjort (London) did not think it could be argued that all those who used the lime and soda process were fools, and if they had erred it had been in good company.

Mr. G. R. Shankland (London) remarked that with the Permutit process there was not the priming in the engines that occurred with water treated with other processes, and there was no turbidity of the water or deposit in the pipes.

Mr. J. R. O'Callaghan (London) thought the only advantage that could be claimed for the Permutit process was that sludge was avoided.

Dr. Meyer, in a brief reply, admitted that the lime and soda process was all right if it was desired to bring down the water to 4 deg., and if a trained chemist was engaged. As to the cost of the Permutit plant, it was a difficult thing to say, because the cost depended upon the hardness of the water. The average cost was ¼d. per 1,000 for water of 15 deg.

## CORRESPONDENCE.

*"Men are never likely to settle a question rightly as when they discuss it freely."* Macaulay's *"Critical and Historical Essays."*

### SEWAGE DISCHARGE INTO TIDAL RIVER.

*To the Editor of* The Surveyor.

Sir,—I have the supervision of a small town of 1,500 population. A tidal river runs along the front, and the sewage is collected to one point and stored during high water in a small tidal tank which runs under the shipping wharf, and discharges about 60 ft. to 70 ft. outside the landing stage. Invert of pipe (which is 15 in. diameter) is 6 ft. to 8 ft. below lowest low-water mark spring tides.

Below this point the public bathing ground is situated. The trouble I get is that, although every possible precaution is taken to empty the tidal tank only when the sewage is likely to be carried off to sea, I find offensive matter is washed ashore, and lodges about the wharf and in front of the houses.

I have tried letting out sewage at various times, but did not find much improvement. The best time for clearing it away is the hour before and after high water, but I am, again, at times unable to do this, as the tank will only discharge when there is a certain amount of water above pipe.

I may say the tank is not water-tight, and the sea water gets in it. The whole length of it is about 30 yards, and it is 4 ft. 6 in. diameter, made of brick (circular in shape). The pipe entering it from the town is 15 in., and the outlet is 15 in.; distance from landing stage to the bar, about one mile.

Can any brother reader who may have the supervision of a similar place give me any information, or throw out any suggestion that will remedy matters? I may say that up to 1908 the outlet was only 30 ft. outside landing stage, and level with low-water spring tide. In that year a 30-ft. length was added to it—which was laid on the river bed, which dropped about 6 ft. in that length—in the hope of remedying matters, but the result has been somewhat disappointing. I have thought of suggesting a new water-tight (cast iron) tank, double the present size, and to store for twenty-four hours, and discharge it in the night only during the summer season.—Yours, &c.,

Anxious.

**Women as Contractors.**—A small city in New Mexico has women contractors, as the following extract from a Des Moines, Ia., paper goes to show: "I was amazed to find the miles and miles of sidewalks which were not there when I was there before. To my greater amazement I found two women had secured the contract for laying these sidewalks, and that one of these had been the superintendent of the public schools. I determined to see these two women who had nerve enough to do something that the men down there had not thought of. The one who had been superintendent of schools superintends the work, and does the most of it herself. She is a very large woman. I do not know of any woman in Des Moines who is as large as she is, and it was a funny sight to see her down on her knees laying brick. She wears a short skirt and high boots, and is an excellent workman. The other woman is the business member of the firm. She is a small woman; I would say a tiny woman. Both are Eastern women. These women saw a good thing in it, and went to work. The former school teacher is the politician, and she got the contract after the other one had made the specifications and named the price. This is not all that they do. They build houses. The larger one does the front or façade part of the buildings herself, and I never saw finer workmanship. She plans as she goes along. She builds the front part first, but the design is different from any other I ever saw, and really more beautiful. These women are doing all the contract work in the city." It would be interesting indeed to see one of the houses which "she plans as she goes along." *Engineering and Contracting.*

# Law Notes.

Edited by J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

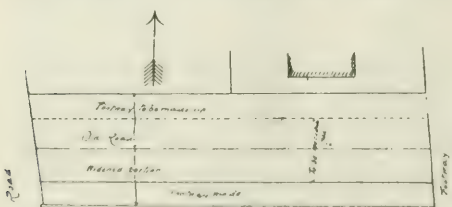
*The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, one side only) should be addressed to "The Law Editor," at the office of* The Surveyor, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction**—*i.e.*, **without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

Dangerous Structures: Uninhabited Houses: London Building Act, 1894, secs. 103, 105, 106, 107, 115.—An important point as to the application of the provisions of the London Building Act, 1894, with respect to dangerous and ruinous structures was decided in *London County Council* v. *Jones & Co.* (King's Bench Divisional Court; April 25th). This was an appeal by the council from the decision of the magistrate of the North London Police Court, dismissing two summonses against the defendants. The council gave notice to the defendants, in accordance with the Standing Orders of the Council, under sec. 115 of the Act, to do certain work to two dilapidated houses, and the work was done to the satisfaction of the council. Subsequently the district surveyor certified, under sec. 105, that the houses were in a dangerous state and should be shored up, or otherwise secured, and that as to one of them a hoarding should be put up for the protection of passengers. The council thereupon, in exercise of the powers given to them by sec. 106, caused the houses to be temporarily shored up, and served notice on the defendants to take down or secure the buildings. The notice not being complied with, these proceedings were taken. The premises were not at the moment dangerous, owing to their having been shored up by order of the council. They were uninhabited, and there was a garden space between them and the public footpath; but if the shoring was removed the buildings were likely to collapse, and might be then dangerous to persons trespassing upon them. The magistrate found as a "fact" that the premises were not dangerous to any person, except perhaps to trespassers in a certain event. He therefore took the view that secs. 103-107, relating to "dangerous structures" (under which the proceedings were taken), were not applicable; but he was of opinion that the houses were "ruinous" within the meaning of sec. 115, which involves a different procedure. He therefore dismissed the summonses. The Court, reversing the magistrate, held that the houses were "dangerous structures" within the meaning of the earlier sections, notwithstanding the fact that they could not be a danger to persons using the street, but only to trespassers. The appeal was therefore allowed.

## QUERIES AND REPLIES.

*In order to avoid confusion querists are requested to use distinctive words as* noms de plume. *The letter* **X**, *combinations such as* **X.Y.Z.**, *and words such as* "engineer" *and* "surveyor," *should never be used.*

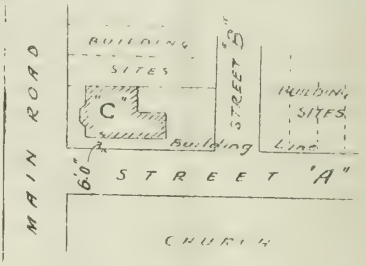
Private Street Works: Apportionment.—"Nemesis" writes: I forward sketch plan of road and notice served under sec. 150 of the Public Health Act, 1875, and shall be obliged if you will give me your valued opinion on the undermentioned matters. The



road was originally 15 ft. wide. The frontages on the south side have been set back another 3 ft., and kerbed, channelled, and paved on that side to my satisfaction (but not yet macadamised) before service of notice. Am I correct in apportioning as under to the frontagers: (1) Cost of kerb, channel, footpath and half cost of macadamising frontages on south side only; (2) half cost of macadamising only to south frontagers; (3) cost of gullies and connections to sewer between all parties? It has been my usual practice to allow value for work already executed during seventeen years' practice, and I am now informed it is incorrect, and that no account must be taken of work already done.

The proposed apportionment certainly seems fair and reasonable, and if the proceedings were under the Private Street Works Act, 1892, there can be no doubt that it would be allowable under sec. 10 of that Act. But sec. 150 of the Act of 1875 contains no similar provision, and apparently under that section the whole expenses must be lumped and apportioned among all the frontagers chargeable according to their frontage. It may be open to doubt, however, whether the frontagers on the south side are chargeable at all, inasmuch as the footway on that side is not now being made up, and it is a question, therefore, whether the premises on that side abut on "such parts" of the street as require to be made up within the meaning of the section. See *Wakefield Urban Sanitary Authority* v. *Mander* (L.R., 5 C.P.D., 248).

Public Health (Buildings in Streets) Act, 1888.—"Quest" writes: Plans have recently been approved for a building estate on which the building line is shown immediately adjoining the footway in street A. The house C is the first erected, and is set back




6 ft. from street A. Will this set-back define the building line for houses to be erected in street A on the other side of street B, or will the building line approved on the street plan hold good?

A house may be in two streets for the purpose of section 3 of the Public Health (Buildings in Streets) Act, 1888. Whether the house C is or is not in street A, and whether it is near enough to the building sites to be on one side thereof, within the meaning of the Act, are questions of fact—that is to say the decision would rest with the magistrates if proceedings were taken. (See *Warren* v. *Mustard*, 56 J.P., 502.) If, however, the plans were approved after the erection of C, this would be a sufficient consent by the local authority under the section to the erection of the houses on the line shown in the approved plans (*Mullis* v. *Hubbard*, 1903, 2 Ch., 431).

Officer's Compensation on Abolition of Office.—Referring to reply on p. 538 *ante*, "Justitia" writes: I am sorry you cannot reply to the query as to whether it is *now* the practice of the Treasury to add years to the period of actual service. This I particularly wanted to know, and thought perhaps you might have known or could have ascertained whether such was the case. In your reply you state—

"For 10 years', but under 15 years', service, 3 60ths additional.
" 5 " " 10 " " 1 60th "

Should this not read "10 to 15 years, 5/60ths
5 " 10 " 3 60ths"

If you could favour me with the information as previously mentioned I should esteem it a great favour.

The practice of adding years was established by a Treasury Minute of 14th June, 1859, which, as far as I can ascertain, has never been formally withdrawn, though it has apparently become inoperative so far as it relates to this practice. Mr. Hobhouse (then Financial Secretary to the Treasury), in reply to a question in the House of Commons on this subject on November 14th, 1908, said—"In ordinary cases the amount of the special annual allowance by way of compensation for abolition of office does not exceed the amount of superannuation allowance to which the retiring officer would be entitled if his retirement were due to ill health. This rule is the outcome of a gradual growth of precedents, and it was stated to the House of Commons by Mr. Goschen as long ago as August 22nd, 1889." It will be noted that Mr. Hobhouse referred to "ordinary" cases, from which it may perhaps be inferred that the Treasury are still prepared to give additional years in special cases. Their discretion, however, is apparently unlimited, and they would be the judges whether the case is special or not. "Justitia" is quite correct in his emendation of the figures in the previous reply. The 10th is for under 5 years' service.

HIGHWAY: BOUNDARY.—"Olympia" writes: On the side of a public road is a natural earth bank or hedge. The owner has grubbed the hedge and built a masonry wall to the extreme edge of the bank. For numbers of years my predecessor and myself have insisted that the face of a wall should not extend beyond the centre of the hedge. The owner in question says he can build a wall of any description or height to his boundary, which he claims to be the toe of the bank. Kindly advise me whether he can legally do as stated by him. There are no building by-laws in force in regard to building line, &c.

The general rule in the case of a highway running between "fences" is that the right of passage or way, *primâ facie*, and unless there be evidence to the contrary, extends to the whole space between the fences, and the public are entitled to the use of the entire space as a highway, and are not confined to the part which may be metalled or kept in order (Pratt and Mackenzie's "Law of Highways," 15th edition, page 41). In the present case I think the hedge, and not the bank itself, would probably constitute the "fence" for the purposes of this rule. If so, it follows that the owner is not entitled to build a wall beyond the centre of the hedge, unless the *primâ facie* presumption is rebutted by the nature of the ground or other circumstances, such as the exercise of acts of ownership with regard to the bank, inconsistent with public rights. The bank, although probably not usable by vehicles, might conceivably be used by pedestrians, in the event, for instance, of the roadway being flooded or otherwise impassable.

PRIVATE STREET WORKS: APPORTIONMENT.—"Cathcart" writes: I should be pleased if you would favour me with a reply to the following question:—An urban authority resolved to apportion the expenses of private street works under the whole of the

powers contained in sec. 10 of the Private Street Works Act, 1892. If the footpaths, &c., alongside the gables of houses owned by A and D were constructed (see sketch), what would be a reasonable proportion of the cost of this work to charge against owners of property B and C?

Presumably ¼ths to B and ¼th to C, unless there are circumstances indicating some other method of apportionment.

CLEANSING POND. "Public" writes: Who is liable to clean out a pond by the side of a main road, and separated from the latter by only a guard fence? The public use it for watering stock, and the county authority for rolling. The last time it was cleaned out the cost was met by public subscription, but this is unsatisfactory, as it gives no one the right to prevent misuse of the pond.

Apparently no one is liable. The parish council have power under sec. 8 (1) (*f*) to cleanse it, but they are not bound to do so. If the pond has been used for many years by the public for watering stock gratuitously it is probably a "reservoir" within the meaning of sec. 64 of the Public Health Act, 1875, and vested in the district council, who "may" keep it supplied with pure and wholesome water. See *Leadgate Local Board v. Bland* 43 J.P., 526.

BUILDING BY-LAWS: BATH-ROOM. "Ash" writes: I shall be glad if you will let me know if it is correct to assume that a bath-room is a room used for human habitation in insisting upon the provision of head-room, window area and ventilation required by the by-laws for habitable rooms?

I am not aware of any decision as to what constitutes a "habitable" room for the purpose of by-laws, and I think it is very doubtful whether a room used exclusively as a bath room can be said to be a room used for human habitation, seeing that, normally, it is used neither as a living room nor as a sleeping-room.

**We have to draw the attention of querists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6 in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.**

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Blackpool T.C.** (May 15th. Mr. T. C. Ekin).—£10,000 for the extension of the plant at the electricity works, and £2,224 for private street improvements. It was stated that the additional electrical plant was required owing to the abnormal development of works and the increased demand consequent upon the more general adoption of the metal filament lamp. If on certain days during the season the emergency machine broke down the small spare unity would not be sufficient for the supply. There was no objection to either of the applications.

**Chapel-en-le-Frith R.D.C.** (May 15th. Mr. H. Shelford Bidwell).—£4,000 for the purpose of constructing a service reservoir at Dove Holes, with a capacity of 1,500,000 gallons.—The clerk, Mr. J. B. Boycott, gave particulars of the population, rateable value, &c., of the district, and evidence was offered in favour of the scheme by Dr. Bennett, the district medical officer, and others. Mr. Brady, of Messrs. Brady & Partington, the council's engineers, explained in full detail the plans of the work. There was no opposition. After the inquiry the inspector visited the site of the proposed reservoir.

**Chester T.C.** (May 16th. Mr. T. C. Ekin).—£15,500 in connection with the provision of hydro-electricity works on the site of the old Dee Mills.—The town clerk, Mr. J. H. Dickson, stated that the money was required for the purpose of erecting works for generating electricity at the weir. The necessity for the application arose from the increase in demands for electrical energy placed upon the electricity undertaking at New Crane-street. The scheme had been devised by the electrical engineer. It involved the use of the water rights of the old Dee Mills, and the installation of three turbines would be capable of generating 775 horse-power. The plant would be capable of developing 1,250,000 Board of Trade units per annum.

**Cottingham U.D.C.** (May 14th. Major J. Stewart).—£600 for the purpose of extending the water mains.—The clerk, Mr. J. S. Moss-Blundell, stated that the proposal had arisen in consequence of the county council providing seven small holdings in the Skidby district, and the county council were to pay the Cottingham Council a sum of £2 10s. per annum for the supply of water to each holding. The county council were also to pay a lump sum of £250. The agreement with the Hull Corporation was to supply the district with water from Kirkella reservoir, and the mains of both the corporation and the council would be connected on the Beverley and Hessle main road. The surveyor, Mr. J. H. Hanson, said the estimated cost of the work was £802.

**Halesowen R.D.C.** (April 30th. Mr. Stanley Fisher).—£800 for the purpose of providing an open space at High-street, Cradley.—An open space, it was explained by the clerk, was essentially necessary in Cradley, as it contained a large number of small houses greatly congested. The proposed space was in the centre of the town. It was proposed to pay £700 for the site.

**Leeds T.C.** (May 14th. Major J. Stewart).—£24,767 for the purpose of constructing new streets in the Quarry Hill and York-street areas.—It is proposed to make a new street 75 ft. wide, extending from Marsh-lane, near East-street, to Pendulum-street. It is also intended to go as far as Cross Stamford-street, and ultimately to Roundhay-road.

**Lowestoft T.C.** (May 3rd. Mr. P. M. Crosthwaite).—£2,000 for reinstating parts of four groynes erected in 1902.—The town clerk, Mr. R. B. Nicholson, stated that the revetment had been completed, not at a cost of £590 as estimated, but at a cost of £670, on account of which he should have to ask the inspector to increase the sanction by £80. The inspector: Have you a resolution for that extra £80? The town clerk said he had not; only for the £2,000 originally applied for. In reply to the inspector, the town clerk said the loan for the groynes constructed in 1902 had just been paid off. The inspector: You estimated the life of the work very well. What is the reason for putting the revetment between these two groynes? The borough surveyor, Mr. G. H. Hamby, said that for some reason which they could not fathom the sea broke in at this spot particularly, and it was with the object of protecting the sea wall at its apparent weakest part that

the revetment was suggested, as they had found good had resulted from a revetment they had put down opposite the Esplanade proper. The inspector: I suppose if those groynes had been in sand they would have lasted considerably longer? The borough surveyor: Oh yes, no doubt.

**Northampton T.C.** (May 16th. Mr. M. K. North).—£2,000 for the extension of water mains.—The town clerk, Mr. H. Hankinson, stated that it had been the practice of the council to ask for sanction to borrow money for the extension of the mains from time to time. The last occasion that the sanction of the Local Government Board was asked was in 1906, and £2,000 was borrowed. This sum had now been substantially exhausted. The average actual expenditure was about £330. The inspector said it was the practice of the Local Government Board only to grant loans which would be spent in the ensuing three years. Mr. Hankinson explained that they now had an estate which was being developed, and sanctioned by the committee, which, if developed fully at once, would mean an expenditure of £900. The Inspector: Then I may take it that the money is likely to be spent within the next three years? Mr. Hankinson: Certainly. It was requested that the loan should be extended over thirty years.

**Nottingham T.C.**—A sum of £18,000 has been handed over to the rates from last year's tramway profits, and £4,163 has been carried to the reserve fund.

**Ossett T.C.** (May 15th. Mr. F. O. Stanford).—£7,193 for the following works: Sewage disposal at Ossett Spa, £3,453; sewerage at Gawthorpe, £1,450; surface water drainage at Gawthorpe, £200; new road to the Church-street refuse destructor, £600; underground conveniences in the Market-place, £450; and water supply works, £1,040. In the absence through illness of the town clerk, the case for the corporation was presented by the borough accountant, Mr. W. M. Oddie, and the borough surveyor, Mr. H. Holmes. There was no opposition to the application.

**Poole T.C.** (May 9th. Mr. W. O. E. Meade-King).—£750 for the acquisition of land at Lilliput-hill, Parkstone, for the purposes of a pleasure ground; £750 for the reconstruction of the fish market on the quay; and £100 for the reconstruction of the sanitary conveniences at the Poole Public Library.—It was stated that the price of the land to be purchased for a recreation ground worked out at £200 per acre. As to the fish market, the building was old and inconvenient, and in regard to the reconstruction of the library conveniences, it was stated that it was proposed to put the urinals, which were at present inside the external walls, outside, and thus prevent the unpleasant smells which now arose.

**Southampton T.C.** (May 7th. Mr. W. O. E. Meade-King).—£660 for the extension of soil and storm-water sewers in Shirley-avenue and St. James-road.—The town clerk, Mr. R. R. Linthorne, and the borough engineer, Mr. J. A. Crowther, gave the necessary particulars to the inspector.

**Thornton (Lancs) U.D.C.** (May 9th. Mr. M. K. North).—£1,905 for works of private street improvements and £323 for the widening and improvements of certain public streets in the district.—Answering the inspector, Mr. H. Fenton, the surveyor, said that the larger sum was for improvements to West Drive, Cleveleys, upon which new houses had been built on both sides. Kerbs and channels had been laid, and would want relaying, and the road had been sewered the full length. It was a private street, and they intended to do the work by contract. In time to come West Drive would become one of the most important thoroughfares in the district, as it would open up two portions of the district between Fleetwood and Thornton. Gas and water mains had been laid, and the sewer was a 12-in. one, and in good order, but it only took storm water from the roofs of houses and backyards.

### APPLICATIONS FOR LOANS.

**Abingdon T.C.**—£1,000 for improving the Wootton water supply.

**Acton U.D.C.**—£9,400 for tar-macadam paving works.

**Annfield Plain U.D.C.**—£14,400 for the erection of sixty dwellings.

**Brynmawr U.D.C.**—£1,100 for the provision of public offices.

**Budleigh Salterton U.D.C.**—£100 for road-widening purposes.

**Dover T.C.**—£575 for widening St. James's-street.

**Egham U.D.C.**—£3,000 for hospital extensions.

**Fylde Water Board.**—£3,000 for the purchase of land and provision of workshop and meter-testing premises.

**Maldon T.C.**—£5,280 for workmen's dwellings.

**Okehampton T.C.**—£800 for the purchase of a site for a town hall.

**Ossett T.C.**—£805 for stores, motor-engine house and storekeeper's house.

**Thanet R.D.C.**—£450 for sewerage works.

### LOANS SANCTIONED.

**East Ellloe R.D.C.**—£5,092 for the provision of cottages.

**East Ham T.C.**—£658 for works of sewerage.

**Hoylake and West Kirby U.D.C.**—£700 for a motor wagon and trailer for scavenging purposes.

**Maidenhead T.C.**—£1,226 for surface-water drainage works.

**Maldon T.C.**—£400 for street improvement purposes.

**Maldens and Coombe U.D.C.**—£413 for purposes of the public offices, fire-station, and mortuary. An item of £12 10s. for electric lamps was not sanctioned, the Board considering that the cost of these articles could not be defrayed out of loan moneys.

**Oundle U.D.C.**—£900 towards the cost of widening North Bridge.

**Pewsey R.D.C.**—£310 for the water scheme.

**Rowley Regis U.D.C.**—£1,130 for the sewerage scheme.

**St. Colomb R.D.C.**—£300 for sewage disposal works.

### FORTHCOMING INQUIRIES.

| JUNE. | £ |
|---|---|
| 3.—**West Ham.** For depot and street purposes (Mr. Edgar Dudley) ... ... ... ... | 4,325 |
| 4.—**Barnet.** For sewage disposal works (Mr. A. G. Drury) ... ... ... ... ... | 7,492 |
| 4.—**Barnoldswick.** For the extension of the waterworks (Mr. H. Shelford Bidwell) ... | 4,162 |
| 4.—**Hayes.** For sewage disposal works (Major C. E. Norton) ... ... ... ... ... | 4,400 |
| 4.—**Heston.** For the purchase of land for a school (Mr. Edgar Dudley) ... ... ... | 2,880 |
| 4.—**Hexham.** For sewage disposal works (Mr. A. W. Brightmore) ... ... ... ... | 3,600 |
| 4.—**Saffron Walden.** For the erection of a water tower (Mr. A. A. G. Malet) ... ... | 2,205 |
| 4.—**Swansea.** For park and paving purposes (Mr. M. K. North) ... ... ... | 2,602 |
| 4.—**Workington.** For alterations to Carnegie Hall (Mr. R. H. Bicknell) ... ... ... | 1,500 |
| 5.—**Ammanford.** For the erection of a retaining wall (Mr. M. K. North) ... ... ... | — |
| 5.—**Bellingham.** For water supply purposes (Mr. A. W. Brightmore) ... ... ... | 575 |
| 5.—**Haslingden.** For street improvement purposes (Mr. R. H. Bicknell) ... ... ... | 4,500 |
| 5.—**Liverpool.** For public garden purposes (Mr. H. Shelford Bidwell) ... ... ... | 10,145 |
| 5.—**Watford.** For sewerage and surface-water drainage works (Mr. A. A. G. Malet) ... | 7,948 |
| 6.—**Aspatria.** For sewage disposal purposes (Mr. A. W. Brightmore) ... ... ... | 9,000 |
| 6.—**Basingstoke.** For the purchase of property (Mr. Edgar Dudley) ... ... ... | 1,750 |
| 6.—**Burry Port.** For works of water supply (Mr. M. K. North) ... ... ... ... ... | 850 |
| 6.—**Lambeth.** For the provision of an underground convenience (Mr. A. A. G. Malet) | 1,500 |
| 6.—**Richmond, Surrey.** For drainage, water main and baths purposes (Major C. E. Norton) ... ... ... ... ... ... | 4,817 |
| 7.—**Bournemouth.** For pleasure ground and road purposes (Mr. Edgar Dudley) ... | 9,000 |
| 7.—**Cardiff.** For street and hospital purposes (Mr. M. K. North) ... ... ... ... | 4,700 |
| 7.—**Hackney.** For the provision of a public convenience (Mr. A. A. G. Malet)... ... | 1,385 |
| 10.—**Bromley.** For private street improvement works (Mr. R. H. Bicknell) ... ... ... | 327 |
| 11.—**Rugby.** For works of water supply (Mr. R. H. Bicknell) ... ... ... ... | 225 |

# Municipal Work in Progress and Projected.

*The Editor invites the co-operation of* Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Greenwich, Leigh £5,000, Norwich £7,943, Wandsworth £10,000, Wrexham; housing and town planning—Bedwellty, Paignton; roads and materials—Falkirk, Manchester; sewerage and sewage disposal—Alsager £3,620, Batley £15,000, Benfieldside £10,000; water, gas and electricity—Cork, Cumnock.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

## ADMINISTRATION.

**Peterborough T.C.**—Acting upon the recommendation of a sub-committee, the council have decided to increase the wages of all the labourers in the borough surveyor's department, including the gangers, by a shilling a week.

## BUILDINGS.

**Barry (Glam.) U.D.C.**—The surveyor, Mr. J. C. Pardoe, has been asked to submit an estimate to the Parks and Public Works Committee of the cost of concrete sea wall, promenade, and shelter, to be erected 20 ft. in front of the existing hoarding at and around Whitmore Bay.

**Brackley T.C.**—It is proposed to provide a public swimming bath at a cost of £200.

**Dundee T.C.**—In connection with the central improvement scheme, it has been agreed to purchase property in Tally-street at a cost of £6,700.

**Forfar C.C.**—Dundee District Committee have erected a new road bridge on the highway between Dundee and Monikie, at a cost of about £2,000.

**Greenwich B.C.**—The question of providing a swimming bath at East Greenwich is engaging attention, and the desirability of constructing an open-air bath at Charlton has been referred to the Finance Committee.

**Isle of Ely C.C.**—The county surveyor, Mr. R. S. W. Perkins, having completed plans for police buildings at Ely, the tender of Mr. G. W. Heath, of March, at £1,738, has been accepted for the work of erection.

**Leigh T.C.**—It has been decided to provide a swimming bath at a cost of £5,000.

**Midhurst (Sussex) R.D.C.**—The surveyor, Mr. A. G Gibbs, estimates the cost of a new bridge at Stone Bridge, Todham, at £490. It is expected that Lord Cowdray will contribute one-third of the sum.

**Norwich T.C.**—The Visitors Committee recommend that alterations and additions be made to the asylum buildings at an estimated cost of £7,943.

**Portsmouth T.C.**—The tender of Messrs. Woods & Co., at £545, has been accepted for building a house for the engineer at the Eastney pumping station, and the tender of the same firm, at £249, has been accepted for the erection of a store and mess-room at Eastney refuse destructor.

**Stirling T.C.**—The burgh surveyor has submitted a scheme for the clearing of the east side, from 2 to 50, of St. Mary's-wynd, demolishing the old buildings, and laying off the ground as building sites. The number of tenants unhoused by the scheme would be about 100, and the houses which could be erected on the new area would be about 60. The cost of purchasing the properties, clearing the site, forming a new street, &c., would be about £6,735. The town clerk has been asked to submit a draft scheme.

**Ventnor U.D.C.**—The tender of Mr. J. Rousell, at £42, has been accepted for the erection of the Coronation shelter on the western cliffs.

**Wandsworth B.C.**—A swimming bath is to be erected at Balham at a cost not exceeding £10,000.

**Wrexham T.C.**—The borough surveyor, Mr. Lawson Taylor, has been instructed to prepare plans and estimates of the cost of constructing proposed new public abbatoirs.

## HOUSING AND TOWN PLANNING.

**Aberystwyth T.C.**—The Militia Barracks have been purchased for a sum of £2,850, and, with the sanction of the Local Government Board, they will be converted into working-class dwellings.

**Armagh R.D.C.**—It has been decided to erect seventy-six cottages, at a cost of £15,159, made up as follows: Acquisition of land, £2,227; fencing, £532; building seventy-six cottages, £11,430; legal expenses, £500; engineering expenses, £330; incidentals, £140.

**Bedwellty U.D.C.**—Tenders are to be obtained for the erection of sixty houses near Pengam.

**Bridport T.C.**—It has been agreed to build ten additional houses upon the North Allington site, and the surveyor, Mr. F. Cooper, has been instructed to prepare the necessary plans, the cost not to exceed £190 per house.

**Lurgan U.D.C.**—It has been agreed to erect a number of artisans' dwellings, at a cost of £125 per house, subject to the consent of the Local Government Board.

**Paignton (Devon) U.D.C.**—The surveyor, Mr. C. O. Baines, has been instructed to prepare a detailed report of the preliminaries necessary for a town-planning scheme, together with the cost.

## REFUSE COLLECTION AND DISPOSAL.

**Exeter T.C.**—It has been agreed to purchase, at a cost of £635, a 6-horse power engine for the haulage of house refuse.

## ROADS AND MATERIALS.

**Argyll C.C.**—The Lorne District Committee have received a letter from the county clerk intimating that the county road board and county council had given their approval to the carrying out of the works proposed to be made on the Pass of Brander-road at an estimated cost of £1,590.

**Beckenham U.D.C.**—Some of the roads in the district are being treated with Akonia for dust prevention.

**Falkirk T.C.**—The council have under consideration a scheme for the formation of a new thoroughfare leading from High-street to Cockburn-street, thus providing a more suitable connection between the centre of the town and the residential quarter than at present exists.

**Forfarshire C.C.**—Last week a new road at Pitairlie, in the Dundee area, formed at a cost of nearly £2,000, was opened for traffic.

**Isle of Ely C.C.**—The county surveyor, Mr. R. S. W. Perkins, has been instructed to purchase a sanitary tumbler cart for use on Whittlesey Urban District main roads at a cost of £25. £100 is to be spent in coating a length of Almshouse-street, Whittlesey, with slag tar macadam, and £75 is to be spent on the footpath on the north side of the main road in Thorney.

**Manchester T.C.**—An improvement scheme is at present under the consideration of the Improvement Committee. If carried out, the works will lead to the opening out of a main direct road stretching from Chapel-street, Salford, to Parr's Wood Station, Didsbury, a distance of about six miles. The proposal would, it is anticipated, lead to the development of certain parts of the city from a town-planning standpoint, and also bring about a diversion of much of the traffic from the main thoroughfares running to the east portions of the city.

**Newhaven R.D.C.**—The tender of Mr. G. Holman, of Tarring Neville, at 5s. 6d. per yard, for the supply of flints, has been accepted.

**Norfolk C.C.**—Mr. Davison, at a meeting of the Eastern Highways Committee, asked that instructions might be given that when tar-paving work was in progress sand should be generously put down so as to cause as little annoyance to the public as possible. Mr. Mornement said he thought the county surveyor would agree with him that the too liberal use of soft sand did away largely with the benefit of the tarring. The county surveyor, Mr. T. H. B. Heslop, said that it was undoubtedly best to have no application of silt whatever. In that way the tar lasted longer, and did not make such a sticky mess in the autumn. In the circumstances some silt had to be used, but he had told the men not to lay it on too liberally, and wherever crossings had to be made to put it on so that the public suffered as little as possible. However, there must be grievances occasionally.

**Perthshire C.C.**—It was stated on Saturday, at the meeting of the Highland District Committee, that the proportion of the county grant from the Road Board was £418 which is to be included in the sum of £557 to be expended in tar-spraying and tar-grouting the main trunk road. Last year, with a grant of £2,008, the improvement of the road to the county march was begun, but this year's share of the grant is too small to complete the work. An additional grant of £58 for tar-grouting, *ex gratia*, was also announced.

**Westminster B.C.**—It has been decided to buy the freehold interest of Nos. 1 to 5a Argyll-place for £23,500 from the University of Durham, for the Argyll-place and Noel-street improvement. A proposal by the Works Committee that the Mall approach from Charing-cross to the Office of Works' boundary should be paved with wood instead of the present macadam has been rejected.

## SEWERAGE AND SEWAGE DISPOSAL.

**Alsagar U.D.C.**—A sewage disposal scheme is to be carried out at a cost of £3,620.

**Batley T.C.**—The Sewage Disposal Committee have given general approval to plans submitted by the borough surveyor (Mr. O. J. Kirby) for the extension of the sewage works, but before the scheme is finally passed by the committee for submission to the council provision of an additional amount of tank accommodation is to be made. The scheme provides for the construction of a range of contact beds between the existing beds near Bradford-road and the railway line at the rear. Powers will be sought for the borrowing of £15,000.

**Benfieldside U.D.C.**—The council have been for some time past considering the sewage disposal of their district, and the Durham County Council have been continually pressing them to instal new works. Last year the council invited five engineers to submit competitive designs for this work. These schemes were referred to Dr. Hill, county medical officer of health, who considered the best was that prepared by Messrs. Taylor & Wallin. The council have now accepted this scheme, and have engaged Messrs. Taylor & Wallin as the engineers for the execution of the works. The whole of the sewage will be dealt with by gravitation, and no pumping will be needed. The estimated cost of the works, including the purchase of land, will probably be between £9,000 and £10,000.

**Cardiff T.C.**—Reporting upon an application by the Llandaff and Dinas Powis Rural District Council to drain the Llandaff and Ely sewage into the corporation sewers, the city engineer, Mr. W. Harpur, says the proposal is quite practicable, and that the city sewers were quite capable of receiving and disposing of the sewage. He suggested that if an agreement is come to with the Llandaff Council, it should be on the understanding that the present sewage disposal works near the racecourse were dispensed with. After a careful calculation, he had arrived at the conclusion that 2s. 6d. per head per annum of the population would be a fair charge to make the Llandaff Council, or, in the alternative, 2s. per head, plus a rateable value upon the breweries and factories, making up the difference. These proposals are to be submitted to the Llandaff Council for consideration.

**Chapel-en-le-Frith R.D.C.**—Sewerage and sewage disposal schemes are to be carried out for Chapel-en-le-Frith, Chinley, Bugsworth and Brownside, and Fernilee, at a cost of £10,120. These schemes will form part of the scheme for which the Whaley Bridge Joint Sewerage Board was formed. The engineers are Messrs. Brady & Partington, of Chapel-en-le-Frith, and the total cost of the work is estimated at £25,000.

**Doncaster U.D.C.**—The tender of Messrs. Jonas L. Rodgers & Son, Castleford, at £4,809, has been accepted for the provision of sewerage and sewage disposal works at Edlington and Warmsworth.

**Dunfermline T.C.**—Last week the ceremony took place of cutting the first sod in connection with the construction of the large outfall sewer which is to drain Dunfermline and Rosyth. So far only one section of the contract has been let, namely, the section which is to drain Rosyth to the Firth of Forth. It is expected that the completed scheme will involve an expenditure of over £100,000. Messrs. Crouch Hogg & Easton, Glasgow, are the engineers.

**Ossett T.C.**—A scheme, designed by the borough engineer, Mr. H. Holmes, has been adopted for the drainage by gravitation to the sewage works of twenty-six cottages at the Spa. It is estimated to cost £250 in construction, and to save £160 a year afterwards.

**Portadown U.D.C.**—The General Purposes Committee have once more drawn the attention of the council to the observations of Dr. O'Brien as regards the want of a proper sewerage system for the urban district, and urged the council to take action as suggested in the report. The want of a proper sewerage system, Dr. O'Brien urged, was a most serious matter for the district. The matter is to be considered at the next meeting of the council.

**Rugby R.D.C.**—Primitive methods of scavenging were commented upon by the medical officer of health, Dr. Tangye, who wrote that the removal of refuse and night soil by individual cottagers was by no means satisfactory. At Long Lawford such matter was being buried within a dangerous distance of the public well, and both there and in other villages it would be an advantage to the general health that public scavenging should be substituted. The matter has been referred to a special committee.

**Skelmersdale U.D.C.**—The council have instructed Messrs. Taylor & Wallin (Mr. Harry W. Taylor, Assoc.M.Inst.C.E.), of Newcastle-upon-Tyne and Birmingham, to thoroughly investigate the existing system of sewers and sewage disposal works, and to advise generally upon the construction of new scheme.

## WATER, GAS, AND ELECTRICITY.

**Barnstaple R.D.C.**—A plan has been prepared for a water supply at Knowle, Braunton, which has been referred to the Braunton Parish Council.

**Birmingham T.C.**—The reports of the trading departments carried on by the corporation show a considerable growth from the gas department. The sum paid to the credit of the improvement rate is £75,621, fully £3,000 in excess of last year. The surplus from the electricity department is £20,000, an increase of nearly £5,000, while the tramways department is transferring for the relief of the rates a sum of over £46,000. The water department makes a call on the rates of £65,000, a slight decrease.

**Brampton R.D.C.**—The council have accepted the scheme prepared by Messrs. Taylor & Wallin (Mr. Harry W. Taylor, A.M.I.C.E), of Newcastle-upon-Tyne and Birmingham, for the water supply of the parish of Talkin, Cumberland. The water will be taken from the mains of the council's large scheme, also carried out by Messrs. Taylor & Wallin, and conveyed through the village to a pressure-maintaining tank.

**Bridlington T.C.**— The Finance Committee recommend the council to purchase the undertaking of the Bridlington Gas Company. The total share capital and loan capital amount to £47,147.

**Carrickfergus U.D.C.**—The council have approved the report and recommendation of a special committee who advised an installation of Candy filters. The committee state that to deal with the Loughmorne supply, one 6-ft. diameter filter and chemical apparatus would be sufficient, and these could be placed on the main of St. Bride-street without reducing the supply to any appreciable extent. The cost of the filter and chemical apparatus would be £372. In addition, the council would have to provide the house and make connections, which the committee estimated at a total cost of £500.

**Cork T.C.**—The council have under consideration a report on the water supply and requirements prepared by Mr. Sandeman, recommending, *inter alia*, the appointment of an engineering assistant to the city engineer, Mr. J. F. Delany, the construction of two new reservoirs, and a filter-bed for 1,500,000 gallons, and the appointment of twelve water inspectors.

**Cumnock T.C.**—It has been agreed to increase the water-storage capacity by at least 3,000,000 gallons, and Mr. Allan Stevenson, Ayr, has been appointed engineer to superintend the carrying out of the work.

**Driffield R.D.C.**—A water supply scheme for Nafferton, which cost £3,600, was formally opened last week. The scheme was prepared by Messrs. Fairbank & Son, of York.

**Exeter T.C.**—The working of the water undertaking for the past year shows a profit of £1,292.

**Margam (Glam.) U.D.C.**—The scheme of Mr. Frank Jones, engineer, for the provision of gasworks, has been approved, and the clerk has been instructed to get tenders for the borrowing of £55,000 for the undertaking.

**Porthcawl U.D.C.**—It was resolved at a meeting on Wednesday to apply to the Local Government Board

for immediate sanction to an increased loan for the purpose of enlarging the new service reservoir now in progress of construction to a capacity of 1,000,000 gallons.

**Rugeley U.D.C.**—Mr. Charles Balbiani, electrical engineer of Birmingham, has prepared an electric lighting scheme for the town, which provides for a system of underground mains in the principal streets, and an overhead system in the less used streets of the town. The system of generation proposed is by means of oil engines of the refined paraffin type. The estimated cost is stated as £4,243, in addition to which will be added the cost of a Local Government Board inquiry and the Board of Trade Order, bringing up the total cost to about £5,000. The total generation costs per annum are estimated at £207, and it is expected that the result of the first year's working will be a loss of £17, after which a profit will be made each year.

## MISCELLANEOUS.

**Hampstead B.C.** Nine horses have been purchased for road work at a cost of £628.

**Ripley U.D.C.** An acre of land near Market-place is to be purchased for £200 for the purpose of securing an easement for the cottage hospital, and providing a depot for the council's horses and vans.

**South Shields T.C.**—The returns of the South Shields tramways for the past year show that the gross profit was £14,505, and the nett profits, after paying redemption of capital, interest, &c., £5,663, or 17·2 per cent on the turnover, an increase of £3,319. The total revenue increase was £3,172, and there was a decrease in the working expenses of £66. The passengers numbered 8,032,488, an increase of 756,670.

**Waterford C.C.**—Coast erosion has had some startling results in Waterford. The village of Ardmore, one of the most picturesque seaside hamlets in the country, is menaced by the ocean. The county surveyor has reported to the Waterford County Council that the rate of advance of the sea appears to average 6 ft. per annum, though, of course, it may be much more in any one year. "It is evident," writes the surveyor, "that unless some measures are taken to protect it the village is doomed." He advises as defence works a number of groynes on the Case system, such as has been successfully used at Youghal. Estimates for three classes of construction have been submitted to the county council, which has referred them to the Law and Finance Committee. The lowest is £1,450.

## PERSONAL.

Mr. J. A. Brodie, the Liverpool city engineer, who is one of the commission of three sent out by the Government to advise as to the laying out of Delhi, the new capital of India, has (says the *Liverpool Post*) written a letter home which shows that good progress is being made with the work of welding the sanitary and architectural ideas of the West with the corresponding features of the East.

Mr. E. H. Capon, engineer and surveyor to the Epsom Urban District Council, and Mr. A. Harrison, the borough surveyor of Southwark, were among those who, on Whit Monday, assisted Mr. C. H. Cooper, the borough surveyor of Wimbledon, in allocating the awards to drivers and others in connection with the highly successful carthorse parade organised by the Wimbledon Highways Committee.

Mr. A. Ernest Prescott, borough engineer of Eastbourne, has been appointed to represent the Institution of Municipal Engineers at a meeting of the Engineering Standards Committee, to be held on June 19th, at the Surveyors' Institution. The Engineering Standards Committee have been requested by the Road Board to consider the question of the standardisation of road material with a view to ascertaining in what directions standardisation may most usefully proceed. The conference will be held under the chairmanship of Sir John Wolfe Barry, chairman of the Engineering Standards Committee.

Mr. R. D. Brown, ASSOC.M.INST.C.E., city engineer of St. Catharine's, Ontario, received his early training in the borough engineer's office at Clydebank, Scotland. After four years there he spent seven years as assistant to the city engineer of Glasgow, and was employed under Mr. W. C. Easton, B.SC., M.INST.C.E., engineer on the construction of the Glasgow main drainage works for the purification of the Clyde, which took some ten years to complete. Leaving corporation service, Mr. Brown took up an appointment with the Considere Construction Company, Limited, of Westminster, and was responsible for the Dunblane Bridge (105 ft. span over the Allan Water) and a steamboat wharf on an exposed part of the coast. On the completion of these contracts he went to Canada, and, after a few months under the city engineer of Toronto on flood-relief problems, received his present appointment. Mr. Brown is also an associate member of the Institution of Municipal Engineers, the Geological Society, and the Sanitary Association of Scotland, and served two years as a member of council of the Glasgow Association of Civil Engineers.

## ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

### VISIT TO CLASCOW SEWAGE WORKS.

By kind permission of the convener (Bailie P. G. Stewart) and members of the Sewage Committee, a visit of inspection will be paid to Dalmuir and Shieldhall sewage works on Saturday, June 8th. Mr. Thomas Melvin, general manager, will conduct the party over the works.

PROGRAMME.

11.50 a.m.—Train leaves C.R. Central Station, low level, for Dalmuir. The party will be met and conducted to the works, where explanatory memorandum by the city surveyor and copy of annual report will be presented to each visitor.

1.30 p.m.—S.S. "Dalmuir" leaves for Shieldhall Works.

2 p.m.—Inspect Shieldhall Works.

3 p.m.—Tea will be served in the committee-room. Votes of thanks.

3.30 p.m. Car to Paisley-road Toll for inspection of Kinning Park pumping station, thence forward by car to Argyle-street.

Members intending to be present must give notice prior to June 1st, so that arrangements can be made for their attendance.

### VISIT TO WAKEFIELD SEWAGE DISPOSAL WORKS.

By kind permission of the corporation and the city surveyor (Mr. J. P. Wakeford, ASSOC.M.INST.C.E.), a visit will be paid to Wakefield on Saturday, June 15th.

PROGRAMME.

2.30 p.m.—Assemble at the town hall.

2.45 p.m.—Proceed to the sewage works, over which the visitors will be conducted by the city surveyor, Mr. J. P. Wakeford, assisted by the manager, Mr. A. Rookby Ward. Mr. Wakeford has promised to prepare a brief description of the method of treatment, &c., and the alterations involved in the remodelling of the works, copies of which will be supplied to visitors.

5 p.m. Tea will be provided by kind permission of the chairman and members of the Works Committee.

Members intending to be present must notify the district secretary on or before Wednesday, June 12th, so as to complete arrangements.

### JOINT MEETING AT SOUTHALL-NORWOOD AND HANWELL.

By kind permission of the Southall-Norwood and Hanwell Urban District Councils the members will have the privilege of visiting and inspecting these sewage disposal works. Mr. S. W. Barnes, ASSOC.M.INST.C.E., will give a description of the Hanwell works, and Mr. Reginald Brown, ASSOC.M.INST.C.E., F.S.I., &c., will give a description of the Southall-Norwood works.

PROGRAMME.

2.30 p.m. Meet at Boston-road entrance to sewage works, Hanwell, where the party will be met by Mr. Barnes and Mr. Brown, and proceed to visit works. After inspection of the works the party will adjourn to the town hall, Southall, where tea and light refreshments will be provided, and a paper will be given by Mr. Reginald Brown, ASSOC.M.INST.C.E., F.S.I., &c., engineer to the Southall-Norwood Urban Urban District Council, on "Fixed Sprays *versus* Revolving and Travelling Sprinklers."

Members intending to be present must notify the hon. district secretary on or before Wednesday, June 19th.

**Tar-spraying on Main Roads.**—The annual report has been issued of the West Riding District Councils Association, which has now a membership of 108 urban and rural authorities. It states that considerable dissatisfaction exists with the practice of the West Riding County Council in requiring the district councils to bear one-third of the cost of tar-spraying on main roads. "The Committee," the report continues, "consider this arrangement decidedly unfair, as it imposes on individual districts a burden which ought to be spread over the whole county area. It has been proved that tar-spraying, if efficiently carried out, lengthens the life of the road surface, does away with the dust nuisance, and reduces the annual cost of maintenance, and the committee are unanimously of opinion that the whole cost of the work should be debited to road maintenance account, and, in the case of main roads, defrayed by the county council. Correspondence has taken place with the county council on this matter, but the West Riding Highways Committee have refused to receive a deputation to lay the views of the district councils before them, on the ground that they hope shortly to be able to arrive at an arrangement with the Road Board which will result in some relief to the Riding generally. It is obvious, however, that any arrangement between the Road Board and the county council can have no bearing on the statutory duty of the county council to pay the actual cost (assuming it to be reasonably and properly incurred) of the maintenance, repair and reasonable improvement of the main roads during any year."


## FOR OTHER ADVERTISEMENTS

See End of Paper.

BOROUGH OF CAMBERWELL.

TO ROAD CONTRACTORS AND OTHERS.

The Council invite Tenders for Kerbing, Channelling, Foundations for Asphalte Paving and Roadwork in the following New Street—viz.:—

Red Post-hill (between North Dulwich Station and Beckwith-road).

Specifications and Form of Tender can be obtained from Mr. William Oxtoby, Borough Engineer, Town Hall, Camberwell, S.E., and Tenders must be delivered on or before Monday, June 10th, not later than 6.30 p.m.

C. WILLIAM TAGG,
Town Clerk.

BOROUGH OF NUNEATON.

Applications are invited for the post of Building and Drainage Inspector. Salary, £90 per annum, rising by three annual increments to a maximum of £110 per annum, with £2 10s. as bicycle allowance.

Previous municipal experience desirable.

Applications must be made on the prescribed form, which will be forwarded on receipt of a stamped addressed foolscap envelope, and must be delivered to the undersigned, endorsed "Building Inspector," not later than 12 o'clock noon on Wednesday, the 12th prox.

Canvassing in any form will disqualify.

F. C. COOK,
Borough Surveyor.

Council Offices,
Nuneaton.
May 28th, 1912.

COUNTY COUNCIL OF WEST SUFFOLK.

MAIN ROADS.

Tenders are invited for the Supply of Broken Material to be delivered at Railway Stations and Wharves in the County during the year ending March 31st, 1913.

Conditions of Contract, with Specification and Form of Tender, may be obtained on application to the undersigned.

Tenders, endorsed "Road Contracts," are to be in the hands of

A. TOWNSHEND COBBOLD, Esq.,
Clerk of the County Council,
Shire Hall, Bury St. Edmunds,

by 10.0 a.m. on Monday, 24th day of June, 1912.

W. LIONEL JENKINS, A.M.I.C.E., P.A.S.I.,
County Surveyor.

County Surveyor's Office,
Shire Hall,
Bury St. Edmunds.


## MUNICIPAL WORK IN SHANGHAI.

### ENGINEER'S REPORT.

Further extensive experiments in road construction have, according to the last report of the engineer and surveyor to the municipality, Mr. Charles H. Godfrey, been carried out in Shanghai, mostly with bituminous binders in place of the usual binding of Soochow sand and water. The chief difficulty to be contended with in Shanghai is the great range of temperature, varying from 168 F. in the sun to 10·5 in the winter. A compound that is sufficiently "stiff" to prevent its becoming soft and "sticky" in the hot summer months must contain such a large proportion of pitch that in the cold, frosty weather it is liable to crack and cause disintegration of the road, and the necessary repairs entailed are difficult to effect in the cold weather. The most satisfactory results have been obtained with material prepared in the depot, and brought on to the work ready for use. This, however, increases the cost of work, on account of the additional haulage of materials to and from the depot. Mr. Godfrey states that the alternative to this method is to put the stone direct on the road and grout it with a bituminous binder. He adds: "This is successful when the work is carried on during a prolonged spell of hot weather, but even one shower of rain may have a very injurious effect upon the ultimate life of the road, as it is difficult to ensure dryness of the lower layers of stone once they have been saturated with water, and dryness is absolutely essential. When the material is prepared in the depot, the stone is heated in order to drive off the moisture, and hot tar is applied to the stone immediately. Once the stone has been so treated it is impervious to moisture, but even in this case dry weather is essential for the laying and rolling of the material."

Mr. Godfrey says the advantages and disadvantages of bituminous roads enumerated in the report for 1910 have, generally speaking, been borne out by observations during the last twelve months. He thinks the advantages are not as substantial as they would be if the use of bituminous roads were more extensive. At present the experimental sections are in isolated position and adjoining ordinary water-bound macadam roads; consequently the mud and dust from the old roads are carried on to the new roads by the traffic. Traffic conditions in Shanghai are also severe, due not only to the number of vehicles, but also to heavy loads carried on narrow tyres, particularly in the case of wheelbarrows and handcarts.

Two tar sprayers have been obtained during the year, and have proved very useful, particularly for spraying tarred footpaths. A hot mixture of ordinary coal tar and desiccated tar has been found to give the best results, desiccated tar alone being too dense to pass through the nozzle in a proper spray. The sprayers have also been used for tarring the surface of ordinary macadam roads, but surface tarring appears to Mr. Godfrey to be successful only on roads subject to light traffic, frequent sprays being required even on these.

Until this year the foundation of all roads consisted of broken bricks. These bricks are largely obtained from old buildings destroyed during the Taiping Rebellion. Latterly it has been difficult to obtain good bricks, and partly on this account, and partly in order to improve the method of construction, the authorities are now using stone spalls for road foundations almost exclusively.

#### BRIDGES.

The number of bridges under the control of the Engineer's Department (including bridges under construction) is now fifty-six, divided as follows: Steel bridges, seventeen; concrete bridges, eight; wooden bridges, thirty-one. In addition to the above there are 151 culverts, mostly of concrete, varying in span from 3 ft. to 12 ft.

The structure known as the Bund Bridge is being replaced by a three-hinged reinforced concrete arch of 45 ft. span and 100 ft. in width. In order to interfere as little as possible with traffic it was arranged for the work to be carried out in two sections. The western section, comprising so much of the work as was clear of the old steel structure, was completed and opened to traffic early in December, and the old structure was thereupon dismantled. The reinforced concrete piles for the bridge were made by convict labour. A contract for the remainder of the work was made in May. It is to be hoped that the con-

pletion of the bridge and the inauguration of a through tramway service will minimise the hindrance to traffic now caused by standing cars.

MILEAGE OF ROADS AND FOOTWAYS.

The mileage of roads under the control of the council is a little over 110 miles, made up as follows: Macadamised, sixty-five; paved, nineteen; unmetalled, twenty-six. Of paved footways there are eighty-one miles, and of unpaved twelve miles, a total of ninety-three miles.

WATER SUPPLY.

The consumption of water for municipal purposes during the year covered by the report is stated to be as follows: Watering roads on 315 days, 296,947 cartloads, 10,358,870 gallons; police stations, abattoirs, markets, latrines, &c., 44,013,000 gallons; electric light works, 2,173,000 gallons; making roads, steam rollers and washing carts, 4,795,794 gallons; sanitary purposes, 480,000 gallons; used at fires, 3,259,534 gallons. This gives a total of 117,080,198 gallons, or a daily average of 320,767 gallons.

PUBLIC LIGHTING.

The most notable feature of the public lighting during 1911 was the extended use of high-power metallic filament lamps in place of enclosed arcs. The engineer to the municipality points out that whilst an enclosed arc gives a good local light there is very little diffusion, and the substitution of a larger number of metallic filament lamps erected at closer intervals, in addition to being more economical, has been found to give better results than arc lamps at rather larger intervals. Mr. Godfrey considers that the enclosed arcs should be considered as an obsolete type which it is advisable to replace as occasion offers.

High-pressure gas lamps have been erected in several roads, and, so far as can be judged from the short period they have been in use, they are satisfactory. It should be noted, however, that the gas lamps so far erected are carried on a vertical column placed near the kerb-line, and this, no doubt, seriously interferes with their lighting value in roads which contain telephone and electric light poles and similar obstructions.

NEW BUILDINGS.

The report mentions that during 1911 permits were issued for the erection of 1,253 houses, as against 2,367 in 1910.

REINFORCED CONCRETE.

In concluding his report, Mr. Godfrey recalls that the Municipal Council voted a sum of money as a grant to the Shanghai Society of Engineers and Architects for the purpose of inquiry into the use of reinforced concrete, having regard to local conditions, and quotes the following statement which has been made to him in regard to the matter:—

"A great many varieties of sand and stone have been obtained from various localities in the vicinity of Shanghai, whilst any cement required has been generously supplied by several local firms. Over 600 compression tests of concrete, with varying aggregate and material, have been made to enable the best mixture to be determined for reinforced concrete beam tests. An interesting series of tensile tests of iron and steel bars procurable on the local market, together with some high carbon steel bars made locally, have been made and tabulated, so that we are now in a position to settle upon the best material for further experiments. Beams are being prepared to enable a decision as to the most economical and useful size for experimental purposes to be arrived at. A simple and efficient machine has been designed for beam testing, and is now ready for use. The committee is now on a fair way to obtain useful local data, which will be of value to the community."

**Profits of Leeds Tramways.**—The past year's working of the Leeds Corporation tramways resulted in a nett surplus of £61,163, which will be available for relief of the rates.

**Road Making in Burma.**—The Burmese Government, says an American consular report, intends to spend £200,000 a year for ten years in improvements of roads in the province. Burma will then possess, in addition to the 1,673 miles of metalled roads already existing, which would be brought up to a first-class standard, about 1,100 miles of main routes. In all Burma there are at present only about 100 miles of road capable of bearing the strain of motor traffic.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President*—Mr. ALBERT D. GREATOREX, M.INST.C.E., Borough Engineer and Surveyor of West Bromwich.

### SCOTTISH DISTRICT MEETING AT STIRLING.

(June 7th and 8th.)

PROGRAMME.

*Friday, June 7th.*

11 a.m.—Reception in the Albert Hall, Stirling, by Provost Bayne and the magistrates of Stirling.

11.10 a.m.—District business.

11.30 a.m.—Discussion on paper (which will be taken as read) entitled, "The Municipal Works of Stirling," by Mr. A. H. Goudie, burgh surveyor, Stirling.

12.15 p.m.—Discussion on paper (which will be taken as read) entitled, "Work Carried Out in Central Stirlingshire under the Road Development Grant," by Mr. D. F. Cox, county road surveyor.

1 p.m.—Luncheon, provided by Stirling Town Council.

2 p.m.—Inspection of burgh works, &c., and county improved roads and quarry.

Mr. Morris, town clerk, Stirling, has kindly consented (should a sufficient number so desire) to conduct members and their lady friends through the Castle and upper part of the town, and point out and describe the buildings of historical and antiquarian interest.

6.30 p.m.—Annual dinner, Golden Lion Hotel, tickets 5s. each.

*Saturday, June 8th.*

Circular tour by motor char-a-banc from Stirling to Lochearnhead, *viâ* Callander and Strathyre, and returning by St. Fillans, Comrie and Crieff.

The following is the probable time table of the tour:—

9.30 a.m.—Leave Stirling, Golden Lion Hotel.
12.30 p.m.—Lunch at Lochearnhead Hotel.
1.30 p.m.—Leave Lochearnhead Hotel.
3.15 p.m.—Afternoon tea, Drummond Arms Hotel, Crieff.
3.45 p.m.—Leave Crieff.
5.45 p.m.—Arrive Stirling.

Tickets for the tour, including lunch, 8s. 6d. each (exclusive of tea at Crieff, which can be arranged personally), can be obtained from the honorary district secretary. Those intending to make the tour should intimate their intention at least a week before the date.

DAVID RONALD,
Falkirk, N.B. *Hon. District Secretary.*

The following meetings have also been arranged:—
June 1st.—Council meeting.
June 15th.—East Ham.
June 22nd.—Lowestoft.
June 29th.—Bridlington.
July 6th.—Stourbridge.
July 11th—13th.—Annual meeting, London.

THOMAS COLE,
11 Victoria-street, S.W. *Secretary.*

**A Garden City Scheme at Sheffield.**—The Sheffield City Council recently moved further towards the realisation of the garden city proposal in the Valley of Rivelin. Some years ago the corporation purchased land bordering the Rivelin River for a length of about 3½ miles. Later they constructed a road along the foot of the valley for the whole of its length. This work was carried out during the last long cycle of severe bad trade by the unemployed workmen of the city, and now provides an ideal route from the city to some of the finest scenery of Derbyshire. The cost of the estate altogether was over £60,000, nearly half of which was spent on the making of the road. The estate is now to be developed. Land is offered for sale or may be leased; the purchase money may be paid either in lump sum or by a deposit of 20 per cent, the purchase being completed in from five to fifteen years, subject to 4 per cent interest. The houses to be erected are to be single, semi-detached, in groups of three and not more than four, and the number per acre must not exceed twelve. Each detached house, inclusive of fences and laying out of grounds, must cost not less than £250, and must be of good design and architectural appearance.

## INSTITUTION OF WATER ENGINEERS.

### SEVENTEENTH SUMMER GENERAL MEETING.

The seventeenth summer general meeting will be held at Cheltenham on Thursday, Friday and Saturday, the 6th, 7th and 8th of June, under the presidency of Mr. J. S. Pickering, M.INST.C.E., borough surveyor and water engineer. The meetings will be held in the town hall, and at the opening of the proceedings on Thursday, June 6th, the institution will be welcomed to Cheltenham by His Worship the Mayor (Councillor C. H. Margrett, J.P.) The programme will include the presentation of premiums awarded by the council for papers presented during the year 1911, as well as other business of special interest to members, so that a large attendance is confidently anticipated.

PAPERS AND COMMUNICATIONS.

The following papers have been promised for reading and discussion at this meeting:—

(1) "The New Waterworks for Skegness," by Percy Griffith, M.INST.C.E. (held over from the last winter meeting).
(2) "The Rating of Water Undertakings," by Donald Dinwiddy, F.S.I.
(3) "The Rating of Water Undertakings," by Arthur Valon, ASSOC.M.INST.C.E.
(4) A discussion upon the desirability of standardising the "General Conditions of Contracts" will be introduced by Harold W. Woodall, M.INST.C.E., water engineer, Bournemouth.
(5) "The Hinckley Waterworks," by E. H. Crump, ASSOC.M.INST.C.E.
(6) "The Gloucester Waterworks (Whitcombe Reservoirs)," by R. Read, ASSOC.M.INST.C.E., city engineer.
(7) "The Use of Sulphate of Copper in Purifying Water Supplies," by Geo. Embrey, county analyst of Gloucestershire.
(8) "The Self-pollution of Water by Natural Growths," by Dr. J. H. Garrett, medical officer of health, Cheltenham.
(9) "The Geology of Cheltenham, with Special Reference to the Water Supply," by L. Richardson, F.R.S.(ED.), F.L.S., F.G.S.

NOTE.—Papers (2) and (3) will be discussed together.

The president-elect, Mr. J. S. Pickering, will deliver his presidential address on Thursday, June 6th, and will also supply a description of the Cheltenham Corporation waterworks. Dr. Samuel Rideal will give a few descriptive notes on the pre-filtration process now being introduced at the Tewkesbury works.

VISITS TO WORKS.

On Thursday afternoon a visit will be made to the Tewkesbury waterworks of the Cheltenham Corporation, including pumping station, new pre-filtration plant, &c.

On Friday afternoon a visit will be made to the Dowdeswell reservoir and filters, also the Hewletts reservoirs of the Cheltenham Corporation waterworks.

On Saturday afternoon a visit will be made to the Whitcombe impounding reservoirs and filtration works of the Gloucester Corporation waterworks.

SOCIAL FUNCTIONS.

The annual dinner will be held at the town hall on Friday evening, June 7th, when the Mayor of Cheltenham and other distinguished guests of the institution will be present.

On Thursday evening members and their friends are invited by the Town Improvement Committee to attend at Montpellier Gardens from 8 p.m. till 10 p.m., when a concert will be given by the Munster Fusiliers.

On Friday afternoon members and their friends are invited by the Mayor of Cheltenham to attend a garden party in Pittville Park, from 5 p.m. to 6 p.m.

Tea will be provided on Thursday afternoon at the Tewkesbury pumping station, and on Saturday afternoon at the Gloucester waterworks.

The manager of the light railway company has arranged for members and their friends to have free use of the tram during the meeting, on presentation of programme card.

Admission to the public parks and gardens may be obtained free during the meeting on presentation of programme card.

PERCY GRIFFITH,
*Secretary.*

54 Parliament-street, S.W.

## INSTITUTION OF MUNICIPAL ENGINEERS.

*President*—Mr. E. A. STICKLAND, ASSOC.M.INST.C.E., Borough Surveyor, Windsor.

### COUNCIL MEETING.

At a meeting of the council on May 22nd the following applicants were recommended for admission:—

To Associate Membership: Messrs. Thomas Knight, 27 Tanza-road, Hampstead, N.W.; Frank A. Jupp, town surveyor's office, Shoreham-on-Sea; T. S. Soorma, 16 Prescot-drive, Liverpool; and Francis Heath, Warsop, Mansfield.

Transfer to Associate Membership: Messrs. F. A. Rawlin, King-street, Hoyland, near Barnsley, and W. E. Johns, surveyor's office, Cheadle Rural District Council.

(Under the new by-laws these elections will be ratified at the next council meeting if no written objections are lodged within fourteen days.)

NEW MEMBERS, &C.

From the applicants recommended for admission at the last meeting four members and four associate members were elected.

CONFERENCE ON ROAD MATERIAL.

In response to a request from the Engineering Standards Committee, the council appointed a representative to attend the suggested conference.

PREMIUMS.

It was decided that a premium of two guineas be awarded annually for the best original paper read by a member or student before meetings of the institution. The president announced that he would present a similar premium this year.

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A meeting will be held on Wednesday, June 12th, at the London Aerodrome, Hendon, N.W. (by the courtesy of Mr. C. Grahame-White and the directors of the Grahame-White Aviation Company, Limited), at 2.45 p.m., when the following papers will be presented for discussion:—

"THE STRUCTURES OF THE FUTURE IN RELATION TO AVIATION,"

By Horace Cubitt, A.R.I.B.A., P.A.S.I. (Member).

"SOME SUGGESTIONS FOR BY-LAWS AND REGULATIONS IN RELATION TO AVIATION,"

By B. Wyand, secretary of the institution.

The discussion will be open, and many prominent engineers (other than members of the institution) and aviators have signified their intention of taking part in it.

PROGRAMME.

1.45 p.m.—Meet at Charing Cross, on the steps of St. Martin's Church (see Note below).
2 p.m.—Motor vehicles leave Charing Cross.
2.45 p.m.—Arrive at London Aerodrome.
3 p.m.—Meeting for the discussion of the above papers, which will be taken as read.
4.15 p.m.—Tour of inspection of the hangars, workshops, and other buildings, when an opportunity will be afforded of examining many of the most modern types of aeroplanes. It is hoped that Mr. Claude Grahame-White will be able personally to conduct members round the aerodrome.
5 p.m.—Adjourn to the grounds, where exhibition flights will be given (weather permitting).
6.30 p.m.—Motor vehicles leave for Charing Cross. Passengers may alight at points *en route*.

Arrangements have been made for private motor vehicles to convey members and their friends from Charing Cross to the Aerodrome and back, at an inclusive charge of 1s. 6d. per head. This amount must, in every case, be sent to the secretary when applying for ticket of admission, and not later than Thursday, June 6th.

NOTE.—Members are requested to note that admissions on tickets may be obtained independently of tickets of conveyance, as many might find it more convenient to go direct to the grounds than *via* Charing Cross. These would then meet the party at the Aerodrome at 2.45, as set forth above.

Admission to the Aerodrome will be by ticket only, and tickets, price 1s. each, may be obtained from

the secretary of the institution. Tickets and copies of papers to be presented will be forwarded as soon as the latter are in print.

Ladies are invited to attend.

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A visit will be paid to the show rooms and works of Messrs. Doulton & Co., Limited, Albert Embankment, London, on Wednesday, June 5th, at 2.30 o'clock.

Members will assemble in the show rooms at 2.30, and the processes to be seen during the round of visits will include the manufacture of drain pipes and other sanitary stoneware, fireclay stoves, architectural terra-cotta, and Doulton and other art ware.

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### COUNCIL MEETING.

The next meeting will be held on Saturday, June 22nd, at 3 o'clock.

B. WYAND,
39 Victoria-street, S.W. *Secretary.*

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**New Bridges for Reading.**—Reading Town Council have decided to spend £75,000 in erecting two new vehicular bridges and in widening the approaches between the town and Caversham, which was recently incorporated. An anonymous donor has offered £5,000 towards the cost of one of the bridges.

**Aberystwyth Housing Scheme.**—At the meeting of the Aberystwyth Town Council recently the town clerk reported the receipt of a letter from the Local Government Board with reference to the application of the corporation for permission to borrow £11,793 for the purpose of erecting a number of dwelling-houses for working people. The Board made several suggestions for improving the type of house planned, which could be let at a lower rent than the 4s. 6d. and 5s. 6d. proposed. The Board added that in order to hasten on the work they were prepared to arrange an interview at Whitehall. The council referred the letter to the Public Works Committee.

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## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

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SURVEYOR AND INSPECTOR OF NUISANCES. June 3rd.—Ottery St. Mary Urban District Council. £95—£110.—Mr. Holliday Hartley, clerk.

SURVEYOR AND WATER ENGINEER.—June 6th. Teignmouth Urban District Council. £80 per annum. —Mr. F. W. Knight, surveyor and water engineer.

QUANTITY SURVEYOR.—June 7th.—Essex County Council. £200—£250.—Mr. J. H. Goold, clerk, Shire Hall, Chelmsford.

WATERWORKS ENGINEER.—June 8th.—Diss Urban District Council.—Mr. Alfred Cooper, surveyor.

CHIEF ROAD SURVEYOR.—June 10th.—Corporation of Birmingham. £400 per annum.—Mr. Henry E. Stilgoe, city engineer and surveyor.

GENERAL FOREMAN.—June 10th.—Hitchin Urban District Council, 35s. per week.—Mr. W. O. Times, Clerk's Office.

ROAD FOREMAN. June 10th.—South Mimms Rural District Council. 25s. per week.—Chairman of the Council, 12 High-street, Barnet.

JUNIOR DRAUGHTSMAN. June 11th. Corporation of Burnley. 25s. per week.—Mr. P. Thomas, town clerk.

QUANTITY SURVEYOR.—June 11th.—Corporation of Burnley. £200 per annum.—Mr. P. Thomas, town clerk.

DISTRICT SURVEYOR.—June 12th.—East Suffolk County Council. £170—£200 a year.—Mr. A. Townshend Cobbold, clerk.

FOREMAN PAVIOR. June 12th. Corporation of Bedford.—Mr. N. Greenshields, borough engineer and surveyor.

SANITARY INSPECTOR. June 13th. Chelsea Borough Council. £120 £150 per annum.—Mr. T. Holland, town clerk.

ASSISTANT SANITARY INSPECTOR. June 14th. —Heston and Isleworth Urban District Council. £120—£150.—Mr. H. J. Baker, clerk.

## MUNICIPAL COMPETITIONS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

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LLANELLY.—June 18th.—Designs for school buildings, comprising boys', girls' and infants' departments, for the urban district council. Premium 50 guineas. —Mr. I. W. Watkins, clerk, Education Office, Coles-hill-terrace, Llanelly.

HALE.—June 28th.—Designs for a town planning scheme for the urban district council. Premiums of £50 and £25 are offered.—The Clerk.

REIGATE.—June 29th.—Plans and schemes for laying out and developing part of the Reigate Lodge estate, belonging to the town council. Premiums of 30 and 10 guineas.—Mr. Alfred Smith, town clerk.

PADIHAM.—June 30th.—Designs for town hall and baths. Premiums £40 and £20.—Mr. J. Gregson, surveyor.

DUSSELDORF.—July 1st.—Plan for the extension of the city. Premiums of £1,000 and £375 are offered. —The Chief Burgomaster.

CARDIFF.—August 6th.—Designs and estimates for fire station.—The Town Clerk.

WARRINGTON.—Plans for a public elementary school.—Clerk to the Education Committee.

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## MUNICIPAL CONTRACTS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

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### Buildings.

SALFORD. June 1st.—For the construction of an underground convenience, for the corporation.—Mr. W. Plant, engineer and surveyor.

GLASGOW.—June 1st.—For the construction of a public convenience, for the corporation.—Mr. J. Lindsay, town clerk.

MANSFIELD.—June 3rd.—For the erection of covered pig shed and iron pens, for the corporation.—Mr. T. P. Collinge, borough surveyor.

CHURCH.—June 3rd.—For the erection of public conveniences, for the urban district council.—Mr. W. Wood, surveyor.

CARMARTHENSHIRE.—June 3rd.—For the demolition of existing bridge and the erection of a new masonry bridge, and constructing embankment, for the county council.—Mr. R. Williams Jones, county surveyor.

WIDNES.—June 3rd.—For removing existing latrines and fixing extensions and additional latrines, for the corporation.—Mr. G. H. Danby, Town Hall.

SOUTHEND-ON-SEA.—June 3rd.—For the construction of an administrative block, for the corporation. Mr. E. J. Elford, borough engineer.

BURNLEY.—June 3rd.—For alterations to a council school, for the corporation.—Town Clerk.

GILDERSOME.—June 3rd.—For constructing 200 lin. yds. of dry walling, for the urban district council. —Mr. W. Wilby, surveyor.

WEST HAM.—June 4th.—For building extension to electricity generating station and coal bunkers, for the corporation.—Mr. Fred E. Hillcary, town clerk.

BARNET.—June 4th.—For the erection of twenty-two cottages, for the urban district council.—Mr. H. W. Poole, clerk.

SHILDON.—June 4th.—For building wall and supply of wrought-iron fencing and gates, for the urban district council.—Mr. M. Turnbull, surveyor.

KEIGHLEY.—June 4th.—For macadamising a school playground, for the Education Committee.—Mr. H. Midgley, secretary.

WOOLWICH.—June 5th.—For the construction of an underground convenience, for the borough council. Mr. A. B. Brysson, town clerk.

RAWTENSTALL.—June 5th.—For alteration at the market hall, for the town council.—Mr. J. Johnson, borough surveyor.

WEST HAM.—June 5th.—For the erection of refuse destructor and steam-raising plant, for the corporation.—Mr. Fred. E. Hilleary, town clerk.

LINTON.—June 5th. For the erection of two pairs of cottages, for the rural district council.—Mr. W. Richardson, clerk.

SOUTHEND-ON-SEA.—June 6th. For the construction of a new loading pier (580 ft. in length), for the corporation.—Mr. H. J. Worwood, town clerk.

MANCHESTER.—June 6th.—For the erection of a rustic shelter in public park, for the corporation.—Mr. Thomas Hudson, town clerk.

OLDHAM.—June 7th.—For the erection of a school, for the corporation.—Mr. J. H. Hallsworth, town clerk.

WEST RIDING.—June 7th.—For the erection of a school, for the Education Committee.—Mr. Francis Alvey Darwen, clerk, County Hall, Wakefield.

BEDWELLTY.—June 7th.—For the erection of sixty houses, for the urban district council.—Mr. T. J. Thomas, clerk, 36 High-street, Bargoed.

RUGBY.—June 7th.—For additions to public baths, for the urban district council.—Mr. D. G. Macdonald, engineer and surveyor.

ALTRINCHAM.—June 8th.—For the erection of thirty-two cottages, for the urban district council.—Mr. W. S. Stokoe, clerk.

SELBY.—June 8th.—For the erection of fifteen cottages, for the urban district council.—Mr. B. Gray, Council Chamber.

DERBYSHIRE.—June 10th.—For the erection of a secondary school at New Mills, for the county council.—Mr. G. H. Widdows, architect, County Education Offices, St. Mary's-gate, Derby.

MERTHYR.—June 10th.—For the erection of forty-eight workmen's dwellings, for the corporation.—Mr. T. A. Rees, town clerk.

ALTRINCHAM.—June 1t0h.—For the erection of shelter and conveniences, for the urban district council.—Mr. W. S. Stokoe, clerk.

STRETFORD.—June 10th.—For alterations and additions to town hall and erecting new baths, for the urban district council.—Mr. Geo. H. Abrahams, clerk.

EVESHAM.—June 10th.—For the erection of ninety cottages, for the rural district council.—Mr. E. H. Wadams, clerk.

HANWELL.—June 10th.—For the construction of a refuse destructor, for the urban district council.—Mr. Percy Scott, clerk.

BRIGHTON.—June 10th.—For laying a new floor in the Royal Pavilion, for the corporation.—The Borough Surveyor.

WEST HAM.—June 10th—17th.—For cleansing and repairing schools, for the Education Committee.—Mr. W. Jacques, architect to the committee, 2 Fencourt, Fenchurch-street, E.C.

MALDENS AND COOMBE.—June 10th.—For the building of an office, extension of mortuary and conversion of store, for the urban district council.—Mr. J. W. Johnson, clerk.

SWINDON.—June 10th.—For the erection of two domestic centres, for the Education Committee.—Mr. W. Seaton, secretary.

SOUTHALL-NORWOOD.—June 11th.—For the construction of an open-air swimming bath, for the urban district council.—Mr. R. Brown, engineer, Town Hall.

WARE.—June 11th.—For the erection of a brick urinal, for the urban district council.—Mr. G. H. Gisby, clerk.

LANCASHIRE.—June 12th.—For alterations and additions to council schools, for the Education Committee.—Mr. Harcourt E. Clare, clerk, County Offices, Preston.

CHESHIRE.—June 15th.—For the erection of a school at Haslington, for the Administrative Sub-Committee.—Mr. C. E. Speakman, clerk, Education Office, Crewe.

HYDE.—June 22nd.—For the erection of public hall, police courts and offices, for the corporation. Mr. Thos. Brownson, town clerk.

ESSEX.—June 24th.—For repairs and alterations to schools, for the Education Committee.—Mr. D. T. Williams, clerk.

## Iron and Steel.

CHEPSTOW. June 3rd. For the construction of fifty-six additional iron pens in the cattle market, for the urban district council.—Mr. G. W. Sargent, surveyor.

CHESHUNT.—June 7th.—For laying cast-iron and steel conduits, for the Metropolitan Water Board.—The Clerk, Savoy-court, Strand, W.C.

LONDON. June 7th.—For the supply of cast-iron pipes and specials, for the Metropolitan Water Board.—The Clerk, Savoy-street, Strand, W.C.

ASHTON-UNDER-LYNE. — June 10th. — For the supply of cast-iron pipes and special castings, with bolts, nuts and washers, for the corporation.—Mr. Fred. J. Dixon, water engineer, Town Hall Chambers.

STOURBRIDGE.—June 10th.—For supplying 400 yards of unclimbable iron fencing, for the urban district council.—Mr. F. Woodward, surveyor.

HOWRAH (India).—June 18th.—For the supply of steel pipes, cast-iron specials, sluice valves and air valves, for the municipality.—The Chairman, Howrah Municipality, India.

BELFAST.—June 18th.—For the supply of cast-iron pipes and special castings, for the corporation.—City Surveyor.

## Roads.

KINGSTOWN (Co. Dublin).—June 1st.—For laying 17,000 sq. yds. of tar or bituminous macadam, for the urban district council.—Mr. J. Sherlock Vaughan, town clerk.

BLACKROCK.—June 1st.—For laying 30,000 sq. yds. of tar or bituminous macadam, for the urban district council.—Mr. R. Finlay Heron, town clerk.

CASTLE DONINGTON.—June 1st.—For the supply of granite, slag and cartage, for the rural district council.—Mr. F. E. Burton, clerk.

ELY.—June 1st—3rd.—For the supply of machine-broken Leicestershire granite, for the urban district council.—Mr. G. M. Hall, clerk, Market-square, Ely.

MALDENS AND COOMBE.—June 3rd.—For kerbing, channelling, and paving works, for the urban district council.—Mr. J. W. Johnson, clerk, Municipal Offices, New Malden.

SUTTON-IN-ASHFIELD.—June 3rd.—For making up several streets, for the urban district council.—Mr. W. Burn, surveyor.

BILSTON.—June 3rd.—For making up and sewering, for the urban district council.—Mr. J. D. Wassell, clerk.

ROMFORD.—June 3rd.—For the supply of blue Guernsey granite, for the rural district council.—Mr. T. W. A. Greenhalgh, clerk.

HASTINGS.—June 3rd.—For the supply of broken granite, for the corporation.—Mr. P. H. Palmer, borough engineer.

HAYES (Middlesex).—June 3rd.—For work of tar-painting, for the urban district council.—Mr. D. C. Fiddler, surveyor.

ALNWICK.—June 3rd.—For the supply of hand-broken whinstone, for the urban district council.—The Highways Committee.

BATTERSEA.—June 3rd.—For the supply of 6,000 ft. of granite kerb and 200 tons of dressed granite setts, for the borough council.—Mr. W. Marcus Wilkins, town clerk.

RHYMNEY.—June 3rd.—For hire of steam roller and scarifier, and supply of granite, granite gravel and haulage, for the urban district council.—Mr. W. Lloyd Marks, surveyor.

EALING.—June 4th.—For making up part of Pitshanger-lane, for the corporation.—Mr. Geo. E. Brydges, town clerk.

LEITH.—June 4th.—For laying whinstone setts and concrete carriageway, for the corporation.—Mr. T. B. Laing, town clerk.

BRIGG.—June 4th.—For relaying tar-macadam, for the urban district council.—Mr. G. S. Sowter, clerk.

HUNSLET.—June 4th.—For making up private streets, for the rural district council.—Mr. W. B. Pindar, clerk.

PORTSLADE-BY-SEA.—June 4th.—For the supply of team labour, for the urban district council.—Mr. Ernest H. Kempe, clerk.

HOLLAND (Lincs). June 4th. For the supply of road-making materials, for the Small Holdings Committee.—Mr. E. J. A. Christie, Market-place, Boston.

HOVE. June 5th. For executing paving and laying wood paving upon present concrete foundation, for the corporation. Mr. H. Endacott, town clerk.

BIRMINGHAM. June 5th. For the reconstruction of War-lane, Harborne, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

BLYTH.—June 6th.—For the construction of two streets, for the urban council.—Mr. Robert Grieves, surveyor.

BRECON.—June 7th.—For constructing paving, kerbing and channelling, for the corporation.—Mr. G. H. Williams, town clerk.

WILLINGTON.—June 8th.—For works of levelling, paving, metalling and channelling, for the urban district council.—Mr. J. H. Gardner, surveyor.

WAKEFIELD.—June 10th.—For the execution of private street works, for the corporation.—Mr. J. P. Wakeford, city surveyor.

FAREHAM.—June 10th.—For the supply of granite, basalt, or other road stone, for the rural council.—Mr. J. F. Whitear, surveyor.

STANLEY.—June 10th.—For making up roadways, for the urban district council.—Mr. A. Routledge, surveyor.

ISLINGTON.—June 10th.—For the extension of road at cemetery, for the borough council.—Mr. W. F. DEWEY, town clerk.

HANWELL.—June 10th.—For laying 1,800 yds. of tar-paving, for the urban district council.—Mr. Percy Scott, clerk.

COLCHESTER.—June 11th.—For sewering, metalling, kerbing, channelling, paving and making good, for the corporation.—Mr. H. Goodyear, borough engineer and surveyor.

WANDSWORTH.—June 11th.—For laying wood paving and other works, for the borough council.—Mr. P. Dodd, borough engineer.

RYTON.—June 12th.—For the construction of street works, for the urban district council.—Mr. Henry Dalton, clerk.

ENFIELD.—June 12th.—For providing and laying granite kerbing, granite channelling, artificial stone paving and granite crossings, for the urban district council.—Mr. T. W. Scott, clerk.

CHILDWALL.—June 13th.—For the supply of macadam and limestone chippings, for the urban district council.—The Clerk, 22 Lord-street, Liverpool.

EPSOM.—June 17th.—For making up a road, for the rural district council.—Mr. T. R. Ware, surveyor of highways, Waterloo-road, Epsom.

EAST SUSSEX.—June 17th.—For the hire of steam rollers and scarifiers, for the county council.—Mr. Fred. J. Wood, county surveyor.

WEMBLEY.—June 18th.—For private and public street improvement works, for the urban district council.—Mr. F. W. Rodd, clerk.

LEWES.—June 22nd.—For scarifying and steam rolling, for the corporation.—Mr. Montague S. Blaker, town clerk.

### Sanitary.

RAWMARSH.—June 1st.—For the construction of sewage outfall works, for the urban district council.—Mr. J. W. Bellamy, clerk.

OAKHAM.—June 1st.—For scavenging and removal of house refuse, for the rural district council.—Mr. W. Batts, clerk.

GRANTOWN-ON-SPEY.—June 1st.—For the construction of sewage disposal works, for the corporation.—Mr. J. Wittet, surveyor, Elgin.

DUNDALK.—June 3rd.—For constructing new sewer, for the rural district council.—The Clerk.

BILSTON.—June 3rd.—For laying pipe sewers and manholes, and making up and sewering, for the urban district council.—Mr. V. Turner, surveyor.

EAST HAM.—June 3rd.—For the supply of stoneware pipes, for the corporation.—The Borough Engineer.

EPSOM.—June 3rd.—For the removal of house refuse, for the rural district council.—Mr. F. A. Pratley, surveyor.

SOUTHGATE.—June 3rd.—For the construction of land drains, for the urban district council.—Mr. C. G. Lawson, surveyor.

WOMBWELL.—June 4th.—For relaying 700 lin. yds. of 12-in. stoneware pipe sewer and manholes, for the urban district council.—Mr. Percy Milnes Walker, clerk.

BEDFORD.—June 5th.—For laying sewers, for the town council.—Mr. C. Stimson, town clerk.

BIRMINGHAM.—June 5th.—For the removal of mud, refuse, street detritus, and rubbish from wharves, for the corporation.—Mr. H. E. Stilgoe, city engineer and surveyor.

HENDON.—June 5th.—For the construction of a sewer and manholes, for the rural district council.—Mr. J. A. Webb, engineer and surveyor.

SEFTON.—June 5th.—For constructing a sewer, for the rural district council.—Mr. F. Pool, surveyor, 21 Evered-avenue, Rice-lane, Walton, Liverpool.

SEGHILL.—June 7th.—For the removal of house refuse, for the urban district council.—Mr. T. Spencer, clerk, Seghill, Northumberland.

LINLITHGOWSHIRE.—June 7th—17th.—For the construction of 2½ miles of sewers and other works, for the Bathgate District Committee.—Mr. J. G. B. Henderson, district clerk, Linlithgow.

MANCHESTER.—June 7th.—For the execution of sanitary alterations, for the corporation.—Chairman of the Drainage, &c., Sub-Committee.

CHESHAM.—June 8th.—For construction of outfall works and laying out additional land for sewage disposal purposes, for the urban district council.—Mr. Percy C. Dormer, engineer.

LANCHESTER.—June 10th.—For work of scavenging, for the rural district council.—Mr. J. R. Lupton.

GOSFORTH.—June 11th.—For constructing rainwater sewer, for the urban district council.—Mr. G. Nelson, engineer and surveyor.

SOUTHALL-NORWOOD.—June 11th.—For extensions to the sludge-press house, for the urban district council.—The Clerk.

TOWCESTER.—June 15th.—For constructing sewers and sewage disposal works, for the rural district council.—Mr. W. K. Higham, clerk.

### Stores.

CLECKHEATON.—June 1st.—For the supply of granite, dross, lime, cement, cartage, stoneware pipes, kerbs, setts, fodder, tar, pitch and oil, for the urban district council.—Mr. John H. Linfield, clerk.

CHURCH.—June 3rd.—For the supply of flags, kerbs, setts, grit, granite, limestone, pitch, creosote oil, salt-glazed socket pipes, scavenging brooms, manhole covers, lamphole covers, step-irons, street grates and disinfecting powder, for the urban district council.—Mr. J. R. Reddish, clerk.

PAIGNTON.—June 3rd.—For the supply of coal, coke, granite, lamp columns, gully gratings, oil and firewood, for the urban district council.—The Surveyor.

ASHTON-IN-MAKERFIELD.—June 8th.—For the supply of sanitary pipes, lime, slag, macadam, spades and general stores, for the urban district council.—Mr. A. Sykes, clerk.

### Miscellaneous.

CLECKHEATON.—June 1st.—For the supply of tar and ammoniacal liquor, for the urban district council.—Mr. John H. Linfield, clerk.

BARRY.—June 1st.—For the supply of general haulage, small castings, fodder, lime, and general stores, for the urban district council.—Mr. T. B. Tordoff, clerk.

NEWBURY.—For a complete gas plant to run three existing Crossley gas engines.—Mr. S. J. L. Vincent, borough surveyor.

## TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BALBY-WITH-HEXTHORPE.—For laying sewers and surface water drains, including 260 yds. 15-in., 860 yds. 12-in., and 500 yds. 9-in. stoneware pipes, for the urban district council.—Mr. G. Gledhill, engineer:—

| | |
|---|---|
| Yorkshire Hennebique Contracting Company, Leeds | £1,896 |
| C. Fletcher, Doncaster | 1,677 |
| J. E. Nadin, Sheffield | 1,663 |
| F. Eyre, Sheffield | 1,650 |
| S. Porter & Sons, Doncaster | 1,496 |
| H. Arnold & Sons, Doncaster * | 1,415 |
| J. Parkin, Horsforth | 1,430 |

Engineer's estimate, £1,673.

CARRICK-ON-SUIR.—For laying iron pipes and fittings and constructing service reservoir, also supplying cast-iron pipes and valves, for the urban district council:—

| | |
|---|---|
| Stanton Iron Works, Nottingham | £5,730 |
| Martin & Co., Drogheda | 3,079 |
| Ham, Baker & Co., London | 339 |

Total cost of works, £9,148.

DUBLIN.—For the supply of four watering carts, for the corporation.—Mr. P. Tobin:—

Corporation of Dublin Workshop, Stanley-street depot, £37 10s. each cart, only one tender received.

EPSOM.—For the making-up of Norman-road, for the rural district council.—Mr. T. E. Ware, surveyor of highways:—

| | |
|---|---|
| A. T. Bullen | £1,133 |
| T. Adams | 829 |
| R. Strong & Co. | 806 |
| H. M. Blaker | 792 |
| E. Iles, Senr. | 774 |
| J. Mowlem & Co. | 760 |
| Streeter & Co. | 717 |
| J. May & Son | 660 |
| Kavanagh & Co. | 597 |

Surveyor's estimate, £617.

HARROGATE. For widening East-parade, for the town council. Mr. C. E. Rivers, borough engineer and surveyor:—

| | |
|---|---|
| Kershaw & Hill, Harrogate | £936 |
| A. Hymas, Harrogate | 842 |
| T. Godfrey, Harrogate | 831 |
| W. H. Pettinger, Harrogate | 787 |
| E. Lone, Starbeck | 689 |
| C. H. Dickinson, Starbeck* | 686 |

HAVERHILL.—Accepted for the supply of granite, slag, tarred-macadam, and basalt, for the urban district council.—Mr. W. H. Eley, surveyor:—

Johnston Brothers, London.—Basalt, 12s. 1d. per ton.
Tarmac, Limited, Wolverhampton. Tarred slag, 16s. 6d. per ton.

KENSINGTON.—For wood paving works in several streets, for the borough council:—

Improved Wood Pavement Company, Queen Victoria-street, accepted for all wood paving works, recently advertised.

KINGSBURY.—Accepted for laying tar macadam, for the urban district council.—Mr. R. C. N. Newport, surveyor:—
Tarmac, Limited.

PEMBROKE.—For the erection of a school, for the Education authority.—Mr. O. T. Thomas, education architect:—

| | |
|---|---|
| F. Lloyd & Co., Milford Haven | £2,420 |
| Cole & Sons, Milford Haven | 2,697 |
| T. Harries, Neyland* | 1,625 |

TUTBURY.—Accepted for scavenging work, for the rural district council.—Mr. H. S. Tebbitt, surveyor:—

J. Brookes, Branstone.—£65 per annum, and 12s. per day for one man and two horses.

[The fixed sum of £65 per annum is for scavenging work in the parish of Branstone, and the team work for the Merryweather Vacuum Cesspool.]

WANDSWORTH.—For works of repair, for the borough council.—Mr. P. Dodd, borough engineer:—

Cowick-road, Tooting.—It is recommended that the footpaths be paved with Aberdeen adamant artificial stone paving, and that the tender of J. Mowlem & Co., Limited (£625, and schedule prices for extras or omissions) be accepted.

Part of Crowborough-road, Streatham.—It is recommended that the tender of T. Adams (£264 and schedule prices for extras or omissions) be accepted.

Part of Prince's-road, Southfield.—It is recommended that the tender of H. Woodham & Sons (£787, and 20 per cent above schedule prices for extras or omissions) be accepted.

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# "The Surveyor" Supplement.

For Architects, Quantity Surveyors, Contractors, and all Users of Reinforced Concrete.

## New Public Swimming Bath for East Ham.

### DESCRIPTION OF THE BUILDING.

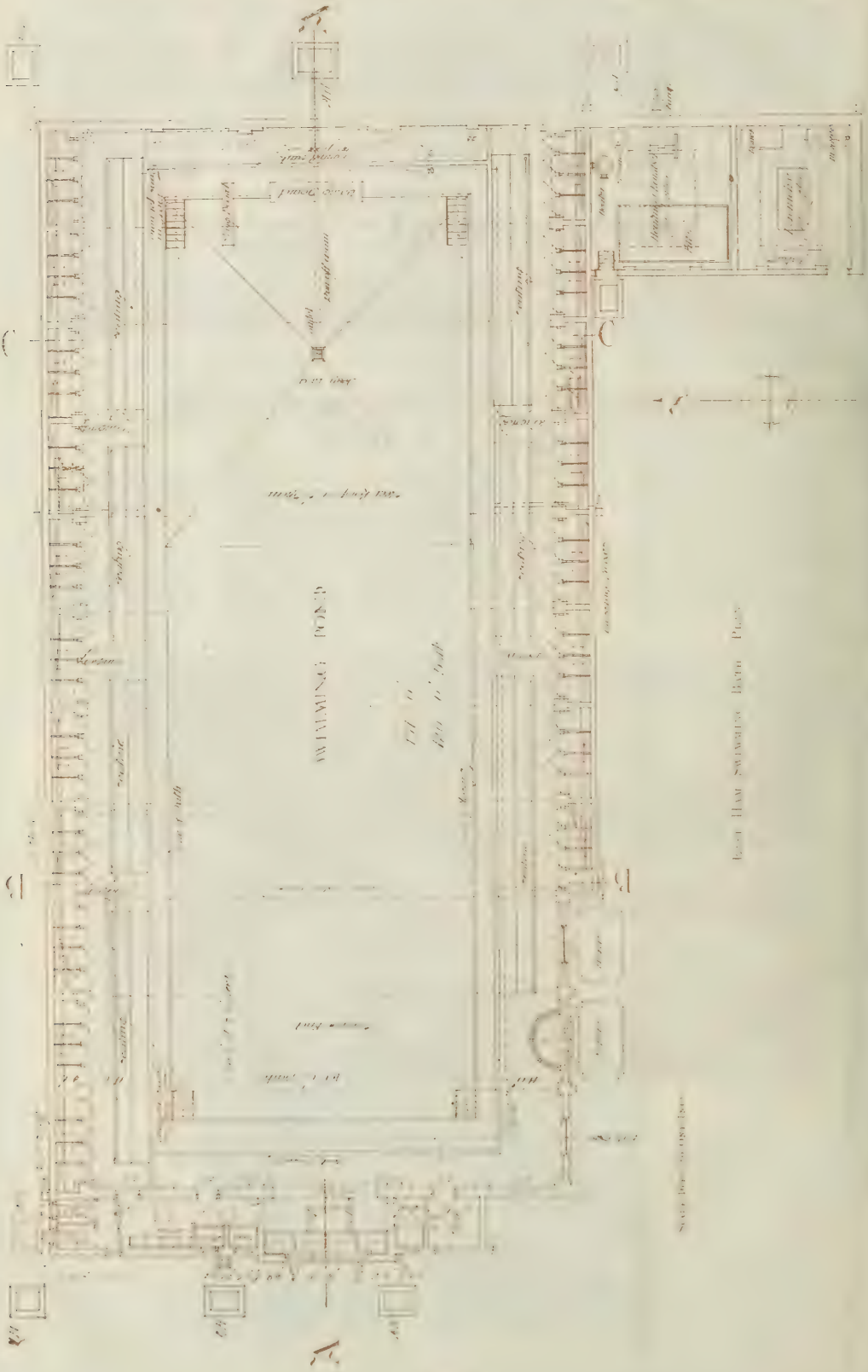
Of a commanding elevation, and presenting a light and attractive aspect in the interior, the new public bath built by the corporation of East Ham was formally opened on Thursday, the 16th inst., by the Mayor (Councillor Oakes, J.P.). The building has been constructed upon a site adjoining the Town Hall, and it was stated by the Mayor, in the course of an address, in which he reviewed the history of what may be termed the "bath movement" in the borough, that the work had been carried out entirely by municipal labour, and he did not think that when the account was rendered the ratepayers would have anything to complain about. The cost had worked out under the engineer's estimate—it is understood to be in the neighbourhood of £9,000—and this in spite of the fact that the men engaged on the job had been paid something above the ordinary wage.

The bath [illegible] under the supervision of the late borough engineer, Mr. A. H. [illegible] burgh—and has been erected under the auspices of the present borough engineer, Mr. J. E. W. Birch.

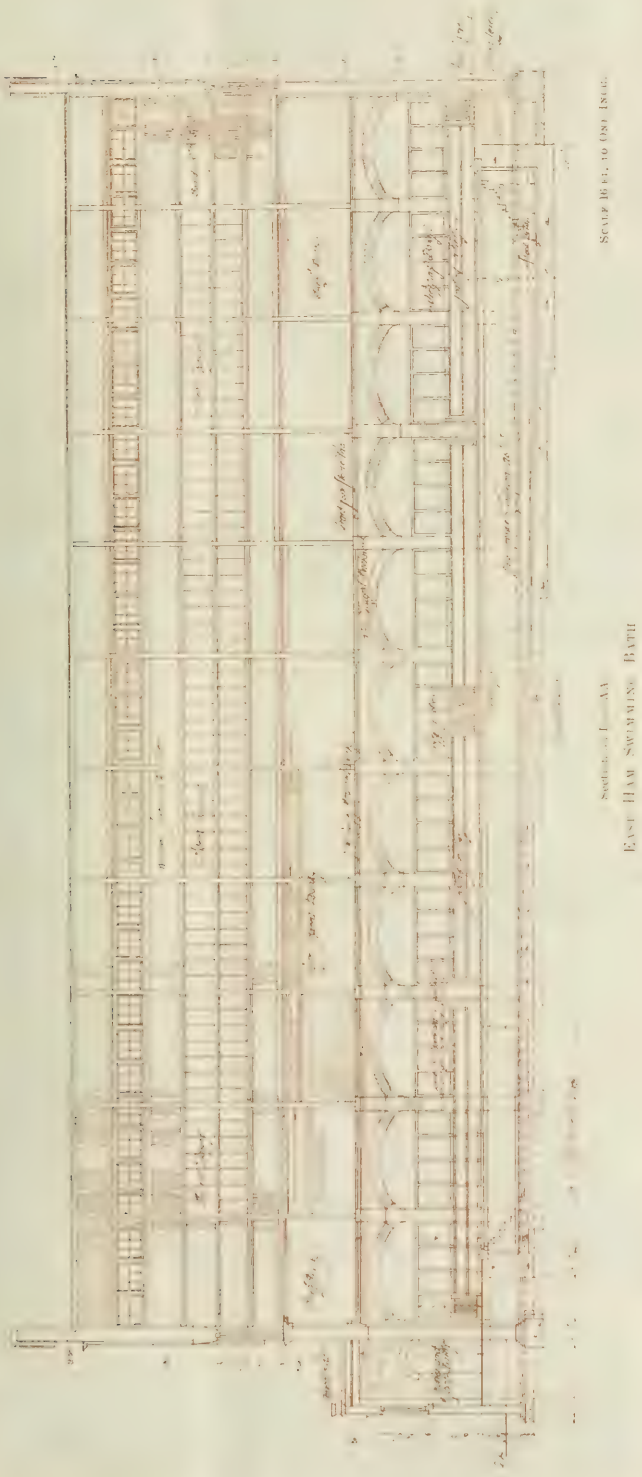
The pond is 120 ft. long by 40 ft. wide, and for a distance of 30 ft. from the shallow end it has a regular depth of 3 ft. A wire rope will be strained across at this space of 30 ft. by 40 ft. ample provision for children and those wishing to learn to swim. The wire rope forms a guard, and draws attention to the fact that beyond it is deeper water, as from that point the remainder of the bath ranges from 3 ft. to 8 ft. 6 in. in the centre of the bath at a distance of 20 ft. from the deep end, and rising from this point to 6 ft. 9 in. at the extreme end, the object of this extreme depth of 8 ft. 6 in. being that of providing sufficient depth of water for high diving. The pond is constructed with cement-concrete retaining walls, and a concrete floor, the whole being lined with marble terrazzo.

East Ham Swimming Bath.

The apparatus for heating the bath has been installed by Messrs. Royles, Limited, of Manchester, and is on the aëration and filtration principle—*i.e.*, the water is pumped from the deep portion of the bath, passing in its route through a strainer, and is thence discharged into the open air 40 ft. above the level of the bath through a series of perforated plates into an open tank, and then gravitated through a filter and a heater into the shallow end of the bath, thus forming a complete circuit. The exhaust steam from the pump is used to heat the water before it re-enters the bath. The steam for driving the pump is obtained from the council's electric station. This



operation of periodically emptying and refilling the bath with water from the public supply mains, as in being taken from the public mains to replenish any shortage. The bath is fitted with the usual accessories of diving board, &c., and there are three shower baths, two foot baths, and efficient sanitary accommodation. The bath is surrounded by a series of dressing-boxes, seventy-six in all.




There is seating accommodation for about 300 persons, formed by concrete tiers, finished off with marble terrazzo. This seating accommodation will be supplemented on gala occasions by a temporary wooden tier at the rear of the concrete tiers in front of the dressing-boxes, and will thus accommodate a further 150 persons, making about 450 in all. Plans have been prepared for a further extension to this bath, comprising slipper baths, vapour baths, &c., and an application has been made to the Local Government Board for sanction to borrow the sum of £3,625 to carry out this work.

At the opening ceremony [illegible] borough engineer, in giving the foregoing particulars, said "I should like to take this opportunity of acknowledging the very able assistance rendered by my deputy, Mr. Baker, in the supervision of the erection of this bath, also the loyal and able manner in which the general foreman, Mr. W. Clark, together with the men under him, have carried out the instructions given them."

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**Profits of Leeds Tramways.**

[illegible] the Leeds Corporation tramways resulted in a nett surplus of £61,164.

**Birmingham's New Fire Station.**—A new fire station which has been erected in the Moseley-road, Birmingham, was formally opened last week. The station is situated at the corner of [illegible] important addition to the public buildings of the city. In this building stables are abandoned, and the equipment depends entirely upon automobile engines. The engine-house, which is larger than usual, is 58 ft. by 31 ft., and is placed on the corner of the two roads with a view [illegible] facilities for the "turn-out" and "return," ample space being everywhere given for the manœuvring of the engines. There are six doorways 10 ft. wide opening on to the roads, and two facing the yard for the return of the vehicles. Adjoining the engine-house are the duty room and office, and beyond these, facing Moseley-road, is the district officer's house, separated from the station buildings by an access corridor. At the end of the engine-[illegible] hose drying tower, the latter

[illegible] purposes.

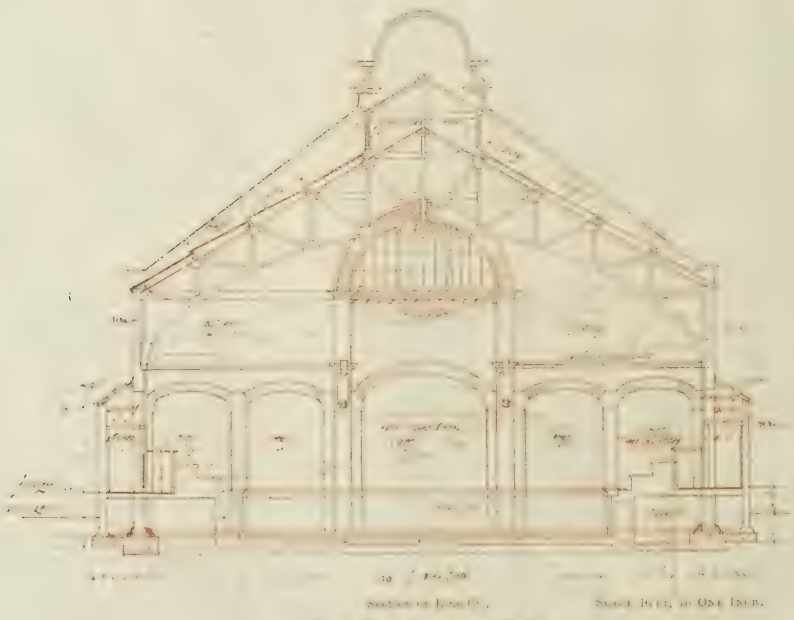
## ROSYTH TOWN PLANNING.

It was reported to a meeting of the Town Planning Committee of Dunfermline Town Council last week that the Local Government Board had granted the necessary authority to proceed with their proposed town-planning scheme. At the Local Government Board inquiry the scheme was objected to by the Dunfermline District Committee, who sought to have the burgh boundaries. Under the Order granted by the Board the town council have been successful in [illegible] proposed to town plan. The area extends to fully 5,000 acres, and the scheme, embracing as it does the Admiralty's territory at Rosyth, is intended to be a [illegible]

not received intimation as to the fate of their scheme, so that there is still under consideration the question as to whether the Inverkeithing Town Council or the Dunfermline District Committee will be the authority charged with the town planning of a strip of district committee territory sandwiched between the boundaries of Dunfermline and Inverkeithing Burghs The principal superior whose land has been incorporated under the Dunfermline project is Lord Mungall, of Transy, the trustees of the late Mr. Thomas Showart, of Broomhead, and the trustees of the late Mr. Thomas Jackson, of St. Margaret's Stone.

Now that they have got the requisite authority the council (says the *Glasgow Herald*) will proceed at once with the preparation of plans by the expert whom [illegible]

Section on Line BB.



East Ham Swimming Bath

MR. J. S. PICKERING, M.INST.C.E.,

*Borough Surveyor and Water Engineer, Cheltenham.*

**President of the Institution of Water Engineers, 1912-13.**

# The Surveyor

And Municipal and County Engineer.

Vol. XLI. JUNE 7, 1912. No. 1,064.

## Minutes of Proceedings.

**Weeds on Roadside Wastes.**

A large part of the whole mileage of roadside wastes in these islands is of such a character that the natural growths of bushes and smaller plants only need from time to time such attention as may be necessary in order to prevent their encroaching upon the carriageway, blocking the ditches, or checking such public or private uses of the wastes as may be customary and expedient. Often a rich growth which makes a display of flowering plants in the spring and early summer is mown down to a greensward in which, later in the season, grasses and their companion herbage plants predominate while periodic mowings, and thin applications of road scrapings or the stuff taken from ditches tend in many places to create the smooth turf which is such a pleasing and useful feature of many of our roadsides. When the part has been brought up to a suitable level there often arises the difficulty that there is no convenient way of dealing with the road scrapings, and the stuff taken from drainage cuts and side ditches, and this often leads to that skilful plastering of the banks which is sometimes very successful for a time, but has its limits, as well as to the gradual raising of margins on the flat. Many roads, it may be observed, run at a level hardly below the level of the adjoining fields, but considerably below that of their banks, which have been built up with the hedges by the continual addition of road detritus; and in some cases the conditions so brought about are unfavourable to the proper management and drainage of the road. In other cases the detritus is placed in heaps upon the roadside wastes, and where drainage cuts pass between these heaps the little valleys so formed are too deep and too steep-sided to allow of the waste being used as a part of the emergency width of the road.

It is not, however, with the general problem of the disposal of surplus road detritus that we are for the moment concerned. We wish rather to direct attention to the fact that, whereas the natural or normal vegetation of the roadside is usually of a harmless or a useful character, the placing of raw material in the form of mud or dust sometimes tends to the encouragement of noxious weeds, which are a good deal more troublesome to manage than are most of the better kinds of herbage. There is a race for the occupation of the newly placed material, and it is to be seen that certain kinds of mud, including the stuff dug from ditches, are often occupied and held for long periods by nettles, while dusty material, and notably the heaps of sweepings from tarred roads, seem specially to favour thistles, which often occupy such heaps very quickly and sometimes to the practical exclusion of all other plants. It does not follow that the occupation will be permanent; subsequent happenings may favour other plants; but it may be a long time before the thistles or nettles are ousted if once they get a hold. In view of the harm which the seeds of thistles do by germinating in pastures and arable fields, and considering, too, that thistles, nettles, and some other weeds are undesirable as roadside plants, it is worth while giving to these heaps or spreadings of raw material such attention as may better the chances of the more-to-be-desired plants. It is not suggested that every bed of thistles or nettles should be regarded as an enemy to be attacked, and it may be noted in passing that where thistles grow in the shade of trees they do not flower much, and if they do flower their seeds do not ripen quickly. It is, however, worth noting that the addition of a few tufts of grass, or of clods or earth containing the seeds of desirable or of grass-preceding plants, may, if added to the spreadings of mud or dust, provide a garrison which will keep at bay the undesirable weeds, smothering their seedlings or preventing their seeds from reaching the soil. A similar treatment of bare patches, such as those sometimes left after the removal of materials for the renewal of the road crust, may prevent their occupation by less desirable tenants and those which are less capable of maintaining the earth against the scour of heavy summer showers. Otherwise, if left alone, these patches may be occupied by little docks and other plants which will delay their incorporation into the general turf strip. Very often the materials needed are actually being taken from the edges of the turf, and uselessly disposed of, while in other cases the bits of clod or earth charged with seeds may very readily be obtained in a few minutes.

* *

**Mechanical v. Sand Filtration.**

In our last issue we drew attention to some American experience in the matter of mechanical *v.* sand filtration of water as embodied in a paper by Mr. J. Winthrop Pratt, chief engineer of the Cleveland Board of Health, read before the Cleveland Engineering Society, and, in view of the importance of the subject to water authorities and engineers in this country we make no apology for extending our remarks on the subject so as to embrace the results of other experience gained on this side of the Atlantic. We pointed out that Mr. Pratt was of opinion that "slow sand filters are generally more costly to build than mechanical filters, but are cheaper to operate," also we cited the

experience of Edinburgh waterworks, where the cost of sand filtration is found to be as high as 20s. per 1,000,0.0 gallons, and the cost of mechanical filtration 23s. 9d. We did not of course intend that these facts, instructive as they are, should of themselves settle the important question of mechanical *v.* sand filtration, and take this opportunity of pointing out how invariably it is found in engineering works that "costs" must be carefully analysed before a general conclusion can be usefully formed. For example, to take another important case where both mechanical and sand filtration have been carried on for some years upon the same works, the actual costs and results obtained put quite another aspect on the question of the relative advantage of the two systems. At the Tunbridge Wells corporation waterworks there exists an area of ordinary slow sand filters and a battery of mechanical filters of the Candy type, and each system is capable of treating 1,000,000 gallons per day, so that the comparative advantages of the two methods of purification may be very fairly considered on an equal footing. After many years of very successful working of the mechanical filters (which were installed about eight years after the sand filters) we are informed by Mr. W. H. Maxwell, A.M.INST.C.E., the borough and waterworks engineer, that the working expenses of the battery of mechanical filters have proved to be but a small fraction of the cost of working the sand filters and that a substantial saving in the annual filtration expenses has been effected by the adoption of mechanical filters. As a matter of fact the working expenses are found to be about 1s. per 1,000,000 gallons filtered. Comparing this with sand filters, even when conducted on a large and economical scale as in the case of the London waterworks, which we believe cost from 3s. to 6s. per 1,000,000 gallons filtered for working expenses, the mechanical filters show a decided advantage. It has also to be borne in mind that the capital cost, including building and foundations, of the Tunbridge Wells mechanical filters was only about a fifth of that of the sand filters for dealing with the same quantity of water, and that they occupy but a small fraction of the space.

True to its historical reputation, the Tunbridge Wells water, in its natural condition, is of a strongly chalybeate nature, and is, moreover, in many ways a peculiarly difficult water to treat, but the results of several years' working have proved eminently satisfactory in every way. The installation of the mechanical system involved no additional labour at the pumping station, and no engine power, moving mechanical devices, chemicals or coagulants are needed to work or cleanse the filters. The absence of these complications, no doubt, goes a very long way to explain the low working expenses of the installation. The reason for introducing the filters was that, after prolonged trials, the slow sand filters were found incapable of dealing with a water so peculiarly difficult to handle on an economical and efficient basis. In view of such experience as this, there can be little doubt that, when properly designed and installed with due consideration of the special circumstances of the case in point, there is a very wide field over which the introduction of mechanical filters of a suitable type will in the near future prove to be essential to the economical working of a water undertaking as well as to the delivery to the consumer of a first-quality, palatable water.

* * *

**The Institution of Water Engineers.**

The new president of the Institution of Water Engineers, Mr J. S. Pickering, M.INST.C.E., yesterday delivered a very comprehensive and most interesting address on the occasion of his assuming office. Mr. Pickering, who is well known as the borough surveyor and water engineer of Cheltenham and a vice-president of the Institution of Municipal and County Engineers, reviewed in the first place the great works of irrigation which have been carried out in modern times throughout the British Empire and in other parts of the world. Many as are the fine achievements of various engineers in this field, there can be no doubt that the finest of all is the construction of the great Assuan Dam, which may fairly be described as the greatest piece of engineering work for the purposes of irrigation in the world. The lecturer referred to some of the greatest modern examples of storage reservoir construction, and, in speaking of the great schemes which have been carried out by the Liverpool, Manchester, Birmingham and other British corporations, he pointed out that the largest impounding waterworks reservoirs in our own country, although exceeded in size by others in various parts of the world, are nevertheless monuments of great engineering skill, and are carried out with every regard to the requirements of the cities whose needs they serve.

A considerable portion of Mr. Pickering's address was very appropriately concerned with the vital question of the quality of water. He commented on the neglect—either entire or partial—of many water authorities in regard to systematic analysis and bacteriological examination. This is a matter of the greatest importance, as it is only by observing such precautions and acting upon the results obtained that a safe and wholesome supply can be assured. In regard to the sources of supply, it is satisfactory to observe that during the last ten years there has been a general reduction in the typhoid rate in towns as compared with the previous decade. The important subjects of purification by storage, mechanical filters, pre-filters, and sterilisation were next considered; and in regard to pumping plant it was pointed out that a matter of great importance as affecting the working expenses is the quality of the fuel. In this connection we would specially direct the attention of our readers to Mr. Pickering's opinion that the only satisfactory method of purchasing coal is on a thermal basis, by which the purchaser buys heat units instead of tons of coal, and the price rises or falls according as the fuel actually delivered yields, on testing, a larger or smaller number of British thermal units than that chosen as the standard.

Dealing with the waste of water which takes place in every district to a greater or less extent, Mr. Pickering calls attention to the urgent necessity for an amendment of the law so as to enable water authorities to make by-laws for the prevention of waste. It certainly appears to be desirable in these days, when complaints of shortage are so frequently heard, that every possible step should be taken to prevent waste, and that the hands of the authorities should be strengthened in the direction indicated. Mr. Pickering, whose address will be found elsewhere in this issue, concluded by a reference to the increasing usefulness and activity of the Institution, and we feel that we are only expressing the views of the members when we say that both Mr. Pickering and the Institution are to be congratulated on the appointment of the former as president for the ensuing year.

* *

**Holborn Paving: Not a Reversion to the Old Setts.**

In view of the misapprehension which prevails in some quarters as to the nature of the paving which it is intended to lay down in High Holborn, it is necessary to draw attention to the fact that the change does not by any means constitute a reversion to the old granite setts with which the inhabitants of North London were only too well acquainted in the past. Those of us who formerly lived in Hampstead and Highgate, for instance, are not likely ever to forget either the noise occasioned by that paving or the excessive vibration that was felt in the omnibuses, especially when they were only lightly loaded and were travelling fast. Even the good qualities of the paving were not without drawbacks. The foothold

for horses was good in its way, but was of a somewhat trying character, and it is probable that the brackets and knobs with which some of the yellow 'buses were provided, in order to prevent the vehicle from dumping its outside passengers when a wheel came off or was shattered, were rendered necessary by the wrenching action of the setts themselves, and not only by the particular effects of tramway tracks in conjunction with the paving. The foothold was not, as in the new paving, provided partly by a difference between the material of the joints and the material of the stone, but was given by deep arrises. In the new form of granite paving, on the other hand, the foothold and resistance to slipping is, if of a less positive, of a more even and steady character, the joints being filled with bitumen. The blocks are 9 in. × 4 in., laid on a quarter-inch bed of dry sand and cement; they are squarely dressed, and the bitumen joint, which is filled up to the top of the stones, is not more than three-sixteenths of an inch in width. The frontagers in Tottenham-circus, where this paving has been in use for some time, seem to have been agreeably surprised at the small amount of noise which it occasions, and, since the paving seems to offer exceptional advantages as regards cost and efficiency in a city which is rapidly becoming a city of motor vehicles, it is hardly surprising that the Holborn Borough Council should have decided to give it a further trial in High Holborn itself. It is now some years since the borough surveyor, Mr. E. F. Spurrell, came to the conclusion that granite blocks properly dressed and laid would be suitable for the altered conditions of traffic, and it is unfortunate that a decision to which the council has come as the result of the recommendations of their qualified professional officer should be the subject of thoughtless attacks by ill-informed writers of Press articles.

* * *

**The Teignmouth Vacancy.**

It was only by the casting vote of the chairman that the Teignmouth Urban District Council decided recently to advertise for an assistant surveyor to fill the place of Mr. R. B. Savage, who has obtained an appointment under the Devonport Corporation. The casting vote alluded to was the climax to a discussion which disclosed the characteristic attitude of a certain class of municipal councillors towards their officials. The surveyor, Mr. F. W. Knight, being doubtless familiar with this attitude, took the bull by the horns when the vacancy was announced by asking that it should be promptly filled as there were several contracts in hand requiring careful consideration, while there were other schemes for which plans had to be prepared in connection with the waterworks and a sewerage scheme. Mr. Knight, with just a natural touch of candour, added that it would be desirable to advertise the post at the same salary as Mr. Savage had received, because he was afraid the council would not get a suitable man for less money. Mr. Savage, he said, had been receiving £80 a year, "only a living wage." Upon this one councillor hinted that they already had in the council's service a thoroughly practical man in the road foreman, who would be able to carry out the supervision of buildings. If there was any intention of improving the pecuniary status of the officer upon whom this further service was to be cast it was completely concealed by the councillor who made the suggestion, and the surveyor, once more equal to the occasion, observed, somewhat caustically, that the road foreman was an outdoor officer, and his time was already fully occupied. Yet another councillor presently ventured the suggestion that it was understood when Mr. Knight was appointed "that probably an assistant would not be required after certain work in hand was completed." Mr. Knight's answer to this was that nothing was said to him about it. The distinctive note of the critics was that every other consideration must necessarily give way to that of economy, while it was painfully evident that they had little or no appreciation of the special value of professional service. Happily the casting vote of the chairman saved the situation, though that could hardly be expected to alter the view of some half of the council that to engage the services of an assistant surveyor is infallibly to place a premium upon official opulence and comfort.

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**The London County Council—A Year's Work.**

The annual report of the London County Council for 1910 consists of four volumes, in which are contained accounts of the multifarious activities of the council. The second and fourth volumes, which deal respectively with the work of the Asylums Committee and the work of the council as local education authority, are not directly of interest to our readers. The first volume deals with all the general local government services administered by the council, and its study enables the reader to form some idea of the magnitude and variety of the work which falls to the lot of London's central authority. For example, the council is the authority in London for street improvements which are more than local in character, and have for their object the facilitation of through traffic between all parts of the county. During the year 1910 five such improvements were undertaken, involving an estimated outlay of no less than £189,800. Then, again, the council is the local tramway authority under the Tramways Act, 1870, for the County of London (exclusive of the City of London). The application of this Act to the County of London is unique; for while, elsewhere, the "local" and the "road" authority are the same, in London the council is the "local authority" for the whole county, and each metropolitan borough council is the "road authority" in the metropolitan borough over which it has jurisdiction. Thus, under the Standing Orders of Parliament, the consent both of the council and of each metropolitan borough council concerned must be obtained to the introduction into Parliament of a Bill proposing to authorise the construction of new tramways within the county. The council, although it is the "local" authority under the Act, cannot introduce such a Bill without the consent of the "road" authorities through whose districts it is proposed to construct tramways. This curious state of affairs has on more than one occasion enabled an individual borough council to exercise an effective veto over the council's tramway proposals.

The first volume of the report deals with a large number of other matters to which it is impossible to refer here. Suffice it to say that the different sections have evidently been prepared with great care, and the whole forms an admirable *résumé* of the work accomplished by the council in its task of the government of London.

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**An Interesting Calendar Competition.**

Messrs. Josiah Smart & Son, of 53 Victoria-street, Westminster, send us particulars of a prize of £10 which they are offering for a suitable design for their next year's calendar. The competition is "open to all persons, or employees of such persons," by whom a copy of Messrs. Smarts' calendar for 1912 was received, but we understand that such calendar would be sent, on application to the firm, to those who were not favoured with it but would nevertheless like to enter for the competition. All designs submitted must reach 53 Victoria-street by July 8th next, and it is hoped that the result of the competition will be published in THE SURVEYOR of July 26th. The designs will be adjudicated upon by three judges, one of whom, we notice, is Mr. H. Percy Boulnois, M.INST.C.E.

# The Struggle with Sewage Sludge.

By WM. NAYLOR, F.C.S., ASSOC.M.INST.C.E.

The one or two recent advances in methods for the disposal of sewage sludge will be welcomed by the many who have from time to time encountered the despairing cry of economists bemoaning waste of phosphates and nitrogen in sewage sludge, to say nothing of that fertilising content which is sent away to the sea in sewage works effluents.

Many and various are the modes of making this extravagance to appear appalling—curves and diagrams showing the annual loss to the nation in pounds sterling, the number of acres which could be manured by it, and the bushels of wheat grown elsewhere, but which ought to be grown at home.

In getting to close quarters with the subject, the outstanding facts are: First, that growing crops require, and are benefited by, organic nitrogen (or, more correctly, the products of the natural oxidation thereof—ammoniacal salts) and phosphates; secondly, that agriculturists supply the crop requirements in the form of artificial or natural manures; and, thirdly, that sewage sludge, according to the analyses of all reputable analysts, contains the required ammonia and phosphoric acid in varying, but appreciable, amounts, sometimes to an extent as considerable as in artificial manures sold at a good price.

Who then can be surprised at the question, Why not apply sewage sludge to the land?

Sewage effluents themselves can easily be disposed of—the volume of water accompanying the manurial value is so considerable. But pressed sludge contains no more water than farmyard manure, and in case the difficulty of handling arises, are there not installed already at several sewage works breaking machines which reduce it at any rate to a "spreadable," though fairly wet, powder? Nevertheless, farmers cannot be said to be tumbling over themselves after it. To be on thoroughly safe ground, let us look at the manures which farmers *do* buy, and which suit their purposes.

From a price list of artificial manure manufacturers the following are taken:—

| | Guaranteed analysis in percentages. | | | | Price per ton in bags at works, London. Terms cash. |
|---|---|---|---|---|---|
| | Ammonia. | Phosphates. | | Potash (pure). | |
| | | Total. | Of which soluble. | | |
| | | | | | £ s. |
| No. 1. Sold as a guano ... ... ... ... ... ... | 8—9 | 30—35 | Part | 2 | 10 10 |
| No. 2. ,, ,, ,, ... ... ... ... ... ... | 4—5 | 35—40 | ,, | 2 | 8 0 |
| No. 3. ,, ,, dissolved guano ... ... ... ... .. | 7 | 24 | 20 | 2 | 10 10 |
| No. 4. ,, ,, ,, ,, ... ... ... ... .. | 8 | 24 | 20 | 2 | 9 10 |
| No. 5. ,, ,, ,, bones ... ... ... .. ... | 2—2½ | 35 | 22 | — | 5 10 |
| No. 6. ,, ,, bone compound ... ... ... .. ... | 1—1½ | 30 | 20 | — | 4 10 |
| No. 7. ,, ,, superphosphate ... ... ... . ... | — | 30 | 26 | — | 3 5 |
| No. 8. ,, ,, special manure ... ... ... ... . | ¼ | 30 | 20 | 2 | 6 10 |
| No. 9. ,, ,, bone flour .. ... ... .. .. ... | 1¼—2 | 55—60 | — | — | 6 10 |
| No. 10. ,, ,, bone meal ... ... ... .. ... .. | ¾—1½ | 45—50 | — | — | 6 5 |

Others are:—

(*a.*)

20% soluble phosphate
10% insoluble phosphate
½ to 1% ammonia
} £7 5s. per ton.

(*b.*)

16 to 18% soluble phosphate
3 to 4% insoluble phosphate
4% ammonia
} £5 5s. per ton.

In one manufacturer's list is the notification that allowances will be made for deliveries not to sample or order, at the rate of 2s. 9d. per unit per cent for soluble phosphate and 12s. 6d. per unit of ammonia.

But, bearing in mind the cost of the base, it may be put that roughly a manure is worth 15s. per unit per cent of ammonia and 2s. 6d. per unit per cent of soluble phosphates, if dry, and in the absence of deleterious constituents.

As bearing on this valuation the following are instanced from the annual reports of the Royal Agricultural Society:—

1906. Report of the Consulting Chemist, page 249.

| | |
|---|---|
| Moisture ... ... ... ... ... | 20·04 |
| *Organic matter and water of combination | 41·05 |
| Monobasic phosphate of lime ... ... (equal to tribasic phosphate of lime, 3·82) | 2·44 |
| Insoluble phosphates ... ... ... | 1·25 |
| Sulphate of lime, alkaline salts, &c. ... | 14·13 |
| Insoluble siliceous matter ... ... ... | 21·09 |
| | 100·00 |

* Containing nitrogen equal to ammonia, 3·71.

"Was described as a new kind of manure, costing £3 5s. per ton delivered, and sold as a "potato manure." Shoddy and coal ashes figured among its ingredients; but it was to my mind very far from being what a potato manure should be, and the price was just about £1 above the real value."

1907. Page 216.

| | |
|---|---|
| Moisture ... ... ... ... ... | 13·44 |
| *Organic matter and water of combination | 27·73 |
| Monobasic phosphate of lime ... ... (equal to tribasic phosphate of lime rendered soluble by acid, 9·08) | 5·80 |
| Insoluble phosphate ... ... ... | 4·56 |
| Sulphate of lime, alkaline salts, &c. ... | 24·05 |
| Insoluble siliceous matter ... ... ... | 24·42 |
| | 100·00 |

* Containing nitrogen equal to ammonia, 1.42.

"Cost £5 5s. per ton, which was just double its value."

1908. Page 304.

"Tillage" sold in Lincolnshire at £2 per ton, delivered.

| | |
|---|---|
| Moisture ... ... ... | 50·00 |
| * Organic matter ... ... ... ... | 26·67 |
| Lime ... ... ... ... ... ... | 3·00 |
| † Phosphoric acid ... ... ... ... | ·88 |
| Alkalies, &c. ... ... ... ... ... | 12·81 |
| Sand ... ... ... ... ... ... | 6·64 |

* Containing nitrogen equal to ammonia, 2·76.
† Equal to phosphate of lime, 1·92.

"This, it will be seen, was half water, and it was, consequently, in very bad condition for applying to the land. £1 per ton would have fully represented its value."

1909. Page 350.

Tanyard refuse.

| | |
|---|---|
| Moisture ... ... ... ... | 37·50 |
| Mineral matter ... ... (including sand, 3·04) | 8·86 |
| Nitrogen ... ... ... ... ... (equal to ammonia, 5·52) | 4·55 |

"The price was 50s. per ton, but the material was in bad condition and difficult to handle, so that the price must be considered rather above the real value."

Confining our attention to chemical composition, only the usual output from sludge presses may be said to consist of 50 per cent water, ammonia from 1 to 2 per cent, and phosphoric acid, as tribasic phosphate of lime, from 1 to 3 per cent.

The following reports are taken as representative of a collection to hand, and in perusing these, little account need be taken of items other than phosphoric

acid and ammonia, as they are only present usually in about such quantities or proportions as are present in ordinary soil.

SEWAGE MANURE FROM THE HENDON SEWAGE WORKS.

Dried sludge (not pressed) collected from average daily samples produced during a period of two months.

Analysis (No. 3) of Sewage Sludge from Hendon.

| | Air dried. Per cent. |
|---|---|
| Moisture ... ... ... ... ... | 12·62 |
| * Organic matter ... ... ... ... | 46·60 |
| Oxide of iron ... ... ... ... | 3·60 |
| Alumina ... ... ... ... | 2·96 |
| Phosphates of alumina ... ... ... | 2·21 |
| Magnesia ... ... ... ... ... | none |
| Potash... ... ... ... ... | 0·29 |
| Sand and clay ... ... ... ... | 29·20 |
| Sulphuric acid ($SO_3$) ... ... ... | 1·46 |
| | 98·94 |

The sludge is in a fine uniform state of division, and is of good quality in manurial properties.

(Signed) ARTHUR ANGELL, PH.D., F.I.C., Public Analyst.

* Containing nitrogen equal to 2·28 per cent of ammonia.

The 2·28 per cent of ammonia at the present market value of 12s. per unit would with the other constituents be worth about 30s. per ton of sludge dried to 12 per cent of moisture; the quantity of such dried sludge obtained from the strong Hendon sewage and laundry refuse is found to amount to 4 tons per 1,000,000 gallons of sewage, of the value of £6.

CORPORATION OF COVENTRY SEWAGE WORKS.

Analysis by Dr. Voelcker, F.R.S., of sewage lake produced at these works.

| | |
|---|---|
| Moisture ... ... ... ... ... | 56·83 |
| * Organic matter ... ... ... ... | 18·67 |
| Phosphate of lime ... ... ... ... | 1·97 |
| Carbonate of lime ... ... ... ... | 5·13 |
| Caustic lime ... ... ... ... | 4·60 |
| Alkaline salts and magnesia ... ... | 1·79 |
| Oxide of iron and alumina ... ... | 3·43 |
| Insoluble siliceous matter ... ... ... | 7·61 |
| | 100·00 |
| * Nitrogen ... ... ... | ·84 |
| (equal to ammonia, 1·02) | |

As regards deterioration, Dr. Voelcker says: "If anything of value can evaporate it can only be ammonia, due to the decomposition of nitrogenous organic matter. It appears that no such loss takes place if kept for some time." An analysis of a piece of old cake showed:

| | |
|---|---|
| Nitrogen ... ... ... ... ... | 1·12 |
| (equal to ammonia, 1·36) | |

"In my judgment it is worth about 15s. a ton."

The advent of the bacterial system of treating sewage has naturally caused observers to note that in the absence of precipitants sludge will have a higher organic content, and be free from the slimy aluminous and iron oxides which have the tendency of rendering soil impervious.

Drying experiments during the past year or two have resulted in producing a powder from bacteria treatment much more acceptable to agriculturists, both on account of its appearance, organic content, and "manipulative" qualities.

Farmers object to a heavy base; what they require is a bulky manure, such as will ensure even spreading.

A circular recently issued by the Manchester Corporation contains the following:

COMPARATIVE ANALYSES OF MANURES.

The following analyses will give some idea of how the dried sewage manure compares with the older and better known manures —

| — | Ordinary pressed sludge cake. | Fresh farmyard manure. | Dried sewage manure. |
|---|---|---|---|
| | Per cent. | Per cent. | Per cent. |
| Moisture ... ... ... ... | 60·10 | 75·20 | 10 to 12 |
| Organic matter ... ... ... | 16·69 | 21·25 | 35 ,, 45 |
| Containing nitrogen ... ... | 0·63 | 0·39 | 1·25 ,, 2·0 |
| Equivalent to sulphate of ammonia ... | 2·96 | 1·83 | 5·9 ,, 9·4 |
| Phosphoric acid ... ... | 0·32 | 0·18 | 1·0 ,, 2·0 |
| Equivalent to tribasic phosphate of lime | 0·70 | 0·39 | 2·2 ,, 4·4 |
| Oxide of iron ... ... ... ... | 1·40 | — | — |
| Alumina ... ... ... ... | 0·43 | — | — |
| Hydrate of lime ... 10·73 ) Carbonate of lime 1·36 ) Sulphate of lime ... 0·92 ) | Total lime as CaO. 9·01 | 0·49 | 5·0 ,, 10·0 |
| Magnesia, &c. ... ... ... | 1·00 | — | — |
| Insoluble siliceous matter ... ... | 7·35 | 1·08 | — |
| Potash ... ... ... ... | — | 0·15 | — |

The analysis of the ordinary pressed sludge was made by Mr. A. Smetham, F.I.C., chemist to the Royal Lancashire Agricultural Society, while that of the farmyard manure is due to Mr. Primrose McConnell, B.SC.

Dried sewage manure, therefore, on the face of the previous observations, would appear to have a value of from 30s. to 40s. per ton, and to be easily capable of enrichment by ammonium sulphate or ground bones, so as to bring it within the region of the best artificial manures.

But this is just where other considerations call for a halt.

It has recently been pointed out by Dr. E. J. Russell that a soil must be considered from three points of view: Its store of plant food, actual and potential; its physical properties, and the rate at which potential plant food can be converted into actual food. The old view of the soil was that it consisted of particles of various sizes derived from the original rock material, the whole being intimately mingled with the decaying fragments of plants. But recent researches have shown that the rock particles are coated with a "colloidal complex" made up of organic matter, silica, aluminium and iron oxides, phosphoric acid, potassium compounds, &c., which have the power of interacting with and precipitating dissolved substances.

What one has to consider in dealing with the real value of a manure or fertiliser in a soil is the "ease of decomposition," and, as pointed out by Dr. Russell, this is "of fundamental importance;" the ease of decomposition is affected by physical structure in the case of sewage manure to a very considerable extent.

In spite of alluring advertisements and tempting analyses, farmers do not take even ordinarily dried sewage away as voraciously as one would expect, and they know the reason why. The results are not encouraging, because the manurial constituents are not assimilated by the soil.

The principal cause of this is the presence of *grease*, and this cause must be removed before sewage sludge is accepted as a manure worthy of the consideration of agriculturists.

In the issue of this journal for March 1st, current, appeared a paper read by Dr. Grossman before the Manchester Section of the Society of Chemical Industry, which, after dealing with the subjects of pressing and gasification, concluded with the following important passage—the italics in which are the writer's:

A NEW METHOD.

"The hygienic disposal of sewage sludge is the keystone of sewage purification, and the most rational mode of sludge disposal is that of putting it back on the land. But to use it in the shape of sludge, wet, pressed, or dried, for farming purposes, is nearly always impracticable and always open to serious objections on hygienic grounds. There will always be a suspicion that it may disseminate disease among cattle and human beings; it should never be used where cattle is grazing, and not where the plant shoots have appeared above ground; its use in the latter case is, I understand, forbidden by law in France. Ordinary drying of sludge is no guarantee of sterilisation. *To make the sludge available for farming purposes it must be deprived of its grease*, and the residue exposed to such a temperature as will be a guarantee that it is thoroughly sterilised. It is these considerations which I have borne in mind in working out my process for the disposal of sludge by means of distillation with superheated steam in such manner as will comply with the severest requirements of hygiene."

Only those who have tried the effects on land of sewage sludge containing varying amounts of grease can fully appreciate the effects of it. The extent to which it does vary is also remarkable. During the present year the writer has examined several sludges from different towns, and the following table gives the quantity of fatty acids and unsaponifiable fats present in what were handed over as representative samples:

RESULTS OF EXAMINATION OF SEWAGE SLUDGES, FIGURES GIVEN IN PERCENTAGES ON OVEN DRIED (212° F.)

| Town. | Organic Matter. | Oils and Fatty Acids (included in Column 1). | Organic Nitrogen. | Phosphoric Acid as Tribasic Phosphate. | Iron and Alumina Oxides. | Siliceous Matter. |
|---|---|---|---|---|---|---|
| Accrington (sedimentation tanks following filters) ... | 53·5 | 5·5 | 1·7 | 6·3 | 13·3 | 25·4 |
| Accrington Septic Tanks ... | 65·5 | 13·8 | 3·8 | 2·5 | 7·7 | 24·0 |
| Rochdale ... ... | 48·1 | 13·7 | 1·8 | 4·7 | 9·9 | 25·3 |
| Darwen ... ... | 48·8 | 20·7 | 1·3 | 2·3 | 8·7 | 21·2 |
| Devizes (humus from slate beds) ... ... ... ... | 51·8 | 4·0 | 3.2 | 3·7 | 9·7 | 20·4 |
| Stoke (Staffs) ... | 22·7 | 2·2 | 1·1 | 2·7 | 13·6 | 53·7 |
| Colne ... ... ... | 44·0 | 6·5 | ·9 | 1·0 | 3·3 | 10·3 |
| Rishton ... ... | 29·3 | 4·1 | ·8 | 1·8 | 13·9 | 38·9 |

The high figure for grease in the Darwen sample led to a further examination, when it was found that this figure—20·7—could be split into—

17·1 Saponifiable fatty acids.
3·6 Unsaponifiable mineral oils.

It may be assumed safely that the dried sludge from the average sewage works will contain not less than 5 per cent of grease, and in manufacturing towns where special precautions are not taken within the factories, nor the grease intercepted by special contrivances at the sewage works, the figure will be higher. The case of Stoke in the foregoing table is explained by a low figure for organic matter and a correspondingly high one for siliceous matter, and is due to the admission into the sewers of liquids from what are usually extraneous sources.

Now, with regard to the removal of grease, the methods tried up to the present may be divided into three classes:—

(1) Solvent degreasing.

(2) Distillation by means of superheated steam.

(3) Dry distillation.

Solvent degreasing presents difficulties almost insuperable so far as sewage sludge is concerned. The solvents—naphtha, petrol, carbon bisulphide, or the like, are both expensive and dangerous. This means that the apparatus also is expensive, and every slight leakage must be guarded against. To eliminate all the grease by means of a solvent from a fairly porous and dry substance is not easy, as those who have observed a Soxhlet extractor up to the twelfth and thirteenth extraction know full well.

With a substance resembling wet clay the difficulty is intensified, and does not end there. Merely extracting the fat by means of a solvent is really comparatively easy; the greater difficulty presents itself in trying to drive off or recover the last traces of solvent from the recovered grease. Any loss here is fatal; and as it has not yet been accomplished when dealing with even such substances as fish, skins, and wool, where the grease content is much higher and the finished products much more valuable, the chances for sewage sludge are, up to the present, very small.

Distillation by means of superheated steam appears to be more promising, and as between this system and that of dry distillation it is altogether too early to make any pronouncement. Developments are going on in connection with both.

Dr. Grossman's plant is based on the fact that fats may be distilled by means of superheated steam at a temperature lower than that at which they volatilise in the absence of steam. Stearine, for instance, is volatilised at a temperature of 350 deg. Cent. dry distillation, while in the presence of steam it is carried over at about 250 deg. Cent.—an operation well known in soap, candle and bone works.

The text, therefore, of Dr. Grossman's paper, above referred to, is that actual drying is expensive, as carried on at Manchester—namely, by means of external steam jackets, whether by exhaust or live steam; and, furthermore, that sterilisation is not complete, nor grease removed. Dry distillation he also condemns as uneconomical, but that is distillation in retorts, a method which has been tried and abandoned over and over again.

There remains, however, the method of distillation by means of hot gases, together with steam generated from the wet sludge at a temperature sufficiently high to distil off the fats, but not to carbonise or char the organic matter and decompose the nitrogenous compounds.

It would be idle to suppose that this method had not received the attention of the Manchester sewage works staff as a matter of fact it is within the writer's knowledge that plant to this end has been installed at no less than nine different works. The difficulties are mechanical. The introduction of the hot gases for the purpose of distilling off the fats has resulted in more than one case in the whole contents becoming ignited and the plant being heated to redness throughout.

The passage of ordinary pressed sludge through revolving cylinders, heated internally or externally by hot dry gases, results in a caking, and this lining of hard cake eventually fires.

Ruggles-Coles dryers have been tried during the past year at four or five sewage works, it having been assumed that the successful operating of these machines on cement, ores, slurries, sand, slag, and the like would justify the trial, but the presence of grease and organic matter in the sludge have been found to render it more difficult of treatment than the aforementioned substances.

On the face of it, it would be only rational to assume that in a Ruggles-Coles dryer, worked with high temperature gases, say, 600 deg. to 1,200 deg. Fahr., the steam generated from the moisture in the sludge would be sufficiently superheated to carry away with it any fats present in a state of volatilisation.

Whether, however, sufficient moisture is left in the sludge when it reaches a temperature approaching 400 deg. Cent. to provide the necessary steam appears to be at present an open question.

The difficulty of drying at all successfully has yet to be met, and it is significant that at Norwich—where the Norwich Natural Manure Company, Limited, is installing a Ruggles-Coles dryer—the sludge is to be primarily subjected to the "wet carbonising" process.

The makers of this particular dryer had their attention drawn to the wet carbonising process when dealing with peat.

In bulletin No. 4, Canadian Department of Mines, there appears a paper by Mr. Alf. Larson (translated) on the Ekenberg wet carbonising process, from which the following is extracted:—

"If the peat pulp be treated, under pressure, to a temperature of 150 deg. Cent., or preferably higher, then the peat undergoes a twofold change:—

"(1) The peat loses its gelatinous property and becomes amorphous; thus the same physical difference exists in the peat pulp before and after the heating under pressure as between gelatinous and amorphous silica or alumina. Following such treatment, the water in the peat can be more easily pressed from it, and to a greater extent.

"(2) A coking, which I call 'wet carbonising,' takes place during this process, the completeness of which depends, as in dry coking (dry distillation), on the temperature used.

"Oxygen and hydrogen are separated during this process from the peat in the form of water, and as a result the carbon content of the coke is increased, and at the same time, of course, a decrease of the peat substance takes place. During this process no gases are evolved, as in the case of dry coking, when large amounts of gases (containing carbon in some form) are developed, decreasing the output of coke.

"The wet carbonising apparatus is constructed in the form of an oven, with many pipes, and is similar

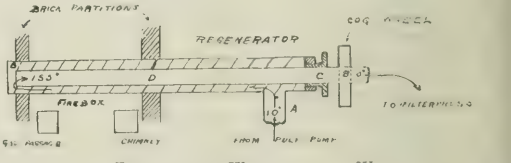



Fig. 6.—Theoretical Working of a Wet Carbonising Oven.

to a tubular boiler. It consists of double pipes; the inner one, which is spiraled with a worm, is free to rotate within the outer one. This revolving forces the peat forward in the pipe at the same time the pump supplies it. Fig. 6 illustrates the principle of this apparatus.

"The peat pulp is forced in at pipe A, and, by means of the worm on pipe D and the pressure from the pump, is moved towards B, where it turns and passes through the inner pipe D towards the outlet C, which is controlled by a regulator, so that an even pressure is always maintained

"The peat is forced in at the outer pipes, which are fifty-two in number, moves forward through the fire-box to a joint chamber connected to all the pipes, thence through the inner pipes to a common outlet. The peat, in making this cycle, is gradually heated, first by the heat from the outgoing mass, and later from the fire in the fire-box, where it attains its highest temperature; then, in passing out through the inner tube, it gives off a great part of its heat to the incoming pulp. The peat, let us suppose, during its passage has a maximum temperature of 185 deg. Cent.; in passing through the inner pipe D towards the outlet C, it is cooled down by the incoming peat to a temperature less than 100 deg. Cent.

"A temperature of 185 deg. Cent. corresponds to a pressure of about 11 atmospheres, but in order to ensure that no steam be formed, a pressure of 15 atmospheres is kept up by the pump.

"When no steam is formed the mass forced in has the same heat capacity as the mass passing out, and

theoretically should be able to absorb all the heat contained in the outgoing mass. The incoming and outgoing masses would have the same temperature, if it were practical to make the pipes sufficiently long. The pipes used in Stassjo are 11 metres long, and a maximum temperature of 155 deg. Cent. was maintained."

The writer has found the effect of this treatment on wet sludge to be decidedly beneficial.

A sludge was treated containing 90 per cent water and 10 per cent fats, which before treatment was slimy, only pressed with difficulty, and the filtration of which through filter-paper could only be brought about by means of a suction pump.

After the wet carbonising process, the physical character of the sludge was entirely altered. Equal quantities of digested and undigested sludge were thrown on to a filter after well mixing, the former running right out in five minutes, while in the case of the undigested portion only one-sixth the quantity of filtrate had passed in the same period.

On allowing the digested sludge to stand in a tank the solid precipitate of sludge fell at once towards the bottom, and in the course of twenty minutes there were 24-45ths of the total depth occupied by a perfectly clear (though dark-coloured) supernatant liquor, which could be drawn off, thus reducing the bulk for pressing by more than one half, apart from the fact that what was left was much more easily pressed.

It is probable that a machine such as the Schaefer ter meer would deal satisfactorily with this sludge, but on that nothing can be said here at present.

The actual fat content, however, was unaltered, and a quantity of tallow only, in water, was submitted to the process, and found to be unaffected to any serious extent. It was certainly discoloured, and to some extent granulated, but not by any means charred or "carbonised," up to a temperature of 400 deg. Cent. and 600 lb. pressure.

The question has been asked, Why not increase the pressure on digesters to prevent the formation of steam at the temperature which would distil off the fats?

The pressure required, however, to prevent the formation of steam at a temperature of 350 deg. Cent. is, according to Rankine's formula ("Steam Engine," p. 237), 2,255 lb. per square inch, and according to that given by Cotterill ("Steam Engine," p. 5):—

$$\log p = 5.\left(\frac{t - 212}{t + 367}\right) + \log 147$$

2,250 lb. per square inch, both impracticable pressures, to say nothing of the fat volatisation temperature at a pressure of 600 lb.

The wet carbonising process must, therefore, be taken as an aid to pressing only, to be followed by pressing and the distillation of grease.

The description given above, however, of the mechanical plant for wet carbonisation is no more the last word on the form of apparatus to be used than is either the Ruggles-Coles dryer or the Grassman plant for grease removal. The plant and the problem throughout lend themselves specially to the chemical engineer, and offer opportunities for such economies and improvement as will bring the delivery of powdered, dried, sterilised, fat-free sewage sludge just as much a part of the sewage works manager's duty as the delivery of a non-polluting effluent.

The Norwich Natural Manure Company starts now as the pioneer, and the prospectus issued on April 13th last contains interesting particulars as to the position. From that it appears that the company has acquired from the Electro Metals, Limited, the exclusive licence to use the process of wet carbonising in relation to the treatment of Norwich sludge, subject to a royalty not exceeding 1s. per ton dry. Whether the heating of sewage sludge under pressure, or of any other substances, can be maintained as a valid patent is not quite clear in view of what has already been done by others, and in any event the Ekenburg patent for peat was taken out in 1903, eleven years ago.

The company is granted a free site by the corporation and will receive from it a payment of £600 per annum during a period of fifteen years for treating the sludge up to a quantity not exceeding 1,200 tons per week, wet—producing, say, 100 tons per week dry. Thus the company starts with a bonus of 2s. 4d. per ton on saleable material, say the cost of pressing, and free raw material. The prospectus also states that a responsible firm has offered to take the whole of the output at a price of 45s. per ton, but that a better price should be obtained in consideration of its high manurial value.

If, however, the suggested prices are based on the supposition of the composition of the finished material being similar to the samples quoted, disappointment is probable.

It is stated that the average analysis of the dried product from Norwich shows: Nitrogen equal to ammonia 4·41 to 5·28 per cent on the dry.

Seeing that this figure is as high as that from dried fæces, it is hardly likely to be maintained without enrichment.

On the whole, however, the start must be regarded as a very promising one, a landmark in the history of sewage treatment, and well worthy of support.

## COMMERCIAL MOTORS.

### THE ANNUAL PARADE.

The parade of motors arranged annually by the Commercial Motor Users' Association took place on Whit Monday in Grosvenor-road and the by-streets adjoining the Tate Gallery. The entries were fewer than last year, but the Coronation year was admittedly an exception to all rules, and this was certainly the case with respect to this particular exhibition. The quality of the entries this year, however, was of a high order, and the parade proved to be in all respects most satisfactory. The awards are given, not only for the condition of the machines on the day of inspection, but for the care bestowed upon them by the drivers for a period antecedent, an engineer appointed by the association spending six months of his time in "surprise" visits to the garages containing the competitive motors, and forming his judgment as to the means the men have of doing their work properly, the driver's personal qualifications, the total mileage, and the condition of the vehicle. The money and other awards given away equalled £300 in value.

In connection with the display, the annual luncheon took place at the Royal Automobile Club, Pall Mall, under the presidency of the Hon. Arthur Stanley, M.P., supported by Colonel R. E. Crompton (chairman of the association and engineer to the Road Board), Captain R. K. Bagnall-Wild (vice-chairman), Mr. W. G. Lobjoit, Mr. E. Shrapnell Smith, Mr. T. B. Browne, Colonel T. J. Kearns (Army Service Corps, First Division, County of London), Mr. H. Lyon Thomson, Mr. E. Percy Beavan, Mr. H. J. Chapman, Major W. E. Donohue (chief inspector Mechanical Transport, Aldershot, Army Service Corps), Mr. D. S. Kennedy, Mr. G. W. Watson, Mr. Charles Wheeler, Mr. A. W. Windsor, and Mr. Frederick G. Bristow (secretary).

The chairman proposed the toast of the association, coupled with the name of Colonel Crompton, of whom, he said, when the history of commercial automobilism was written, there would be found in its pages no more honoured name.

Colonel Crompton, in response, said the drivers had discovered there was money to be made out of engineering education, and it was a matter for congratulation that the standard of education in engineering had been raised amongst drivers. Reduction in the cost of upkeep of motor vehicles was not only to the interest of owners, but to the ultimate advantage of the public. The result was reflected in lower rates of carriage. As one who had devoted many years to mechanical traction, he said it was very pleasing to find his hopes had been realised in his lifetime.

**London's New Reservoir.**—The work of constructing the large reservoir at Chingford, which is being carried out for the Metropolitan Water Board by Messrs. Charles Wall, Limited, is nearing completion, and it is expected that it will be finished towards the end of the year. The reservoir has a capacity of about 3,000 million gallons, an area of 416 acres, and 4¼ miles of embankment.

**Ashton-under-Lyne District Waterworks.**—The Joint Committee of the Ashton-under-Lyne, Stalybridge and Dukinfield (District) Waterworks, to which Mr. Fred. J. Dixon, Assoc.M.Inst.C.E., is engineer, has work proceeding at the present time involving an expenditure of £150,000. The amount which has been available for distribution among the various constituent authorities as a result of the work of the Joint Committee has been increased by £4,000 during the last two years.

# Institution of Water Engineers at Cheltenham.

## MR. J. S. PICKERING'S PRESIDENTIAL ADDRESS.

At the opening, yesterday, of the seventeenth summer general meeting of the Institution of Water Engineers at Cheltenham, Mr. J. S. Pickering, M.INST.C.E., the borough surveyor and water engineer, was formally installed as president of that body, and subsequently delivered the following inaugural address:—

My election as president of the Institution of Water Engineers is an honour which, I need hardly say, I deeply appreciate. I realise the responsibilities which are inseparable from the distinguished position I have been chosen to occupy, and with your assistance during the coming year I will do all in my power to maintain the dignity and usefulness of the institution.

The work of the water engineer, while, as a rule, entailing much anxiety, is nevertheless full of interest, and so long as communities exist, must provide a vast field for research and scientific skill. The kindred practice of hydraulic and irrigation engineering is equally engrossing, and at the present time must appeal with special interest to the young engineer, inasmuch as new opportunities for his services in this direction appear to be opening in all parts of the world.

### MODERN RESERVOIRS.

It is only 100 years ago since rapid developments began to take place in the public water supplies of this country, and this is mainly to be attributed to the introduction of cast-iron pipes, which enabled water to be supplied at greater pressures. Steady progress has been made ever since, with the result that there are now few populous places without a piped supply. During the last few years many large and important undertakings have been carried out in different parts of the world, and a brief reference to a few of these may be of interest.

The Wachusett dam, said to impound the world's largest municipal reservoir, was completed six years ago. It is built to store the water of the Nashua river as the principal source of water supply for Boston, Mass., U.S.A., as well as for twenty-seven other municipalities. The contents of the reservoir when full is 63,000 million U.S. gallons (8,420 million cubic feet). The cost of the reservoir complete has been £2,115,545.

The New Croton reservoir for the supply of New York was completed about the same time as the Wachusett reservoir, and occupied thirteen years to construct. The dam is a handsome structure of solid masonry, and impounds 30,000 million U.S. gallons (4,010 million cubic feet). The reservoir is only one of a series on the Croton river and its tributaries. These, with others in progress, give an aggregate capacity of about 102,000 million U.S. gallons (13,636 million cubic feet). The present supply is even now barely sufficient to meet the demands of the city, and a colossal scheme which, it is said, before completion will cost over £36,000,000, is in progress for bringing water from the Catskill Mountains—a distance of more than 100 miles.

The Cataract dam for the supply of Sydney—the biggest in Australia—has recently been completed. It impounds 21,411 million gallons of water (3,436 million cubic feet), or nearly a thousand days' supply. Like other large dams in Australia, this dam is painfully devoid of embellishment or ornamentation; there is nothing but the outlet towers to relieve the monotony of the huge expanse of wall. The structure, though plain and bare, is strong, effective and cheap. In commenting on the unsightliness of New South Wales dams, Mr. E. M. de Burgh M.INST.C.E., [illegible] has them as bare segments of a vertical concrete cylinder wedged into the gorges without even a parapet-wall being built to set them off. Happily, in this country regard is had not only to efficiency and economy, but to the more artistic requirements which render the work of a pleasing and picturesque character, and in connection with the magnificent lake which have been made for supplying the needs of large cities there is nothing unharmonious with the surrounding scenery.

The largest impounding reservoir in our own country, although exceeded in size by others in various parts of the world, are, nevertheless, monuments of great engineering skill, and are carried out as a matter of course to the requirements of the city whose needs they serve. In making a comparison it must not be overlooked that in this country the consumption of water per head is considerably less than in the United States. Take, as an instance, Boston, U.S.A. The earlier works were designed to supply 30 gallons* per head per day, but in 1870 the supply increased to 66 gallons per head, in 1875 to 69 gallons, in 1880 to 87 gallons, and in 1895 to 92 gallons. In that year the State Board of Health reported that it would not be safe to calculate on a less requirement than 100 gallons per head per day for the next twenty-five years, and even this liberal estimate was speedily outgrown. Extravagance of this description would not be tolerated in this country, and, in my opinion, instead of providing costly engineering works to meet unreasonable demands, it is preferable to take any steps which may be necessary to prevent the misuse of water. There is probably no city in the world with a better water supply than London, yet here the requirements of a population numbering something like 7,000,000 are amply provided for by a supply of 32 gallons per head per day.

There has been great activity in this country in recent years with regard to water supply undertakings. Within the space of a few years three of our largest cities—Liverpool, Manchester, and Birmingham—have obtained entirely new supplies, and in a short time the Derwent Valley works, carried out under Mr. Edward Sandeman, M.INST.C.E. (our immediate past-president), will be augmenting the supplies of Leicester, Derby, Nottingham, and Sheffield from reservoirs having a total capacity of 3,940 million gallons (632,000,000 cub. ft.). A large dam to impound 1,100 million gallons (177,000,000 cub. ft.) is in course of construction at Angram for the supply of Bradford, where a serious shortage took place during the drought of last summer. The Leighton reservoir, at Leeds, which is costing about £500,000, is also nearing completion. The Alwen reservoir, which is to contain 3,000 million gallons (481,000,000 cub. ft.), for the supply of Birkenhead, has been commenced. Reservoirs for the city of Cardiff are in course of construction, and when the Taff Fawr works are complete there will be a total storage of 2,200 million gallons (354,000,000 cub. ft.). Harrogate has spent nearly £1,000,000 on its waterworks, and its new reservoir under construction will have a capacity of 540,000,000 gallons (80,000,000 cub. ft.). Lincoln, after experiencing an epidemic of typhoid fever, has recently obtained a supply from the new red sandstone 20 miles from the city.

The Metropolitan Water Board have constructed covered reservoirs at Honor Oak to contain nearly 56,000,000 gallons. The opening of the Island Barn reservoir at Molesey has added 900,000,000 gallons additional storage, while a further 3,000 million gallons storage will be added with the completion of the Chingford reservoir. This will bring up the total reservoir capacity for unfiltered water to 12,800 million gallons (2,054 million cubic feet), in addition to which there are eighty covered service reservoirs for filtered and spring water of a total capacity of 311,000,000 gallons (50,000,000 cub. ft.).

But it is not, of course, merely reservoir capacity which gives security as regards water supply. The new Croton reservoir of New York is more than twice the size of the whole of London's reservoirs, but whereas London is amply provided against all contingencies for many years to come, New York is compelled to push forward a gigantic and costly scheme of water supply with almost feverish haste.

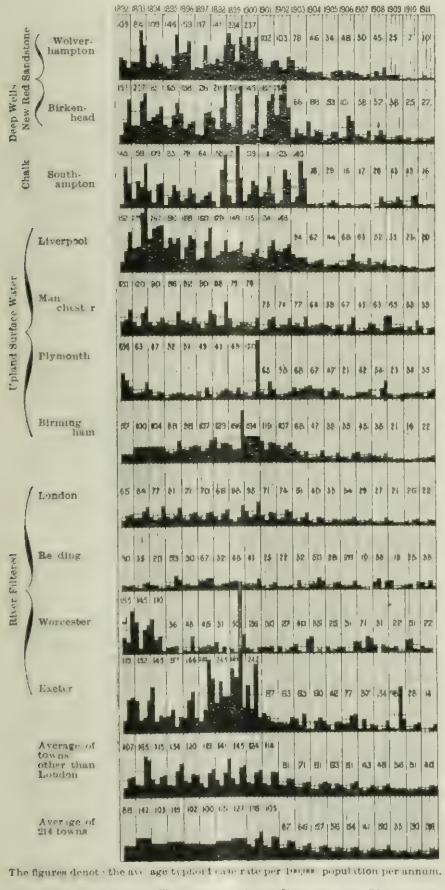
### THE QUALITY OF WATER.

The quality of a public water supply is a matter of vital importance. With the development of bacteriological science, and a wider knowledge of the laws of health, public authorities in this country, as well as elsewhere, are realising the necessity of a pure water supply. An enormous responsibility attaches to the water engineer who is called upon to supply a community with a commodity which is one of the first essentials to health. Water for drinking purposes and dietetic use is now laid on to almost every house in the populous parts of the kingdom, and an unwholesome supply may prejudicially affect the health of whole communities. When germs of

* U.S. gallon equals .833 Imperial gallon.

disease are present in the water, the weak and sickly will quickly succumb, nor is there immunity even for those who may have vigorous constitutions. The water engineer knows the risk and danger of an impure supply, and as far as it is within his power, it is his duty to supply water of a quality beyond suspicion. The responsibility is not, however, all on the side of the water engineer. The water authority under whose direction he works is called upon to take its share, and in cases where obvious risks are pointed out, and the advice of the engineer is disregarded, the authority must accept the risks attaching to an unsatisfactory supply.

Whatever may be the nature of the supply itself, constant supervision by a competent engineer and a reliable staff is absolutely essential, and what is of equal importance is a systematic and methodical examination of the water by a qualified chemist. A return from water authorities throughout the king-




The figures denote the average typhoid case rate per 100,000 population per annum.

CHART SHOWING TYPHOID CASE-RATES OF VARIOUS TOWNS IN ENGLAND.

dom as to their practice in submitting samples for analysis and bacteriological examination would, I believe, come as a somewhat startling revelation. It would, I fear, show that in the large majority of cases this very simple safeguard is, even in the case of some of the larger authorities, either neglected entirely or carried out in such a spasmodic and partial manner as to be of very little value.

The frequency with which examinations should be made must, of course, depend on the character of the supply and the system of purification. Where there is more than one source of supply, samples should be submitted from each source, and in all cases periodical examinations should be made of the water actually drawn from the service taps. Where filters are in use, not only should samples be taken from the pure-water tank, but the effluent from each individual filter should be subjected to examination at frequent and regular intervals. It is only by observing such precautions and acting upon the results obtained that a safe and wholesome supply can be assured.

SOURCES OF WATER SUPPLY.

One of the most onerous duties of the water engineer in this country is to advise on suitable sources of supply. With the continued growth of population, the limited area at his command and the burden of taxation which he cannot overlook, his task is becoming year by year more difficult. Many of the large cities and towns have gone far afield to obtain supplies from sparsely populated and uncultivated districts, and have acquired immense areas of land within their gathering grounds for the purpose of preventing pollution. London, on the other hand, continues to serve its huge population from an admittedly polluted river supply, which is, however, rendered of hygienic purity by storage and filtration.

The efficiency of modern processes of purification has become so marked that it is now a debatable question as to whether water contaminated to a slight extent and undergoing a thorough treatment of purification is not safer than an untreated water obtained from what may be considered an unimpeachable source.

A chart has been prepared by Mr. Thomas Caink, the city engineer of Worcester, showing the typhoid case-rates of various towns in England having different sources of water supply. A similar diagram appeared in the "Transactions" of the institution eleven years ago, but the information has been brought up to date, and now forms a most interesting record for the last twenty years. Of the eleven towns which were selected for comparison (without any previous knowledge of their respective typhoid rates), three derive their water from deep wells, four from upland sources, and four from rivers. An average of typhoid cases is given also of 214 towns.

The following table gives a summary of the averages:—

| Town. | Average per annum for 10 years 1892-1901. | Average per annum for 10 years 1902-1911. | Average per annum for 20 years 1892-1911. |
|---|---|---|---|
| *Deep Wells.* | Per 100,000 Population. | | |
| Wolverhampton | 142 | 42 | 92 |
| Birkenhead | 174 Average 144 | 79 Average 56 | 126 Average 100 |
| Southampton | 118 | 47 | 82 |
| *Upland Surface Water.* | | | |
| Liverpool | 173 | 61 | 177 |
| Manchester | 98 Average | 60 Average | 78 Average |
| Plymouth | 62 110 | 42 62 | 52 81 |
| Birmingham | 112 | 43 | 77 |
| *River Water Filtered.* | | | |
| London | 77 | 35 | 56 |
| Reading | 38 Average | 28 Average | 33 Average |
| Worcester | 67 96 | 35 37 | 51 66 |
| Exeter | 190 | 51 | 126 |
| Average of towns other than London | 128 | 54 | 91 |
| Average of 214 towns | 111 | 51 | 81 |

The figures show a somewhat high typhoid rate in Worcester up to 1894, and an exceptionally high rate in Exeter up to 1900, but, notwithstanding these figures, the averages are the lowest in the towns deriving their supplies from rivers. In 1895 and 1902 Worcester and Exeter respectively installed an additional area of filter-beds, and it will be seen from the chart what a remarkable diminution has since occurred in the typhoid rates of these two cities. Whatever may be the value of the chart in other respects, it shows clearly that during the last ten years there has been a general reduction in the typhoid rate, as compared with the previous decade, not only in each of the cities and towns specially mentioned, but in the 214 towns from which statistics have been obtained. This is a gratifying result, and is probably due in a great measure to improvements in the water supplies which have taken place generally throughout the country.

PURIFICATION BY STORAGE.

The purification of water by storage has of late years been the subject of much interesting discussion. The research work of Dr. Houston in connection with the storage of the river waters supplying London has been rewarded with most important and gratifying results, which are beneficial not only to the Metropolitan Water Board, but to all engaged in water supply undertakings. Dr. Houston has shown that the microbes of disease and those which are indica-

tive of sewage (B. coli) perish rapidly in stored water. In about three weeks, speaking generally, the safety change is complete and dangers imminent from sewage pollution are reduced to a minimum. The water is also in a better state from a chemical point of view, and nearly the whole of its sediment is removed.

These conditions refer especially to river waters, but they are no doubt applicable generally to waters from gathering areas which are subjected more or less to sewage contamination.

But while such contaminated waters will improve by storage, filtered waters, and waters from underground and other sources not liable to pollution, may actually deteriorate by impounding in open reservoirs. Where practicable, waters of this description should, if storage is necessary, be kept in covered reservoirs.

The storage of water in open reservoirs sometimes gives rise to trouble owing to the growth of algæ, and some classes of water so affected which do not undergo subsequent treatment may become unfit for use. It is quite a common practice in the United States to apply copper-sulphate to water of this description, not only to destroy the algæ, but to prevent their growth, and the results appear to justify the treatment. This remedy has not found much favour in this country, although in a few cases it has been applied successfully, particularly at Newport and in the neighbouring city of Gloucester.

### MECHANICAL FILTERS.

The mechanical type of filter is becoming extensively used in this country. It possesses advantages over the slow sand filter with regard to space occupied, initial cost, and working expenses, and may frequently be used where a slow sand filter would be impracticable. The filter is especially serviceable where the use of a coagulant is desirable to remove peaty and other discolouring matter, as, in addition to producing a bright filtrate, the chemical has the advantage of assisting the bacteriological purification of the water. The pressure filter has been given preference over the gravity filter, chiefly because it can be introduced on the service main without much loss of head. Where, however, sufficient head is available, this practice is not to be recommended, as it is obviously preferable to keep the filtrate as closely under observation as possible. Mechanical filters, when properly arranged, will give equally good results as slow sand filters. The weak point in both types is their impaired efficiency after cleaning, but whereas the former generally have to undergo this operation very thoroughly at least once a day, the latter may continue for weeks without even the surface film being removed.

### PRE-FILTERS.

In many cases where ordinary slow sand-filters are in use I am of opinion that mechanical filters might be introduced as pre-filters with considerable advantage. Experience has proved beyond doubt that after the filtering skin has been removed a filter loses much of its power to remove the micro-organisms from the water, and it is only after running the water to waste for some time and reducing the speed of filtration that it gradually regains its efficiency. These precautions are recognised as necessary by all water engineers, but those who have charge of filters realise the difficulty of carrying them out in practice, particularly as there are no means of really testing the work a filter is doing except by a bacteriological examination of the filtrate. As a safeguard, then, against the inefficiency of a freshly scraped filter, and as a second line of defence, as it were, against the passage of pathogenic bacteria into the supply mains, pre-filters are of the greatest value. In his presidential address Mr. W. H. Humphreys stated that water from the river Ouse for the supply of York, after undergoing purification by means of gravity pre-filters and ordi-

The most complete form of filtration is that known

five years ago. This plant is fully described in the

usual storage reservoir), a group of coarse sand pre-filters, and finishing beds of fine sand. Owing to the efficiency of the strainers and pre-filters, the finishing

scraped only two or three times a year. This is in striking contrast to the usual type of filter bed, which generally only runs for a few weeks without cleaning.

### STERILISATION.

Although a high standard of purity is now generally demanded, the time will probably come when nothing short of complete sterilisation will be acceptable. Many substances have been found which are capable of destroying infectious germs, but their application to drinking water has been rendered objectionable owing to a harmful residue left in the water after treatment. The use of ozone is not attended with this difficulty, and in recent years this has been adopted for the sterilisation of the water supplies in many large towns. The chief disadvantage is the cost of working, and until this can be greatly reduced, the process is not likely to become extensively used in this country. The use of hypochlorites for the sterilisation of water has met with success, and this treatment has the advantage of being comparatively inexpensive in working. During the memorable epidemic of typhoid which occurred at Lincoln in 1904-5, the water supply was, on the advice of Dr. Houston, sterilised with "Chloros" (an electrolysed solution of common salt), which proved to be efficacious. The bactericidal action of the ultra-violet rays has also been applied to the sterilisation of water on a fairly large scale, and papers on this process were recently read before this institution. An interesting paper has also been submitted on what is known as the "De-Clor" system, in operation at Reading. Through the agency of a minute dose of chlorine the objectionable bacteria are destroyed, and the residual chlorine is eliminated by means of charcoal placed within the filters. The "De-Clor" apparatus takes the place of ordinary sand filters, the river water only undergoing preliminary treatment through coarse pre-filters.

### PUMPING PLANT.

Considerable progress has been made in recent years in the development and design of waterworks pumping plant, and the engineer has now a variety of different types of machinery suitable for his requirements to select from. Economy in working expenses is, as a rule, the main object to be aimed at, and it frequently happens that to effect this a large expenditure of capital on modern machinery to replace plant which, though in good working order, is of an obsolete type, may be entirely justified by the improved results obtained.

As an example of the efficiency of modern pumping machinery, the result of the official tests made by Prof. Orr, in 1908, of one of four engines supplied by an English firm to the Rand Water Board, South Africa, may be mentioned as of interest. The mechanical efficiency given was 93·4 per cent on a lift of 960 ft., and a duty of 183,000,000 foot-pounds per 1,000 lb. of steam at 183 lb. pressure above atmosphere superheated to 120 deg. Fahr. The results were based upon water actually delivered at a speed of 41 revolutions per minute. Mr. Alfred Towler, in a paper read before this institution, referred to these results as constituting the world's record for minimum steam consumption against water delivered. The figures are instructive, as showing the high efficiency to which modern pumping machinery has been brought. But in determining the probable economy of the plant the water engineer has to bear in mind not only the duty he may expect to get from it in actual practice, but the whole of the annual costs for fuel, labour, maintenance, interest and sinking fund charges, and a con-

must guide him in the choice of the most suitable type of machinery.

A matter of great importance as affecting the working expenses of a pumping plant is the quality of the fuel. It is obviously the duty of the engineer to

price. The usual practice of purchasing coal of a

any regard to its varying calorific value, is unsatis-

is paying. The only satisfactory method of purchas-

has made most progress in America and is also making some headway in this country and on the Continent. Under this system the purchaser buys heat-units instead of tons of coal, and the price rises or falls according as the fuel actually delivered yields,

on testing, a larger or smaller number of British thermal units than that chosen as the standard.

Up to the present time no other motive power has equalled that of steam for facility and smoothness of starting, variability of speed and general reliability. Steam engines can be coupled direct to pumps, while internal combustion engines and electric motors must necessarily drive through gear reduction. Gearing has, however, in the last few years greatly improved in efficiency and quietness of running.

The recent coal strike has shown the necessity of securing an alternative fuel supply not only in connection with waterworks pumping plant, but for the numerous other power purposes for which coal is used in the great industries of the country. Such an alternative will possibly be found in liquid oil fuel. Where steam engines are already in use, it may be found practicable either to equip the existing boiler furnaces with nozzles for burning crude oil or to provide separate oil-fed furnaces. Oil, in any case, is likely to prove a useful substitute, and it is by no means improbable that it may ultimately supersede coal as fuel for power production. Since its introduction some fourteen years ago the Diesel oil-engine has been greatly improved in design and construction, and it is now extensively used. Unlike the steam engine, it requires no auxiliary plant, but converts the heat of the natural fuel into work in the cylinder itself. There is reason to believe that crude oil can be obtained in almost unlimited quantities and at a cost to make its use practical on a large scale, and should this be proved beyond doubt, the recent stoppage of the coal supply will have given a decided impetus to the use and application of an alternative form of fuel.

ENGINEERING STANDARDS COMMITTEE.

The advancement of engineering could scarcely be shown in a more marked degree than in the establishment of the Engineering Standards Committee, an organisation which is worthy of a foremost place among the great national institutions of the present century. The leading technical societies and the manufacturers of this country are, happily, co-operating in order to bring about a standardisation of designs and methods in engineering practice, the want of which has hitherto resulted in enormous waste of money, and has placed the manufacturers of this country at a disadvantage in foreign competition.

Water engineers have reason to be grateful to the committee for the standard specification which has been produced for Portland cement, a material which plays so important a part in most of the structural works with which they are concerned. The issue of this specification has not merely been a convenience to the engineer and manufacturer, but it has brought about an immense improvement in the quality of cement. In order to obtain the high quality demanded, manufacturers during the last few years have had to revolutionise their methods and to replace their plant with machinery designed on the most modern scientific principles. The processes of mixing, of burning, and of grinding have all undergone much alteration, but perhaps the greatest improvement is the new and additional process of hydration. It is claimed that this operation achieves in a scientific, rapid and efficient manner what aëration has only imperfectly effected in the past. For many years it has been the general practice to specify that cement should be stored in bulk on the works for some weeks for the purpose of undergoing aëration. Some engineers still consider this precaution necessary, notwithstanding the extraordinary developments and improvements in the processes of manufacture, but the opinion appears to be getting more general that if cement is obtained of the high standard required by the new British Specification, aëration on the works may safely be dispensed with.

Another important matter on which the Engineering Standards Committee have been engaged, and which was initiated by our own institution, is the standardisation of cast-iron pipes. The work is now well advanced, and it is hoped that the standard specification will be issued at no distant date.

THE WASTE OF WATER.

The waste of water is a subject which has been frequently discussed at our meetings, and its importance cannot be too strongly urged. It is a remarkable fact that people who are accustomed to observe the strictest economy in other things regard wastage of water with indifference. The average householder would deem it the greatest extravagance to drain a gallon of milk each day when his family's requirements would be met by a supply less valuable probably not to be concerned with the trickling of water from a defective tap, although the value of the water wasted might be much more than that of the unused milk. In the one case he suffers direct pecuniary loss; in the other his pocket is only indirectly affected. There is no remedy for such waste except a thorough and systematic house-to-house inspection, followed up with the immediate repair of defective pipes and fittings. The supply of water for domestic purposes by meter is not likely to find favour in this country, and we are probably committed for a long time to come to the rough-and-ready practice of charging for water on the value of the property supplied. The question as to the quantity of water per head which may be regarded as reasonable must depend on the circumstances of each particular supply. Where every gallon of water has to be pumped and the supply is limited, the prevention of waste is necessarily more important than in the case of an unlimited supply by gravitation.

By-laws for the prevention of waste would appear to the most casual observer an absolute necessity, yet at the present time there are many water authorities who have no legal power to make such by-laws. The institution has frequently drawn attention to this, and has urged the necessity for a short Act embodying the necessary powers.

One of the best methods of avoiding waste and reducing the consumption of water to a minimum is in operation under the Consett and Weardale Water Company. Mr. Robert Askwith, M.INST.C.E., the engineer, states that, for over thirty years, the company have undertaken the repair and renewal of service pipes and taps upon payment of 1s. per annum for each draw-off tap. This has been taken advantage of by nearly all the consumers, and the company have profited by keeping the down the supply down to the exceedingly low average of 21 gallons per head to a population of 360,000. It is a practice which might be followed with advantage by all water authorities if the necessary legal powers were available.

THE INSTITUTION.

The past year marks a new era in the history of our society, inasmuch as we have become a recognised corporate institution, and our powers have been greatly increased under new Memorandum and Articles of Association. While we have thus attained to a higher status and a more important position, we have accepted greater responsibilities, and it now rests with each individual member of the institution to assist in the promotion of the objects we have in view. Those of us who have been connected with the institution since its inception, and can look back to the time when the water engineers of this country had no facilities for meeting as a body and few opportunities of becoming acquainted with the work of their colleagues, can fully realise the usefulness of the institution both to its members and to the water authorities whom they serve. The splendid record of sixteen years' work is shown in our yearly volume of "Transactions," and even if our efforts had been confined to the production of the valuable papers and discussions which the volumes contain, we could claim that our institution has rendered very great service in matters affecting the public water supplies of the country.

The advantages of attending meetings of the institution are so obvious to its members that it is scarcely necessary to allude to them, but it is very desirable that water authorities should be brought into closer touch with the work of the institution, so that they also may realise these advantages, and with this object in view the council have for the first time invited a limited number of delegates to attend the annual meeting.

When it is considered that the first object of the institution is "to promote the advancement of water engineering in all or any of its branches, and all matters connected with or relating to water undertakings," and, further, that its meetings are held for the purpose of discussing papers on waterworks matters and visiting works of water supply, there should be no hesitation on the part of water authorities, not only in asking their engineer to attend the meetings, but in defraying his expenses in doing so. The staff at home engineer is not likely to be so well qualified to give advice as the engineer who takes advantage of the facilities afforded to widen his experience and to profit by the practice of others engaged in similar work, and it is manifestly unreasonable that he should be expected to acquire such know-

ledge for the benefit of his authority at his own expense.

The services of engineers engaged under waterworks companies are, as a rule, much better appreciated and more suitably recognised than in the case of engineers to public authorities. The directors of a company know that the success of their undertaking depends almost entirely upon the ability and energy of their engineer, and, being financially interested in the undertaking, they appreciate his services from a purely business point of view. Public bodies may value the work of their engineer, yet, however willing they may be to reward his services, they not infrequently sacrifice their personal conviction to a fear of public opinion, with the result that not only does the official suffer, but in all probability the undertaking also.

Engineers to public bodies who are entrusted with the carrying out of large engineering works too often meet with discouragement from the authority which, above all others, should act as their strongest supporter. In giving their sanction to a loan for public works it is the practice of the Local Government Board to make a condition that no payment out of the loan is to be made to a salaried official. This means that, whatever the magnitude and importance of the works which the engineer may carry out, and although these may be entirely outside his ordinary duties, the authorised loan cannot include any fee to which his authority may consider his added responsibilities justly entitle him. The stipulation is rendered all the more objectionable by a proviso which invariably follows that it is not to apply to the clerk of the authority. It is difficult to understand why this invidious distinction is made in view of the fact that the legal work in connection with the undertaking is usually insignificant as compared with the engineering work, and it is still more difficult to conceive why the authority may not pay their own engineer out of the loan, and yet may do so in the case of a consulting engineer or another municipal engineer who may be asked to confer with him. The contention that the salary of an official should cover special services in connection with large and important undertakings quite outside his ordinary duties is manifestly unfair. The works being of a permanent character and provided for out of a loan, the engineering costs should also be a charge on capital.

The report of the Water Areas and Statistics Committee presented at the last winter meeting of the institution sets forth the important work on which the council have been engaged for some time past. The report deals with many of the unsatisfactory conditions which exist with regard to public water supplies, and points out the remedies which it is suggested should be adopted by the Legislature. The establishment of a central authority and district boards to control the allocation of new sources of supply, and to deal with questions of national importance relating to public and private supplies, cannot be indefinitely postponed, and the recommendations made by the institution on this important matter will no doubt prove of great value. The collection of statistics relating to water undertakings which has recently been undertaken by the Local Government Board has always been strongly advocated by the institution, but it is to be regretted that the information invited is so limited in character.

The increased activity of the institution, particularly in connection with the Water Supplies Protection Bill and the National Insurance Bill, and in other matters affecting the interests of water authorities, has necessitated an increased expenditure, and last year, for the first time, there was an adverse balance on the year's working. It is the opinion of the council that the work which has been undertaken cannot be curtailed without sacrificing much of the influence and usefulness of the institution, and it is necessary, therefore, to adopt some means of permanently increasing the revenue. After the most careful consideration the council have decided to ask the members of the institution to consent to the raising of their annual subscription, and it is hoped, in the interests of the institution, that this proposal will be readily accepted.

The accompanying table shows the number of members during the past five years.

Though the increase is somewhat slow, it has to be remembered that the number eligible for membership is limited, and that for some time past the standard of qualification for admission to the various classes has been raised. At the present time the council have under consideration the question of forming a class for students, and I firmly believe this course to be very desirable. The institution is the only body representing the water engineers of the country, and I think it should include in its ranks not only the engineer whose experience has qualified him for membership, but the young engineer who is intending to follow this branch of the profession. Later on I hope it may be found practicable to institute a voluntary examination for water engineers. This appears to be necessary in view of the fact that there is at the present time no recognised qualification for assistants to water engineers other than that of experience, and I hold that theory and practice are equally important. Further, I am of opinion that the usefulness of the institution might be materially increased if a large number of visits were arranged to engineering works. The advantage of this is beyond question, and I hope that the matter may be favourably considered by the council.

| Class. | 1st January. | | | | |
|---|---|---|---|---|---|
| | 1908 | 1909 | 1910 | 1911 | 1912 |
| Honorary Members ... | 2 | 3 | 3 | 3 | 3 |
| Members ... ... ... | 206 | 207 | 214 | 221 | 227 |
| Associate Members ... | 108 | 116 | 121 | 125 | 130 |
| Associates ... ... ... | 36 | 39 | 38 | 38 | 36 |
| Total ... ... ... | 352 | 365 | 376 | 387 | 396 |

In conclusion, may I express the hope that the coming year may be one of progress, and that our institution will continue its useful work for the benefit of its members and to the advantage of the authorities who are entrusted with the responsible control of the water undertakings of this country?

## SURVEYORS' INSTITUTION.

### ANNUAL MEETING.

The Hon. Edward Gerald Strutt, who has been elected president of the Surveyors' Institution in succession to Mr. W. E. Horne, M.P., presided on Monday at the 44th annual meeting of that body.

Vice-presidents for the year were elected as follows: Mr. Howard Chatfeild Clarke, F.R.I.B.A., Mr. E. B. l'Anson, F.R.I.B.A., Mr. W. E. Woolley, and Mr. John Farrer; and there were added to the council Mr. J. H. Sabin, Mr. James Inglis Davidson, and Mr. John McClare Clark.

An increase of 205 in the membership of the Institution was shown by the annual report, the roll now numbering 4,705, inclusive of twenty-four honorary members. Over 65 per cent of the English and Welsh, and 95 per cent of the Scottish candidates satisfied the examiners. The report went on to state that the institution building had been enlarged and improved under the supervision of Mr. Paul Waterhouse, whose father was the architect of the building. Expert evidence had been given on behalf of the institution before the Departmental Committee, over which Sir John Kempe is presiding, regarding the changes which have occurred in the relations between Imperial and local taxation since the Report of the Royal Commission of 1901. It was understood that one of the principal points on which the committee was taking evidence was the extension of the principle of taxing site value, and a conference, at which urban and rural interests were represented, had been held. Complaints of conduct falling below the recognised standard of professional practice had become more frequent, and a circular had been issued to the members of the two bodies after a consultation between the Surveyors' Institution and the Auctioneers' and Estate Agents' Institute.

Senior members of the institution were reminded that the employment register provided a useful means of securing qualified assistants. During the year considerable numbers, especially in the valuation division, had found places through its agency; but the use made of the register by those having vacancies to fill still left something to be desired, and the council strongly urged that in the first place they should apply to the secretary for particulars of any suitable men on the books. By so doing they could hold out a helping hand to their fellow members at the outset of their professional career.

The president of the Surveyors' Institution will hold an afternoon reception at the Royal Botanical Gardens, Regent's Park, on Tuesday, the 18th inst.

## IMPRESSIONS OF THE PARIS TRIP.

(1) BY AN ENGINEERING TRIPPER.

Looking back on the enjoyable and instructive trip of the Institution of Municipal and County Engineers to Paris, it must strike all who had the privilege of taking part in the excursions and inspections that too much was attempted. We were dazed with the amount of works we saw, and confused with the masses of papers and figures with which we were bombarded. We saw and heard too much; we had no time to read, mark, learn, or digest the information.

Two things greatly impressed me: The extraordinarily able address of Monsieur Bechmann (which he delivered in English!) upon the water supply, the sewerage, and the underground railways of Paris, and the beautiful, even classical, speech given in French by the secretary of the institution, Mr. T. Cole. This last was a great surprise to the members, and raised the estimation which the French have for the institution to a great height. It was a veritable *coup d'Etat!*

Now with regard to the works which we inspected.

THE CITY SEWERS.

First as to the sewers, which are really subways with a channel for sewage in the floor. The general impression was that it is magnificent, but not economical—a grand "show," but not practical. It would be better to have subways for the water pipes, the gas pipes, the electrical cables, the air-pressure mains, and the sundry other "services" in separate subways, and the sewers kept to themselves. The construction, as carried out, was extravagant, and not on the best sanitary lines. It is necessary to keep the sewage at a certain fixed level, and a very slight rainfall brings the large number of storm-water outlets into play, with disastrous results on the river Seine. Besides this, the Paris floods showed how wrong it was to combine sewers and subways in one structure, and the lesson we learnt on this inspection was rather what to avoid than to follow.

WATER SUPPLY.

With regard to the water supply of Paris, it was generally felt that it was to be regretted that the supply from the four springs was insufficient at certain dry seasons, and that it had to be supplemented by water from the rivers Seine and Marne. Although we saw splendid works in progress for filtering and purifying these waters, one could not help feeling how much better it would be to abandon the river sources altogether and to find an inexhaustible and pure supply from other sources. The treatment of water by ozone and violet rays cannot successfully compete with a water which is naturally pure and requires no bolstering up by artificial means.

The works of the Nord-Sud Metropolitan Railway, where the tunnel was being constructed under the river Seine, were particularly interesting, and showed an enormous amount of engineering skill. This part of the programme was one of the highest attraction, the only regret being that it had necessarily to be undertaken at a great hurry, giving very little time for a more complete inspection.

PAVING BLOCKS.

The next impression, that of cutting wood blocks for street paving, was the perfection of a machine which with innumerable saws was disgorging hundreds of blocks a minute! Any machine which is doing work on wholesale lines is always fascinating to watch, and we were much impressed with the simple ingenuity of this machine. The blocks are of ordinary pine, and are not creosoted, they are merely dipped, but for what purpose, except to hide their imperfections, did not transpire.

REFUSE "DESTRUCTION."

Then we inspected the municipal dust destructor works at Romainville—at least they were so described in the programme of our proceedings. But we found that the municipal "dust" was really house refuse of a very offensive character, and that instead of being "destroyed" it was messed about by men and machinery, and finally sent broadcast all over the country in railway wagons in a condition which did not seem to be much of an improvement on that in which it had arrived at the works. We were all of opinion that it was a "show" that was useful on the lines of "how not to do it," for it is impossible to conceive a more disgusting and insanitary method for dealing with the waste products of the dust "bins" of any community.

GASWORKS.

Finally, we inspected the large gasworks at Landy, which were very interesting to those of us who understand anything about the manufacture of coal gas. Here about 27,000,000 cub. ft. of gas can be manufactured per diem, and the works are well laid out, and a number of labour-saving methods have been introduced. Our impressions were that these works were remarkably clean and free from coal dust or smell. I think our final and lasting impressions will be those of congratulations to the president and secretary of the institution for a delightful trip, and of thanks to our French friends for all their cordiality and the immense amount of trouble that they must have taken to make our visit a success. "Vive l'Entente Cordiale!"

(2) BY AN ENGINEER POET.

A certain Monsieur President and a certain Monsieur Cole
Determined on a little trip, and Paris was their goal;
So forthwith all arrangements were made with Monsieur Cook,
And *re.* "the Institution," did our "billets" promptly book.
At "l'Hôtel de Ville" of Paris, where we met in solemn state,
We gazed at "salons magnifiques," which were almost *too* ornate,
And we listened with amazement to a "discours en Français"
Which Monsieur Cole did give us, and then we said, Hurrah!
"Nous buvions à sa santé," and then 'twas "en voiture,"
To see a "Buthilitique" road, "la poussière" to cure.
Next day we all went underground, "les égouts" to explore,
And then we went to Montsouris to see a Reservoir.
And after our "déjeuner" at the Paris-Lyons Station,
We inspected, at the "Saint Maur" works, an "Ozone" installation
For "l'épuration de les eaux," drawn from the River Marne.
This process, plus some violet rays, to keep all germs from harm.
Sunday was wisely left alone "for individual action;"
What members did I do not know, but Monday saw reaction.
But, notwithstanding, off we went to see the Electric Works,
A "grand déjeuner" at Lafitte, a meal which no one shirks.
And then "en voiture" once again, inspecting, whilst "en route,"
A model sewage treatment plant—a great success "sans doute."
On Tuesday we were photographed; we all looked very nice
[THE SURVEYOR published this last week; six pennies is the price.]
Then "sous terrain" again we went, the "Underground" to see,
The "Nord-Sud Paris Undergrund," which one and all agree
Was splendidly constructed, "un succès tout à fait,"
The engineers we compliment, and then we drive away.
The next thing we inspected was quite "une autre chose,"
Called "Paris Dust Destructor Works," where critics fierce arose.
Why is this "ordure" not destroyed, but merely "messed about"
By men and women and machines?—"une faiture triste sans doute."
"Un petit oiseau" then replied, "'Tis due to Politics!"
But what *our* refuse have to do with Socialistic tricks?
We came away disheartened "ce n'était pas la guerre,"
"Ce n'était pas économique, ce n'est pas sanitaire."
We hurried off to Landy the Gasworks to inspect,
But we were rather tired and worn—what else could you expect
But at our parting dinner that night at the "Lazare"
We drank the healths of all our hosts with many a loud "Huzza."
We felt we had enjoyed ourselves; long live "La France si belle,"
Long live the Institution, and the "entente cordiale."

H. P. B.

A detailed description of the works visited by the members of the Institution of Municipal and County Engineers during their stay in Paris will appear next week. In last week's account of the proceedings it should have been stated that Monsieur Bechmann is the president-elect of the French, Belgian, and Swiss Engineers' Association, to which reference was made by the president at the farewell dinner at the Hotel Terminus; another point which should be made clear is that Mr. Greatorex, in acknowledging his indebtedness to Sir James Lemon's help during the early days of his career, recalled the fact that he was deputy borough engineer of Southampton at the time Sir James was mayor of that town.

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## FERRO-CONCRETE FOOTBRIDGE AT RICHMOND, SURREY.

An account is given in the May issue of *Ferro-Concrete* of the latest example of the application of ferro-concrete in the construction of railway footbridges. The work described is a bridge built for the Richmond (Surrey) Corporation by Messrs. S. N. Soole & Son, Richmond, under the direction of Mr. J. H. Brierley, Assoc.M.Inst.C.E., the borough engineer. The structure crosses the London and South-Western Railway at Kew Gardens Station, and comprises a main girder span of 84 ft., between the supporting columns, with a stairway at one end, and an approach girder span of 32 ft. 9 in., with stairway at the other end, the approach being continuous with the main portion of the bridge.

Views of Ferro-Concrete Footbridge, Kew Gardens Station.

The accompanying views show the main features of the design. The two continuous girder spans are supported on a group of four ferro-concrete columns at each end, with a pair of intermediate columns between the approach and main spans.

The stairway at the right-hand has seventeen steps, and eight steps are formed on the sloping deck of the approach span. The left-hand stairway is in two flights, of seventeen and fifteen steps respectively. The [illegible] consist of two [illegible] girders spaced 6 ft. apart and constituting parapets, which are connected by ferro-concrete decking, 4 in. thick, [illegible]. Each girder has tension and compression flanges, 8 in. wide, connected by a 3 in. parallel [illegible] vertical stiffeners spaced from 3 ft. to 4 ft. apart, the girders in the main span being of the [illegible] type, as shown by the photograph. Wind bracing is provided over the middle of this span by two 8-in. by 8-in. transverse struts, and a ferro-concrete smoke hood has been constructed over the centre line of each railway track.

The ferro-concrete work is in accordance with working drawings prepared for the engineer by Messrs. L. G. Mouchel & Partners, and the bridge is of interest as including the longest girder span constructed in the United Kingdom, although ferro-concrete arches of much greater length have been built in various places.

## GODSTONE RURAL DISTRICT.

### SURVEYOR'S ANNUAL REPORT.

Last year was a busy and somewhat expensive one in the Public Health Department of the Godstone Rural District Council, but several new problems are likely to engage the attention of the authorities during 1912. Foremost among these, according to the last annual report of the surveyor, Mr. Thomas C. Barralet, are sewer extensions and sewage disposal schemes at Limpsfield, Godstone and Lingfield, in addition to impending extensions at Oxted. These will, in the aggregate, involve a very large expenditure, though there is a considerable difference in their relative urgency.

The drainage of the parish of Warlingham is another question which will require consideration in the near future, if the area should develop with any rapidity, as the present method of cesspool drainage cannot be considered as final in a residential district so close to the Metropolis.

The provision of cottages, either by private enterprise or municipal action, or both, has become an acknowledged necessity in Oxted and Limpsfield, and Mr. Barralet thinks the same may be said of Woldingham, where the building activity of the last few years has been entirely confined to large residences. The appointment of a Housing Committee and a Town Planning Committee has focussed attention on this most important department of sanitary administration, and the judicious but vigorous application of the powers conferred by the Act of 1909, the surveyor remarks, will do much to hasten better housing conditions throughout the district.

**Dust Carts and Vans.**—Mr. E. D. Groves, engineer and surveyor, St. Austell Urban District Council, will be glad to hear from firms building dust carts and vans.

**Improved Wood Paving Company.**—The tenders of the Improved Wood Pavement Company have been accepted for all the wood paving contracts at Westminster (fifteen thoroughfares). The company have also been accepted for eight thoroughfares in Kensington, although in five cases their tenders were not the lowest.

**Junior Institution of Engineers.**—A week-end visit of this institution to Sheffield is being arranged. The party will leave London for Baslow on Friday evening, June 21st, and will visit Haddon Hall and other places of popular interest on the Saturday, and on the following Monday the party will leave Baslow for Sheffield visiting the works of Messrs. Firth & Sons, Limited, in the morning, and the works of Messrs. Cammell, Laird & Co., Limited, in the afternoon, returning to London in the evening. A movement is on foot to form a local section of the institution in Sheffield.

## EARLY ROAD MAKING.

Of the many useful arts which we owe to Rome, that of road making certainly is one of the most important. That Rome learned from Carthage is possible, but the Romans must always enjoy the credit; for their roads to-day still challenge to speed the panting motor, while those of Carthage lie beneath the dust. The Roman plan of construction was fairly uniform, and every road was laid with a view to durability, whether it were an Appian or Flaminian Way, a Watling-street, or a route through the wilds of Gaul or Macedonia.

The famous Appian Way, called Regina Viarum, "the queen of roads," is at once the oldest and most celebrated of all the highways laid down by the Romans. It linked the capital of the Cæsars with all the important centres of Southern Italy, and was constructed, or partially constructed, under the Censor Appius Claudius Cæcus, in 313 B.C. In view of the natural obstacles presented by the route, the cost of the enterprise must have been enormous. In a deep foundation, from which all loose soil had been cleared, were laid several strata strongly cemented, and above these was placed the pavement of large hexagonal blocks of basaltic lava, fitted together with such precision as to give the appearance of a smooth, continuous surface. Next in importance of the roads of ancient Italy was the Flaminian Way, constructed by Flaminius in 220 B.C., linking Rome with Ariminum on the Adriatic. The Emperor Augustus reserved to himself the office of surveyor of the Flaminian Way when in 27 B.C. he was appointing road surveyors for the other highways.

To modern eyes, used to Piccadilly and Broadways, a Roman road would have appeared but as a lane, though a well-laid lane. They were rarely broader than 15 ft., and often as narrow as 8 ft. Usually they had raised footpaths at the side, as is the case with all modern thoroughfares, and stone blocks at suitable intervals to enable equestrians to mount. At Pompeii such stone pavements may still be seen intact; but from the fall of Rome up to the beginning of the twelfth century mediæval cities were innocent of pavements, and the art of road making seems to have been lost. So-called roads of the Middle Ages were no more than tracks beaten down by the passage of men and horses, rutted and broken by the clumsy wheels of carts and wagons. Thus, in Britain, the four great Roman roads had to suffice for all traffic during the centuries that passed between the withdrawal of the Roman forces and the revival of the neglected art. These four roads were the Watling-street, from Kent to Chester and York, and northward in two branches to Carlisle and Newcastle; the Fosse Way, through Bath to Lincoln; the Ermine-street, from London to Lincoln, with a branch to Doncaster and York; and the Iknild-street, from Norwich to Dunstable.

Not until 1285 do we find any legislation upon the subject of roads [illegible] In that year a law was passed directing that all trees be cut down on the distance of 200 ft. on either side of roads between market towns to prevent the concealment of robbers. But the first [illegible] repairs was not levied until the reign of Edward III., who, in 1346, turned his attention to the roads in and about London. From the days of Rome, when men of consular dignity were appointed to the posts of road surveyors, no similar appointment was made in England until 1555, when an Act was passed whereby each parish was required to elect two surveyors of highways to keep them in repair by compulsory labour. But for many years afterwards the English roads were no more than rough tracks. In winter they usually were impassable, being narrow and so deeply beaten down by the traffic of centuries that they were not unlike ditches. As late as 1736 the roads in the vicinity of London were so bad that in wet weather a carriage could not be driven from Kensington to St. James's in less than two hours, and it not infrequently foundered in the mud altogether.—From the *Globe*.

**Damages Against a District Council.**—At the Berkshire Assizes on Tuesday the Cookham Rural District Council were ordered to pay £40 damages to a cyclist for placing an obstruction across a thoroughfare without notice, whereby the plaintiff sustained injuries to his head. The defence was that there was no right of way.

## WATER SUPPLY IN YORKSHIRE.

### NAFFERTON'S NEW WORKS.

Hitherto the water supply for the 240 houses in the village of Nafferton, Yorks, has been from sources of various descriptions and of doubtful quality, and this led, in 1907, to a severe outbreak of fever. In consequence of the reports by the medical officer of health, the Local Government Board in 1907 ordered a purer supply to be provided, with the result that a scheme was adopted, the construction of which was sanctioned on the 21st ult., when the supply was formally turned on. The works provide for a present population of 1,000 inhabitants, and an increase of 200, the allowance of water being 20 gallons per head per day, the total daily output required being 24,000 gallons.

The well is sunk in the chalk of Nafferton wolds to a depth of 216 ft., and from the bottom of the well there is a bore 10 in. in diameter for the first 25 ft., and 8 in. in diameter for a further 25 ft., making the total depth of the sinking and boring 266 ft. from the surface. The flow of the underground water in the Yorkshire Wolds at Nafferton is from the north-west to the south-east, or towards Nafferton, and to obtain a supply before the water reaches and passes under the village, it was absolutely necessary that it should be tapped [illegible] the village. The test for quantity insisted on by the Local Government Board was continuous pumping for fourteen days and nights, the quantity of water to be lifted by the test pumps to be 33 per cent more than either of the permanent pumps were capable of lifting. During the test 1,421,439 gallons of water were pumped.

PUMPING PLANT.

The pumping machinery is in duplicate as follows: (*a*) A wind engine of 40 ft. in diameter on a 40-ft. high-steel tower, with a set of three-throw deep-well pumps capable of raising 3,000 gallons per hour to the reservoir; (*b*) an oil engine, together with a similar set of three-throw pumps with a like capacity. Gearing is provided by means of which either the wind engine or the oil engine can drive either set of pumps, or both sets can be driven at the same time. The reservoir has a top-water level of 265 ft. above ordnance datum, and has a capacity of 48,000 gallons, or equal to a two days' supply. It is constructed of concrete with a lining of face concrete, and roofed with concrete reinforced with expanded steel. A by-pass is carried from the inlet chamber of the reservoir, so that water may be delivered to Nafferton at such times as the reservoir is being cleaned out.

DISTRIBUTING MAINS.

The distributing mains consist of 4-in. and 3-in. cast-iron socketed pipes, coated with Dr. Angus Smith's anti-corrosive solution and jointed with lead. The usual stop valves are provided for controlling the supply, and there are screw-down hydrants for flushing and fire protection. The water is distributed to consumers by wrought-iron, steam quality, service pipes, each provided with a stop-cock in special pit with surface box. The top-water level of the reservoir is fixed at 265 ft. above ordnance datum, and this gives a head [illegible] of Nafferton. This is an excessive head of water, and it necessitates the provision of a Broadhead's pressure-reducing valve to control it. It is satisfactory to note that the quality of the water obtained is first-class, and the quantity is far in excess of what is likely to be required [illegible] years.

The engineers for the scheme were Messrs. Fairbank & Son, York, and the cost of the undertaking, it is understood, will not exceed £3,600.

**Chartered Surveyors' Golfing Society.**—By kind permission of the Northfield Golf Club, a one-day competition will be held on that club's course on Friday, June 14th. The nearest station is Northfield, on the Midland Railway, which is about 1 mile from the course. In the morning a bogey competition will be played under handicap, and in the afternoon a medal round under handicap. Prizes will be given for the best nett returns. There will be no entrance fee. Members of the society will be made members of the course for the day without green fee. No previous notice need be given, but in order to facilitate the necessary arrangements, members who intend to be present for either the whole day or any part of the day, are requested to, if possible, notify Mr. A. Elliot Terry, 'Firs," Compton, Wolverhampton.

# Correspondence.

*"Men are never so likely to settle a question rightly as when they discuss it freely."*
Macaulay's *"Critical and Historical Essays."*

## MUNICIPAL AND COUNTY ENGINEERS: MUTUAL AID AND PROTECTION: SECURITY OF TENURE.

*To the Editor of* The Surveyor.

Sir,—The reconstruction of the council of the Institution of Municipal and County Engineers is an accomplished fact. Leaven in the way of newly elected district representatives has been added to that lump of mind and matter, and the members wait the signs of a new life from the deadness and misdirected action of the past. I repeat: Just when a united council is expected to put forward a policy embracing the "things that matter" for the good of the institution, and therefore of the profession generally, there appears under the above head an extraordinary letter from Mr. H. T. Wakelam, a newly elected member of the council—extraordinary in that he poses as a "Cromwell up to Date." He dismisses the institution parliament as incompetent, appoints himself dictator, and is extraordinary in that he has altogether failed to realise the conditions as they exist.

There is a feeling, and it is a growing one, that the institution has not in the past occupied that position which it undoubtedly should, that outside the glorification of a few it is of little service to the rank and file of its members—in plain words, they do not get their money's worth. But hope springs eternal in the municipal engineer's breast, and great things are expected from the new council, so let as "wait and see."

"Mutual Aid, Protection and Security of Tenure" surely is, or should be, the charter of the institution, and to be of any use must be backed by that body. It is not a new programme, but was an expressed want even during Mr. Wakelam's previous nine years' of office, and if his advocacy has not received the support of his fellow councillors, let him make it known to the members generally, but let us first hear that the council has had a chance to consider it and have refused to act.

These individual efforts are commendable, but in cases of this kind do not carry success, and the no doubt generous contribution promised does not tempt me.

The members do not ask for charity, and there are those who think the present subscription to the institution, with its enormous yield, is quite sufficient, *properly applied*, to ensure all the blessings named as well as others.

Mr. Wakelam may be right as regards motive, but as a lowly rural surveyor I do not appreciate the method.

Thanking you in anticipation of insertion in your next issue.—Yours, &c.,

Frank Harris,
Engineer and Surveyor, Tunbridge Rural District Council.

Broadway, Southborough,
Tunbridge Wells.
June 3, 1912.

[We have published the letter of our correspondent, but are in no way in sympathy with it. If Mr Wakelam is willing, as we said last week, "to take the trouble and responsibility of forming an advisory committee of engineers and surveyors with a view to formulation, for consideration by the Institution of Municipal and County Engineers, of a scheme for mutual aid and protection in particular, and for the eventual obtaining of security of tenure of office," surely his efforts should be welcomed and supported. Cromwell evicted *his* Parliament; Mr. Wakelam would submit to the parliament of municipal engineers a scheme as to which they would be the sole arbiters. Mr Harris can tell what we think of it if he approves or rejects meanwhile our sympathy is with the workers rather than with the waiters.—Ed. The Surveyor.]

*To the Editor of* The Surveyor.

Sir,—Very many thanks for so kindly and so prominently calling attention to my letter on the above subject.

I have already had many donations for and promises of support in the initiation of the scheme, and shall be glad to hear on the subject from more engineers and surveyors who are in sympathy with the movement but who may not have found time to respond.

I hope to send you soon the names of those who have been kind enough to act upon the Advisory Committee. To form the latter, I am endeavouring to secure the chairman of each institution district, with one or two others.—Yours, &c.,

H. T. Wakelam.

63 Victoria-street,
Westminster, S.W.
June 3, 1912.

## PORTLAND CEMENT AS A ROAD BINDER.

*To the Editor of* The Surveyor.

Sir,—Your article in last week's issue invites the discussion of readers upon the subject of the use of cement as a road binder.

To me the term "binder," as ordinarily understood, seems a little inaccurate when applied to the use of cement—in either large or small quantities for in virtue of its nature the particles must become a homogeneous body, and, together with the metal and other binding material, tend to form themselves into a concrete mass, which when once disintegrated has practically no resetting value. Now a road should be either resilient enough to absorb the shock of traffic (which it is bound to get when a little worn) or strong enough to resist it, and it appears to me that any cement used with the binding material would either quickly become disintegrated under ordinary traffic when used in small quantities, or, if used in large quantities, tend to destroy the resiliency of the road and lessen its power to absorb the shock of heavy traffic, while at the same time it would be insufficiently strong to resist it. In either case I think the cement must become disintegrated and useless.

However, it seems to me that cement might be a useful material used solely as a means of strengthening the sub-crust of a weak road. Many macadam roads already weak have their sub-crusts further weakened by conversion into tarred-macadam roads, in consequence of the reduction of camber, which often means a loss of several inches off the sub-crust. Therefore, when a road is converted into a tar-macadam one, it appears to me that the only means of strengthening it (short of relaying the foundation) would be to scarify and screen the sub-crust, relay, and grout in with good stiff cement grout, making it as nearly as possible a solid concrete mass. This, of course, would have to be covered with a sufficient thickness of some such resilient material as tarred metal, so as to form a good carpet layer or cushion to absorb the shock of traffic, and prevent disintegration of the sub-crust. Where the tarred macadam could be laid directly on top of the old crust the latter, instead of the sub-crust, might be strengthened in the same way before laying, if necessary.

These views are put forth entirely as a suggestion, and any criticism on the matter would be appreciated. Yours, &c.,

Malcolm B. Bennett.

Borough Surveyor's Office,
Hove.

*To the Editor of* The Surveyor.

Sir,—Having regard to your remarks suggesting the use of Portland cement as a road binder, the following may be of interest:

Two years ago I was troubled with the "near" side of a hill being badly raked up by skid-pans, &c. I had the metalling dry rolled, grouted with cement and sand (2 to 1), again rolled and finished off with a coating of granite chippings of sufficient thickness to carry traffic so as to allow the road crust to settle. For a period of about a month the results were satisfactory, but when the hot weather arrived the cement binder worked up as dust, and the road had eventually to be treated with tar.

It would be interesting to read the experience of any who have tested roads with cement as a

binder under less severe conditions than those recorded above.—Yours, &c.,

CRETACIOUS.

May 31, 1912.

### THE SOUTHPORT APPOINTMENTS AND IMPROMPTU EXAMINATIONS.

*To the Editor of* THE SURVEYOR.

SIR,—Perhaps you will allow me a few lines to protest against the growing habit on the part of some municipal engineers to hold examinations among the candidates selected to appear in reference to appointments.

When there are many excellent examinations conducted by the various institutions, it surely shows no small presumption on the part of any engineer to run an examination of his own. Not the least objection to this kind of hobby is that each candidate has an uneasy feeling that some other fellow with a little influence may have received a copy of the questions a little in advance of the examination. It should be remembered that the whole of the clerical staff has usually access to these examination papers, being engaged in copying them, &c., so that a copy could easily be sent to a candidate, even without the surveyor's knowledge. Also, in nine cases out of ten, the candidates have had far more examination experience than the engineer himself, and could much better examine him than *vice versâ*.

The latest and worst phase of the examination bogey was seen at Southport recently in connection with two appointments of assistants in the borough surveyor's department.

First, as to the delightful environment. The candidates (nine in all) sat in a room in which carpenters were engaged erecting a partition. Their loud hammering was doubtless intended to soothe the nerves of any tremulous candidate.

Briefly the questions were:—

(1) Print "Borough of Southport" in ½-in. block lettering.

(2) Make a tracing of a rough sketch given.

(3) Draw a detail of manhole 10 ft. deep.

(4) Draw a cross section of a road 70 ft. wide.

Could anyone conceive anything more enthusiastically idiotic? Fancy testing the capabilities of engineers (three of whom were associate members of the Institution of Civil Engineers, and had had 10 to 15 years' engineering experience) with ½-in. block lettering, and a tracing of all things! The 70-ft. road section was a sensible question, as Southport is going in for town planning, and the answers would, no doubt, be useful. Yours, &c.,

ANTI-HUMBUG.

May 30, 1912.

## QUERIES AND REPLIES.

*We cannot undertake to reply to any queries which are not accompanied by the writer's name and address. These are required as a guarantee of good faith, and not for publication. Sketches accompanying queries should be made separate, on white paper, in plain black ink lines. Lettering or figures should be bold and plain.*

**892. Study of Surveying.** "D.C." writes: I am twenty-two years of age, and have had seven years' experience of county council office work. Recently I was transferred to the county road surveyor's department to do clerical work, and as I am desirous of studying surveying so as to enable me to become a surveyor or to enter an estate office, I would be greatly obliged if you would advise me what subjects I should take up and what books would be beneficial to me in this particular work?

We might recommend Algebra: "Elementary Algebra," by Hamblin Smith; trigonometry—"Elements of Trigonometry," by Loney; mensuration—"Mensuration and Measuring," by Baker; surveying: "Practical Surveying," by Usill; building construction: Mitchell.

**893. Sewage Discharge into Tidal River.**—"Anxious" writes: I have the supervision of a small town of 1,500 population. A tidal river runs along the front, and the sewage is collected to one point and stored during high water in a small tidal tank which runs under the shipping wharf, and discharges about 60 ft. to 70 ft. outside the landing stage. Invert of pipe (which is 15 in. diameter) is 6 ft. to 8 ft. below lowest low-water mark spring tides. Below this point the public bathing ground is situated. The trouble I get is that although every possible precaution is taken to empty the tidal tank only when the sewage is likely to be carried off to sea, I find offensive matter is washed ashore, and lodges about the wharf and in front of the houses. I have tried letting out sewage at various times, but did not find much improvement. The best time for clearing it away is the hour before and after high water, but I am, again, at times unable to do this, as the tank will only discharge when there is a certain amount of water above pipe. I may say the tank is not watertight, and the sea water gets in it. The whole length of it is about 30 yds., and it is 4 ft. 6 in. diameter, made of brick (circular in shape). The pipe entering it from the town is 15 in., and the outlet is 15 in.; distance from landing stage to the bar, about 1 mile. Can any brother reader who may have the supervision of a similar place give me any information, or throw out any suggestion that will remedy matters? I may say that up to 1908 the outlet was only 30 ft. outside landing stage, and level with low-water spring tide. In that year a 30-ft. length was added to it—which was laid on the river bed, which dropped about 6 ft. in that length—in the hope of remedying matters, but the result has been somewhat disappointing. I have thought of suggesting a new watertight (cast-iron) tank, double the present size, and to store for twenty-four hours, and discharge it in the night only during the summer season.

## MANUFACTURE OF TAR-MACADAM.

### THE BELFAST PLANT: WORKS SUPERINTENDENT'S REPORT.

At the close of the last financial year twenty-one months' working of the new tar-macadam plant at Belfast, opened by the Lord Mayor of that city in June, 1910, has been completed, and Mr. Hector F. Gullan, M.INST.C.E., superintendent of works, has submitted the following report in regard to the work done:—

"Although there were about nine months during this period when the plant had to be shut down, largely on account of there not being sufficient tar-macadam work coming forward to keep the plant continuously employed, 7,178 tons have been manufactured. Prior to the installation of our new plant the cost of the manufacture of tar-macadam by drying and heating the stone on hot floors, as is done in many places in England and Scotland, was 10s. a ton. After between 50 and 60 tons had been manufactured by the new plant, a reduction of 6d. a ton was made, and by the time that between 400 and 500 tons had been turned out a further reduction of 1s. 6d. per ton for the smaller sizes and 2s. per ton on the large material was made, being respectively a reduction of 20 per cent in the case of the smaller materials, and 25 per cent in the case of the large material.

"All possible charges for cost of materials, working expenses and repairs, including the addition of a number of fittings which have been found necessary during this period, have been made against the working of the plant, the percentage of the various charges being as follows: Broken stones and screenings, 60·67 per cent; tar, &c., 11·49 per cent; wages and cartage, 21·25 per cent; tools, oil, &c., 1·94 per cent; repairs and fittings, 4·65 per cent. On closing the books at the end of the financial year the profits over the cost of production show a balance in favour of the tar-macadam plant of £527. This, in conjunction with the reductions before-mentioned of 20 and 25 per cent in the price of the tar-macadam, will, I think, be considered very satisfactory. Throughout the whole period the plant has worked with entire satisfaction, and in every way more than realised our expectations.

"Having regard to the large surplus, I would suggest that a further reduction of 1s. per ton be made for materials required for special works, and 1s. 6d. per ton for materials required for repair work, the reason for the difference in price being to compensate your committee for the original outlay in which they embarked in the cost of the erection of the plant and other expenses in connection with it."

**Municipal Profits at Lancaster.** — At the recent meeting of Lancaster Town Council it was reported that the nett gas profits worked out at £5,989, of which £3,800 went in relief of rates. The electricity profits were £1,348, or £161 more than the estimate, and the whole of the water profits, amounting to £6,898, were devoted to rate relief.

# Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

*All communications in regard to this page must be addressed to The Editor, St. Bride's House, 21 Bride-lane, Fleet-street, E.C. Envelopes should be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

## THE MONTHLY PREMIUM.

The premium for May is awarded to

Mr. H. F. Scholefield,
Rural District Offices,
Nicholas-street,
Burnley,

who, our readers have, in the opinion of the adjudicators, been the best received during the month.

Mr. George Smith, of Luton, acknowledges the receipt of the books awarded to him in respect of the premium for April in the following terms:

"I beg to acknowledge the safe receipt of the three books awarded to me. I am very pleased with them, and thank you for same, and hereby give my best wish to the Assistants' Section of your Journal every success—which I undoubtedly deserves."

## QUESTIONS.

This week answers are invited to the following questions:—

**248. Pumping.**—What power engine is required to pump 160,000 gallons per day of ten hours through ¾ mile of 5 in. diameter main against 8 ft. head suction and 90 ft. head delivery? Also state size and kind of pump. There are three right-angle bends in the main, in addition to those in the pump-house at connections. If a 4-horse power turbine and 6½-horse power engine, which will be used as a lay-by, be provided, and the figure given (160,000 gallons) is twice a day's supply, is this a reasonable margin when the storage capacity is 60,000 (fire contingency being considered)? (Hack.)

**249. Applied Mechanics.**—What is meant by the reciprocal of a point, and a pair of reciprocal figures?

**250. Pier Pavilion Roof.** Show by sketches how you would roof a pier concert room 60 ft. by 40 ft. If desired, there may be two columns 20 ft. apart below each truss.

**251. Disinfection.**—Distinguish between disinfectants, antiseptics, and deodorants, and name some examples of each. ("Sanitary.")

**252. Girder Bridge.**—Design a girder bridge to carry a 24-ft. road over a river and railway (at an angle of 60°) of two spans, 70 ft. and 42 ft. respectively. The mean height of road surface above bed of river is 21 ft. 6 in., and 17 ft. above rails, and the foundation is clay. Please show calculations and give an [illegible] Norman.

## REPLIES TO QUESTIONS.

**246. Reinforced Concrete.** — A reinforced concrete beam 10 in. deep by 5 in. broad carries a load of 3 tons, distributed over a span of 12 ft. The two reinforcing rods have a united area of 1·2 sq. in., and the centre of them is 1 in. from the bottom of the beam; find the unit stresses in the concrete and in the steel rods at the centre of the beam. Do you consider either [illegible] M R S I

The fundamental equations for the determination [illegible] beam are as follows:—

$$[illegible] = A_s \quad . \quad . \quad . \quad (1)$$

$$[illegible] = \frac{m(d-n)}{n} \quad (2)$$

$$n = \frac{h}{m}\left[\sqrt{1+\frac{2dm}{h}}-1\right] \quad (3)$$

$$B = \frac{cbn}{6}(3d-n) \quad . \quad . \quad 4)$$

$$B = \frac{A_s t}{3}(3d-n) \quad . \quad . \quad 5)$$

where $c$ = compressive stress on the compressed edge of the concrete (lb. per square inch),

$t$ = tensile stress on the steel (lb. per square inch),

$b$ = breadth of beam (inches),

$d$ = depth of beam (inches),

$l$ = span of beam (inches),

$n$ = depth of neutral axis from extreme compressed edge,

$m$ = ratio of modulus of elasticity for steel to that for concrete, taken as 15,

B = bending moment (lb.-inches),

W = external load on beam (lb.).

In these formulæ the notation recommended by the R.I.B.A. Joint Committee in their recent report has been adopted, and in framing the equations the usual assumptions have been made, and the strength of the concrete in tension not taken into consideration. (The proof of these formulæ has already been given in these columns.)

From the details given in question

$b = 5 \qquad d = 9 \qquad A_s = 1{\cdot}2$

$l = 144 \qquad W = 3 \times 2{,}240 \qquad B = \dfrac{Wl}{8} = \dfrac{3 \times 2{,}240 \times 144}{8}$

First find the position of the neutral axis by using (3),

then $n = \dfrac{15 \times 1{\cdot}2}{5}\left[\sqrt{1+\dfrac{2 \cdot 5 \times 9}{15 \times 1{\cdot}2}}-1\right]$

$\therefore \quad n = 5{\cdot}22$ in.

It will be observed that the location of the neutral axis is dependent solely upon the ratio of the area of the steel to that of the concrete under compression, and not upon the values of $t$ and $c$.

To determine $c$ use (4),

then $\dfrac{3 \times 2{,}240 \times 144}{8} = \dfrac{c \times 5 \times 5{\cdot}22}{6}\left(3 \times 9 - 5{\cdot}22\right)$

$\therefore \quad c = 1{,}280$ lb. per square inch.

To determine $t$ use (2) or (5),

then from (2) $t = \dfrac{1{,}280 \times 15 \times 3{\cdot}78}{5{\cdot}22}$

$= 13{,}900$ lb. per square inch.

The R.I.B.A. report recommends a compressive working stress on the concrete not exceeding 600 lb. per square inch, and a tensile stress in the steel of 16,000 lb. per square inch, so it will be apparent that the concrete is stressed far beyond its safe limit.

To support a distributed load of 3 tons, in addition to the weight of the beam, over a span of 12 ft. would require a beam having a breadth of 8 in., an effective depth (i.e., from top of beam to centre line of reinforcement) of 12 in., and an area of steel of 1·6 sq. in. For such a section the value of $c$ would be 600 lb. per square inch, and $t$ 9,000 lb. per square inch.

If, however, it is desired to use the economical percentage of steel, and so stress the concrete to 600 lb. per square inch and the steel to 16,000 lb per square inch, then the dimensions will be: Breadth = 8 in., effective depth = 14 in., area of steel 76 [illegible] H. F. W. *Tottenham.*

Let $t$ = unit tensile stress in steel,

$c$ = unit compressive stress at top edge of concrete,

$A_s$ = area of tensile reinforcement,

$m$ = modular ratio,

$b$ = breadth of beam,

$d$ = effective depth of beam,

$n$ = depth of neutral axis,

$z$ = resistance of lever arm $= d - \dfrac{n}{3}$

the units being lb. and inches throughout.

Now total tension = total compression.

$$tA_s = \frac{cbn}{2} \quad . \quad . \quad . \quad (1)$$

Stress in steel is $m$ times greater than that in

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the surrounding concrete, which varies as the distance from the neutral axis.

$$\therefore f = mc\frac{d-n}{n}$$

Substituting this value in (1)

$$mc\frac{d-n}{n}A_T = \tfrac{1}{2}cbn$$

from which $n = 5{\cdot}22$ in.,

and $a = d - \frac{n}{3} = 9 - 1{\cdot}74 = 7{\cdot}26$ in.

Bending moment $\frac{W.L.}{8} = \frac{3 \times 2,240 \times 12 \times 12}{8} = 120,960$

Moment of resistance $= fA_T a = 8{\cdot}712\,f.$

" " " $= \frac{1}{2}cbna = 94{\cdot}743\,c.$

Equating the values of the B. M.

$8{\cdot}712\,f = 120,960.$

$f = 13,881$ lb. sq. in.,

and $94{\cdot}743\,c = 120,960.$

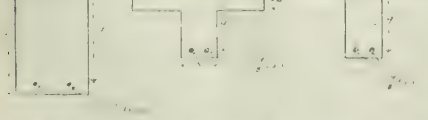
$c = 1{\cdot}276$ lbs. sq. in.

Assuming the permissible values of $f$ and $c$ to be 16,000 and 600 respectively, it is clear that the beam is very deficient in resistance to compression, and the necessary strength may be obtained in several different ways:

(*a*) By increasing the depth and using less steel.

(*b*) By designing the beam as a T-beam.

(*c*) By retaining the dimensions given and using compression reinforcement.




(*a*) A beam 10 in. wide and 13½ in. deep to centre of reinforcement will give satisfactory results with a margin to allow for the increased dead weight, it being assumed that the load given in the question includes the weight of the original beam. Two ¾-in. bars will be sufficient in this case.

(*b*) First find $n$ and $a$.

$$\frac{f}{c} = m\frac{d-n}{n}$$

$$16{,}000 = 15 \times \frac{9-n}{n}$$

$$n = 3{\cdot}24 \text{ in.}$$

and $a = d - \frac{n}{3} = 9 - 1{\cdot}08 = 7{\cdot}92$ in.

Total compression $= \frac{1}{2}cbn$

and assuming the B. M. increased to 133,000,

$$\frac{133,000}{7{\cdot}92} = \tfrac{1}{2} \times 600 \times b \times 3{\cdot}24$$

$b =$ say 18 in.

and total tension $= fA_T$

$$\therefore fA_T = \frac{133,000}{7{\cdot}92}$$

$$A_T = \frac{133,000}{7{\cdot}92 \times 16,000} = 1{\cdot}05 \text{ sq. in.}$$

say 2 – ¾ in.-bars.

(*c*) The tension steel will be as in (*b*), the deficiency in compressive resistance being made up by using compression steel instead of flanges to the beam.

Total compression $= \frac{120,960}{7{\cdot}92} = 15,270$ lb.

of which the concrete takes

$\frac{1}{2} \times 600 \times 5 \times 3{\cdot}24 = 4,860$ lb.

compression taken by steel $= 10,410$ lb.

Let the compression steel be placed at the C. G. of the stress diagram—*i.e.*, at $\frac{n}{3}$ from the top.

Then stress in steel $= 600 \times \frac{2}{3} \times m$

and additional resistance due to steel

$600 \times \frac{2}{3}(m-1)$

$= 400 \times 14 = 5,600$ lb.-sq. in.

$\therefore$ Area of compression steel $= \frac{10,410}{5,600} = 1{\cdot}86$ sq. in.

say 2 – 1¼ in. bars.

*a* and *b* would probably cost about 50 per cent more than the original design, and *c* about double, the only advantage possessed by *c* being that the original dimensions are retained. It will be observed that the compressive reinforcement is in excess of the tensile, the reason being, of course, that only a fraction of its strength can be utilised without overstraining the concrete. ("Devonian.")

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**St. Paul's Bridge.**—Sir William Emerson has been appointed by the Bridge House Estates Committee as architectural assessor in all matters relating to the new St. Paul's Bridge. The engineer will be Mr. Basil Mott.

**Institution of Municipal Engineers.**—A Western District meeting will be held at Cinderford (Glos.) on Thursday, June 20th, when a paper, "Some Notes on the Use, Misuse and Waste of Public Water Supplies: Can Misuse and Waste be Remedied?" will be read by Mr. W. Whitehouse, surveyor of the East Dean Rural District Council. A number of interesting visits to works in the Forest of Dean will be paid. Full programme will appear in our next issue.

**Derbyshire Sewage Scheme.**—A communication has been received from the Local Government Board giving final sanction to the borrowing of money by various local authorities for carrying out a big sewage scheme, estimated to cost something like £25,000. The scheme, the engineers for which are Messrs. Brady & Partington, provides for the sewering of Chinley, Bugsworth, Whaley Bridge, Furness Vale, and portions of Chapel-en-le-Frith, Fernilee and Taxal, with outfall works at Furness Vale.

**Tarred Roads and Fisheries.**—Two letters, Alderman Ferrard stated at a meeting of the Berkshire County Council recently, were received by the Roads Committee, one calling attention to the great danger to fisheries at Lambourn if tar was put on the roads, and the other, from residents in the same district, urging that the roads be tarred on account of the dust nuisance. The committee, he added, had instructed their surveyor, Mr. J. F. Hawkins, not to do any tarring where there was any possibility of injury to fisheries.

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Bideford T.C.** (May 29th. Mr. F. O. Stanford).—£19,300 to increase the water supply of the town.—Mr. Baldwin Latham stated that it was proposed to construct an additional reservoir at Woodville, which would have a capacity of 13,500,000 gallons, and would have a collecting area of 123 acres, which was in addition to the present area, and it was estimated that this would provide an additional 87,000 gallons per day, or with the present supply would give a total of 187,365 gallons per day. It was also proposed to deepen the present higher reservoir to give it an additional capacity of 5,000,000 gallons. There would be a new main from the bridge and to the hydraulic pumping station in the cattle market, where two hydraulic engines would be placed to pump the water to the higher service reservoir in Old Town, which would hold 30,000 gallons, and be a covered reservoir. This reservoir would supply the 1,500 persons in the higher level parts of the town. The town clerk asked that the £1,750 for purchase of the land should be borrowed for forty years, £500 on the machinery for fifteen years, and the balance of £17,050 for thirty years. Replying to the inspector, Mr. R. E. L. Hookway (borough surveyor) said the present mains were not sufficient to distribute the water owing to their being so corroded. He was of opinion, however, that if they were scraped they would be quite sufficient, and they would also be able to stand the extra pressure.

**Brighouse T.C.** (May 31st. Mr. T. C. Ekin).—£3,000 for electricity purposes, £4,125 for improvements in Bradford, Huddersfield, and Thornhill roads, and £110 for sewerage works at Thornhill-road and Scottybank. There was no opposition.

**Chesterfield T.C.** (May 21st. Mr. Edgar Dudley).—£800 for the purchase of premises for a branch police and fire station at Brampton. The property has been purchased for the sum named. The borough surveyor, Mr. V. Smith, stated that the rental of the property would be from £37 to £40 per annum. The alterations necessary to adapt the buildings for the purpose required would be so small that it had been decided to defray it out of current rate.

**Hoddesdon U.D.C.** (May 16th. Mr. Edgar Dudley).—£700 for the purchase and repair of the premises known as 36 Burford-street for the purposes of a store-yard and a house for the road foreman.—It was stated that the area of the premises to be acquired was 1,725 sq. yds., so that the price worked out at 4s. per square yard. The frontage was 83 ft., so that it worked out at £4 5s. per foot, which would give the figure of £352 for the land. Then £200 was put down for the cottage, £100 for the outbuildings, and they were asking for £25 for repairs and £25 for costs, which figures brought the total up to £700, the amount the council were asking for.

**Keighley T.C.** (May 29th. Mr. H. R. Hooper).—£6,576 for electricity purposes.—The town clerk (Mr. W. Bagshaw), the borough electrical engineer (Mr. A. Webber), and the borough treasurer (Mr. A. Lister) gave evidence as to the contemplated works, and Mr W. Coleman, a member of the Electricity Committee, opposed the application. He alleged that the committee were selling electricity at 2d. per unit, when it was costing the corporation 1d. for sinking fund alone. He further contended that the proposed water tower was unnecessary, and said that some consumers of electricity were being charged as much as 1d. per unit. The works were out of repair, and an engine costing £650 was not utilised, and the present boilers already were quite capable of doing the work without having another boiler put in. The inquiry was adjourned *sine die* in order that the electrical engineer might furnish further particulars with regard to expenditure.

**Leicester T.C.** (May 21st. Mr Courtenay Clifton).—£945 for the purpose of a street improvement in Humberstone-road.—The town clerk explained that the corporation had had the opportunity of acquiring certain property at a narrow part of Humberstone-road at a fair price. There were seven houses and shops, and the price asked was £1,800, while the cost of certain street works were estimated to amount to £120 and the incidental expenses attached to the loan were estimated at £25, total £1,945. Towards this the Tramways Committee had agreed to contribute £1,000, leaving the balance of £945 to be borrowed. The width of the street would be increased from 46 ft. to 55 ft. The borough surveyor, Mr. George Mawbey, gave formal details, and corroborated what had been said as to the congestion of traffic.

**Mansfield T.C.** (May 22nd. Mr. Edgar Dudley).—£1,000 to purchase land in Sandy-lane for the purpose of a recreation ground.—The town clerk, Mr. J. H. White, stated that it was proposed to purchase the land from the Duke of Portland, and the agreement was practically completed. It would be used as a playing field in the first place, and would afterwards be properly fenced. It was nearly 7 acres in extent, and the price was £150 an acre.

**Merthyr Tydfil T.C.** (May 14th. Mr. A. G. Drury).—£24,000 for the construction of a main sewer from Troedyrhiw to Quaker's-yard, £1,150 for the construction of a relief sewer from New Castle-street to Plymouth-street, and £3,800 for the purchase and laying out of land for a recreation ground at Treharris.—No opposition was offered to the application.

**Mossley T.C.** (May 21st. Mr. F. H. Tulloch).—£3,600 for the new fire brigade and equipment.—It was stated that hitherto no special provision had been made for a fire station. It was proposed that the building should be erected by contract. The borough surveyor, Mr. R. H. Buckley, stated that the electric lighting estimate was £100, inclusive of globes, wiring and electric bells. The estimate for the walling and the paving of the yard was £290. He also explained that the heating cellar was for supplying heat in the radiators in the engine-house and also in the hose tower. The land on which they proposed to build the station had an area of 1,085 yds.

**Peterborough R.D.C.** (May 17th. Major J. Stewart).—£950 for works of water supply for the parish of Longthorpe (including the laying of mains on Thorpe-road in the city of Peterborough). Peterborough Corporation had also applied to the Local Government Board for sanction to supply water to the rural council to be used at Longthorpe. There was no opposition, and the clerk, Mr. W. B. Buckle, briefly stated the circumstances.

**Stamford T.C.** (May 21st. Mr. R. H. Bicknell).—£850 for a public swimming bath.—It is proposed to construct a bath on a site owned by the corporation, near the river Welland, which will give an adequate supply of water. It will be 100 ft. long and 30 ft. wide, and will have a depth of 6 ft. at one end and 3 ft. at the other.

**Stanley U.D.C.** (May 15th. Mr. R. H. Bicknell).—£11,500 for the provision of a new burial ground at Stanley.—The provisions of a new burial ground is necessary, as the present burial ground is practically filled up, and there is no burial ground unappropriated.

**Towcester R.D.C.** (May 20th. Mr. Courtenay Clifton).—£3,000 for the provision of workmen's dwellings. The clerk, Mr. W. K. Higham, stated that the amount of the proposed loan was made up of—building £2,600, architect's fees £140, clerk of works £60, land £100, and fencing £100.—It was estimated that if the whole of the houses were let there would be a balance to the good of £1 16s. 1d. per annum. Details were given by the clerk as to income and expenditure. He also, in answer to the inspector, gave the rates of wages in the district. Mr. H. Jackson Stops, who has prepared the plans and estimates in connection with the council scheme, supplied architectural particulars.

**Warrington T.C.** (May 22nd. Mr. F. H. Tulloch).—£346 for the purchase of property in Knutsford-road, for the purpose of street improvement. It was explained that Knutsford-road at the point where the property was situated was only 30 ft. wide, and the thoroughfare—a main road—was only 42 ft. at its widest part. The property consisted of two cottages and a strip of land. After the cottages were passed there was no footpath on the same side. Double tramlines ran along the road. Some time ago the corporation prescribed a line through the cottages and the land. Further on the land between the river and the roadway narrowed. It was highly dangerous there, because there was a drop into the river of many feet, and the high water at the spot was 20 ft. deep. The borough surveyor, Mr. T. Longdin, had reported the road as dangerous, and in consequence there was included in the corporation Act a clause for the construction of a river wall extending from Victoria Park to the end of the property they were now proposing to purchase.

**West Riding C.C.** (May 29th. Major J. Stewart).—£32,000 for the extension of the county hall. It was stated that the county council had found the present accommodation at the county hall totally inadequate for their needs owing to the great growth of the work since the building was erected, in 1898. The staff numbered 327; 227 of these were accommodated at the county hall, but the remaining 100 had to be housed in other buildings.

**Worksop U.D.C.** (May 17th. Mr. H. Shelford Bidwell).—£6,670 for the extension of the electric lighting service of the town.—The clerk stated that the outstanding loans on the electric lighting undertaking were £20,747. Mr. Crowther, electrical engineer, explained the position of the undertaking from its commencement in 1902 to date, and showed the rapid progress it had made, the total number of consumers at present being 996, compared with 84 in 1902, and the profit in 1911 £1,026, compared with a deficit in the first four years of its existence. The clerk said they anticipated further demands, as Worksop was a growing town. Included in the loan asked for provision was made for spending £270 to connect up street lamps in isolated districts, where the cable at present was not extended. The total expenditure to date on the electric light works was £31,244, and the authorised expenditure £31,073.

### APPLICATIONS FOR LOANS.

**Belfast T.C.** £52,371 for works of paving.

**Bromsgrove R.D.C.** £1,600 for drainage works.

**East Suffolk C.C.** £2,7— for a new school at Beccles.

**Gloucester T.C.**—£3,068 for street improvement works.

**Ilford U.D.C.** £12,600 for the extension of Valentine's Park.

**Kingsbridge R.D.C.** £400 for a water supply for Sorkelhenning.

**Leyton U.D.C.** £1,600 for relaying sewers.

**Lowestoft T.C.** £1,000 for street improvements.

**Morley T.C.**—£400 for a caretaker's house at the Branchcliffe Hospital.

**Thetford T.C.**—£7,500 for workmen's dwellings.

**Wallasey T.C.** £30,000 for a new town hall.

**Wilts C.C.** £2,750 for the provision of an isolation hospital.

**Worthing T.C.**—£3,770 for electric light extensions.

**Yeovil R.D.C.** £2,806 for a housing scheme.

### LOANS SANCTIONED.

**Bermondsey B.C.**—£18,000 for the extension of the electrical plant.

**Bournemouth T.C.** £3,000 for the purchase of land for the enlargement of a school.

**Bradford T.C.**—£11,281 for a school for deaf and crippled children.

**Bridlington T.C.**—£1,500 for the extension of the condenser at the electricity works.

**Budleigh Salterton U.D.C.** £670 for works of sewerage and water supply.

**Cirencester U.D.C.** £611 for footpath improvement work.

**Dewsbury T.C.**—£1,503 for a fire brigade station.

**Lancaster T.C.** £—78 for the provision of a public garden.

**Maidenhead T.C.** £2,586 and £341 for Turnpike and Kerbing, and £1,653 for footpaths.

**Midleton U.D.C.**—£1,000 for a water supply scheme.

**St. Columb R.D.C.** £300 for a sewage disposal scheme.

**Stoke-on-Trent T.C.**—£350 for alterations to the reference reading room at Hanley.

**Tottenham U.D.C.** — £8,540 towards the cost of a secondary school, and £1,400 for the purchase of the Cedars site.

**Winchcombe R.D.C.**—£4,200 for a sewerage scheme.

**Wood Green U.D.C.**—£163 for making up public walks and pleasure ground.

**Yarmouth T.C.** £—,200 for paving, &c.

### FORTHCOMING INQUIRIES.

JUNE.

| | | £ |
|---|---|---|
| 11. | **Kingston upon-Thames.** | For electricity purposes (Mr. T. C. Ekins) ... ... 13,500 |
| 11. | **Loughborough.** | For destructor and sewage disposal purposes (Mr. H. R. Hooper)... 1,600 |
| 11.— | **Mold.** | For the provision of a depot (Mr. P. M. Crosthwaite) ... ... - |
| 11.— | **Whitley.** | For private street works (Mr. Courtenay Clifton) ... ... 950 |
| 12.— | **Burnham.** | For street, borehole and recreation purposes (Mr. W. O. E. Meade-King) 1,370 |
| 12.— | **Ealing.** | For the provision of bacteria beds and street works (Mr. M. K. North) ... 2,850 |
| 12.— | **Cosforth.** | For road widening purposes (Mr. Courtenay Clifton) ... ... ... 2,230 |
| 12.— | **Mansfield.** | For the electricity undertaking (Mr. H. R. Hooper) ... ... ... 4,000 |
| 12.— | **Welshpool.** | For works of water supply (Mr. P. M. Crosthwaite) ... ... ... 1,000 |
| 13.— | **Pontefract.** | For a housing scheme (Mr. Courtenay Clifton) ... ... ... 21,000 |
| 13.— | **Plymouth.** | For the provision of public conveniences (Mr. W. H. Collins) 1,000 |
| 13.— | **Saltash.** | For street improvement works (Mr. W. O. E. Meade-King) 750 |
| 13.— | **Shrewsbury.** | For bridge widening and the provision of a public slaughter-house (Mr. P. M. Crosthwaite) 1,770 |
| 13.— | **Stoke-on-Trent.** | For street, culverting and storm-water drainage works (Mr. A. W. Brightmore) ... ... ... 3,733 |
| 13. | **Thornaby-on-Tees.** | For street, sewer and depot purposes (Mr. Courtenay Clifton)... 6,856 |
| 13. | **Whitwood.** | For electricity purposes (Mr. H. R. Hooper) ... ... 3,300 |
| 14. | **Bristol.** | For depot purposes and the provision of a monument room (Mr. W. O. E. Meade-King) ... 30,215 |
| 14. | **Leeds.** | For electricity purposes (Mr. H. R. Hooper) ... ... 58,960 |
| 14.— | **Nelson.** | For electricity and bridge-building purposes (Mr. A. W. Brightmore) 6,300 |
| 14. | **Tottenham.** | For works of culverting (Mr. F. O. Stamford) ... ... 3,021 |
| 14. | **West Bromwich.** | For street improvement works (Mr. P. M. Crosthwaite) ... ... 1,500 |

**Repton Surveyor and "Stamp Licking."**—At the meeting last week of the Repton Rural District Council, the surveyor remarked on the difficulty of carrying a lot of insurance stamps about in wet weather. The Rev. L. S. Staley said that the problem of stamp-licking was partially solved. If the surveyor held the stamps with the sticky side upwards he would be saved the trouble of licking them. Mr. G. E. Watts suggested that the surveyor should be allowed a glass of beer for every hundred stamps he had to lick.

**Law of Private Street Works.**—It is surely a commentary on our system of legislation relating to what may be termed domestic matters that the owner of house property (to say nothing of the occupiers of his houses) has to thread his way through a maze of statutes and decisions to ascertain his rights and his liabilities in connection with questions which may arise every day. Such, however, being the case, text-books dealing with what on the face of them might be deemed to be simple matters have become an actual necessity, although the owner of property is lucky if the text-book suffices and he is not driven to consult a specialist. The work before us* deals with one of such subjects, private street works under the Public Health Acts and the Private Street Works Act, 1892, but not with the Metropolitan Management Acts; the statements in the text are supported by decided cases, with references printed in the text; there is also a table of cases and an index, and it should prove a useful hand-book. We find the recent decisions included, and the work seems to have been carefully prepared.—*The Builder.*

* "Notes on the Law of Private Street Works under the Public Health Acts." By J. B. Rosmore Corder, a Solicitor of the Supreme Court. 4½d. nett. London: St. Bride's Press, Limited, 24 Bride-lane, E.C.

# Municipal Work in Progress and Projected.

*The Editor invites the co-operation of Surveyor readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below. Buildings—Beverley £1,000, Birmingham £7,007, Cardiff £1,500, Marylebone £81,000; refuse collection and disposal—Exeter £635, Pontypridd £2,000; roads and materials—Belfast £52,371, Lambeth £700; sewerage and sewage disposal—Ashton-in-Makerfield £23,319, Cannock £10,400; water, gas and electricity—Ashington £5,485.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

## ADMINISTRATION.

**Llandudno U.D.C.**—The standard wage for men employed by the council has been increased from 21s. per week to 23s.

## BUILDINGS.

**Beverley R.D.C.**—An agreement has been signed by this council, the East Riding County Council, the Skirlaugh Rural District Council, and the Beverley Corporation for the construction of the new Hull Bridge. This council undertakes to contribute £1,000 towards the cost.

**Birmingham T.C.**—The Lighting, Stables, and Refuse Disposal Committee will submit to the council plans of proposed new stabling at Nechells on the destructor site, necessary on account of the present limited and inconvenient accommodation. Provision will be made for the accommodation of twenty-six horses, with two isolation stables, smithy and shoeing forge, fodder store and manure pit, and the total estimated cost is £2,315. Plans will also be submitted for new stables and depot at Lifford, where it is proposed to provide accommodation for forty-five horses, with four isolation stables, foreman and horsekeeper's house, foreman's office and weigh-house, smithy and shoeing forge, &c., at a cost of £4,692.

**Cardiff T.C.**—It is proposed to build a new cattle market on 3 acres of land at the end of Sloper-road, at a cost not exceeding £1,500.

**Carlisle T.C.**—The enlargement of the public swimming baths is being pressed upon the council.

**Eastbourne T.C.**—The borough surveyor, Mr. A. E. Prescott, has prepared a sketch plan of a portable building as a refreshment pavilion at the Redoubt Gardens, at an estimated cost of £30.

**Exeter T.C.**—It has been decided to purchase the remains of the ancient building of St. Nicholas Priory for £850, and application is to be made for Government sanction for applying the £1,000 received for the sale of No. 16 Bridge-street to the purchase and restoration of the old structure.

**Harrington (Cumberland) U.D.C.**—Steps are to be taken to obtain more suitable premises for council offices. The condition of the existing building is such that at the last council meeting the surveyor, Mr. C. W. Eaglesfield, said he should hestitate to place a safe in the council chamber.

**Hull T.C.**—The council meeting took place in the new town hall yesterday for the first time. The building, which, when completed, will have cost about £150,000, has grown gradually. One-half, which is devoted to the Law Courts, was opened three years ago; the other half, which will accommodate the municipal administrative departments, will not be completed until a further block is added on the site of the old town hall, facing Lowgate, which is now being pulled down.

**Lincoln T.C.**—The corporation have resolved to provide a sanatorium for themselves within their own area.

**Marylebone B.C.**—Application was made to the London County Council by the borough council for sanction to borrow £81,800, repayable on the annuity system within sixty years, for the erection of the new town hall. The county council, in April of last year, sanctioned the borrowing of £40,000 for a site in the Marylebone-road, and the borough council then estimated the cost of the town hall at £65,000 for the building and £5,000 for equipment. The estimated cost, based on preliminary plans, is now as follows: Building, £75,800 (including £5,960 for contingencies); equipment, £6,000; total, £81,800, an increase of £11,800 (£10,800 in respect of the building and £1,000 in respect of equipment) over the amount of the earlier estimate. The increase of £10,800 in the cost of the buildings is mainly due to the fact that the borough council have allowed for an increased width of corridors and an increased height of rooms to be used by the public, and has included the cost of certain work in the forecourt of the building and a sum of £5,960 for contingencies.

**Pontypridd U.D.C.**—Plans have been completed of the proposed open-air swimming bath to be constructed at Treforest.

**Shoreham U.D.C.**—The surveyor, Mr. A. W. Nye, has prepared plan of a mortuary to be erected at the rear of the town hall, which has been approved, and local tenders are to be invited for the work.

**Stockton T.C.**—It has been decided to purchase, at a cost of £3,800, property adjoining the borough hall, for the purpose of providing extra office accommodation. Several members voted for the proposal on condition that the scheme would embrace also the provision of a new and more commodious council chamber and the enlargement of the borough hall.

**Tredegar U.D.C.**—A bandstand, which cost £300, and a ladies' shelter, both gifts to the council, have been formally opened in Bedwellty Park.

**Ventnor U.D.C.**—It has been agreed to extend the new landing-stage the whole length of the western side of the pier, at a cost of £600.

**Walton-upon-Thames U.D.C.**—The Thames Conservancy have granted the necessary permission for the extension of the bathing pavilion, and the surveyor, Mr. R. Wilds, has been authorised to obtain tenders for the work.

## HOUSING AND TOWN PLANNING.

**Boston R.D.C.**—The council have affirmed the desirability of providing cottages for the working-classes at Benington, and the necessary application is to be made to the county council.

**Colwyn Bay T.C.**—A workmen's dwelling scheme, on a somewhat extensive scale, is being considered by the corporation.

**Egremont U.D.C.**—Plans for the provision of working-class dwellings are nearly completed.

**Rawtenstall T.C.**—A scheme of the borough surveyor, Mr. J. Johnson, for the provision of working-class dwellings has been approved. Two types of houses with stone fronts have been adopted, to be let at (*a*) a weekly rent of 5s. 6d., clear of rates and water; (*b*) a weekly rent of 6s. 6d., clear of rates and water.

**Yeovil R.D.C.**—A scheme has been adopted for the provision of twelve working-class dwellings, and the tender of Mr. J. Fra[illegible] has been provisionally accepted for the work.

## PARKS AND OPEN SPACES.

**Hove T.C.**—The corporation have accepted with thanks as a gift to the town plots of ground on each side of the west entrance of St. Ann's Gardens, the additional area to be thrown into the public gardens.

## REFUSE COLLECTION AND DISPOSAL.

**Exeter T.C.**—A six-horse power engine is to be purchased at a cost of £635 for hauling away the house refuse.

**Pontypridd U.D.C.**—The council have approved the scheme of a subcommittee for the scavenging to be done by the authority instead of by contract, as at present. The intention is to erect stables on the Mill Field, and to purchase the necessary stud of horses. The buildings are estimated to cost £2,000, and the annual expenditure is put at £2,097, as compared with £1,926, the present cost of doing the work. The Local Government Board is to be asked to sanction the scheme.

**York T.C.**—The Streets and Buildings Committee have declined to accede to the request of the York Traders' Association asking the committee to abolish the charges in force for the destruction of refuse delivered to the destructor by any ratepayer.

## ROADS AND MATERIALS.

**Belfast T.C.**—New paving works of the estimated value of £52,371 are to be carried out.

**Esher and the Dittons U.D.C.**—The tender of Messrs. S. Kavanagh & Co., for steam rolling has been accepted.

**Lambeth B.C.**—Street improvements are to be carried out at a cost of £700.

**Lewisham B.C.**—The General Purposes Committee recommend that a stone crusher be purchased from Messrs. Mason Bros., of Leicester, at £70. The machine, it is explained, can be moved from depot to depot, and can be driven by a belt from one of the council's steam road rollers at a cost of about 2s. a ton.

**Lowestoft T.C.**—Following upon a report of the surveyor, Mr. G. H. Hamby, it has been agreed to carry out several street improvements at an estimated cost of £1,000.

**Montrose T.C.**—A circular road to the beach at Montrose, constructed at a cost of £600 by the Traill Improvement Trust, was last week formally opened and presented to the corporation.

**Norfolk C.C.**—A curious position has arisen between the council and a landowner in the parish of Great Witchingham. A section of the county road was being tar-paved, when the road foreman, who lives at Lenwade, received a call at his house from an owner of land in the neighbourhood, accompanied by his solicitor, with a request for the discontinuance of the work on the ground that he as a riparian owner, objected to the application of the tar, which might be washed from the road into the river and damage the trout therein. The work had reached a distance of about 160 yds., but it has now been stopped and the men sent away after using but a small portion of the tar.

**Rowley Regis (Staffs) U.D.C.**—The tender of the Durable Roads, Limited, at £256 has been accepted for tar-spraying portions of roads in accordance with the specification and conditions of the surveyor, Mr. W. H. Brettell. The surveyor has received information from the county surveyor to the effect that the Road Board have agreed to contribute £127 towards the cost of the spraying, so far as main roads are concerned.

**Towyn U.D.C.**—Considerable improvements are being carried out at Towyn and Aberdovey in laying tar-macadam and tar-spraying the streets. Owing to the proximity of the Welsh granite quarries, the council are able to do a considerable amount of work at a low cost. The council were one of the first in Wales to put down tar-macadam. The first work done has worn so well that the surveyor, Mr. R. P. Morgan, who made his own material at that time, has been entrusted with the work again, and as a result of extra work and improvements carried out, the council have advanced his salary by £30 per annum. Several other councils have taken Mr. Morgan's advice in the matter of making and laying their tar-macadam.

**Truro R.D.C.**—An improvement has been carried out on the road at Tregenna Lamorran, under the supervision of the surveyor, Mr. J. P. Carbis, at a cost of £40.

**Weardale (Durham) R.D.C.**—The new road from Eastgate to Rookhope made by the council, has been opened for traffic. The road is about 2½ miles long. It leaves Eastgate at an elevation of 759 ft., and joins the district road at Stotsfield Burn, Rookhope, at a point 1,049 ft. above sea level. The estimated cost was £4,300, and the plans for the whole work were prepared by Mr. G. W. Egglestone, the surveyor, who also designed the three bridges.

**York T.C.**—The Streets and Buildings Committee have given Mr. C. Martin the order to carry out the work in connection with the making up of the new street from Pavement to Piccadilly with tar-macadam, on the schedule of prices contained in his last tender for similar work in private streets, plus 5 per cent.—The Streets and Buildings Committee have been instructed to bring up to the council a pension scheme for the workmen and other employees over the age of seventy.

## SEWERAGE AND SEWAGE DISPOSAL.

**Ashton-in-Makerfield (Lancs) U.D.C.**—Amended plans have been approved for the sewerage and sewage disposal scheme, the cost of which is now estimated at £23,310.

**Cannock U.D.C.**—A scheme for the extension of the sewage farm submitted by the sewage committee is being considered by the council. The estimated cost is £10,400.

**Chertsey R.D.C.**—The surveyor, Mr. H. Beeney, has presented plans, which have been approved by the council, for the surface-water drainage of Byfleet and Pyrford. The area affected is 347 acres. The sanction of the Local Government Board is to be sought for a loan for the whole scheme.

**Disley R.D.C.**—A scheme prepared by Messrs. Brady & Partington, of Chapel-en-le-Frith, for sewerage purposes, for the Furness Vale portion of the rural district, at a cost of £1,150, has been sanctioned by the Local Government Board.

**East Kerrier (Cornwall) R.D.C.**—Mr. R. Worth, engineer, has suggested a scheme of land irrigation for the disposal of the sewage of a portion of the district.

**Folkestone T.C.**—The tender of Messrs. Tuke & Bell, Limited, has been accepted by the council for the supply and erection of a sewage lift installation to raise 750 gallons per minute of sewage, including the compressing plant, for the total sum of £1,005.

**Loughborough R.D.C.**—Instructions have been given for the preparation of a sewage disposal scheme.

**Pocklington (Yorks) R.D.C.**—The sanitary surveyor, Mr. G. W. Mitchell, has prepared a sewage disposal scheme for Shipton Thorpe, the cost of which is estimated at £450. The matter is to be considered at the next meeting of the council.

**South Westmorland R.D.C.**—A scheme for the sewerage of Milnthorpe is to be proceeded with. The cost is estimated at £341.

**York T.C.**—The Sewerage Committee have considered the question remitted to them by the council's resolution in reference to the payment of a minimum wage of 6d. per hour to the workmen in the employment of the corporation, and they have given effect to it in regard to the men employed at the sewerage works, and they have in cases where possible reduced the hours of labour of the men to fifty-three per week.

## WATER, GAS, AND ELECTRICITY.

**Ashington (Northumberland) U.D.C.**—A scheme has been adopted for the provision of water mains and machinery to provide an increased supply of water for the Hirst district, at an estimated cost of £5,485.

**Blackburn T.C.**—Tenders have been received for the construction of the proposed waterworks at Wilpshire. The lowest amounts to about £62,000, which is understood to be an advance of nearly £4,000 upon the rough estimate originally prepared by the borough engineer, Mr. W. Stubbs.

**Bridlington T.C.**—The nett profit on the year's working of the electricity undertaking was £1,376.

**Buckie T.C.**—The burgh surveyor has reported that the new Deacon meters, which the council have purchased, at a cost of about £300, and installed on the water mains leading into the town, disclosed that there were flowing into the burgh 400,600 gallons per twenty-four hours, or fully 45 gallons per head of the population. The wastage is reckoned at nearly 50 per cent, and several men are employed nightly in tracing the leaks. Meanwhile a special committee has been appointed to investigate the matter.

**Cardiff T.C.**—Negotiations are in progress for the purchase of certain lands owned by Lord Merthyr at Pontardaf for reservoir purposes at Taff Fawr.

**Malton (Yorks) R.D.C.**—A communication has been received from the Local Government Board declaring the council in default with regard to supplying certain of the street villages with water.

**Nottingham T.C.**—The year's working of the water undertaking has resulted in a profit of £24,618. The Lighting Committee are still experimenting with clockwork automatic lighting and extinguishing apparatus, which continues to act very efficiently, and is now attached to 330 lamps. The committee are also testing a different type of apparatus working by pressure from the gasworks.

**Shoreditch B.C.**—The London County Council have agreed to sanction the borrowing of £10,845 for the borough council's electricity undertaking; £8,385 of the amount is for the laying of mains primarily for the purpose of street lighting. It is proposed to light 160 streets by electricity instead of gas as at present. The balance of the amount (£2,460) is in respect of mains, house services, and meters.

**Sleaford R.D.C.**—A plentiful supply of pure water has been obtained for Burton Pedwardine by boring, and waterworks have been erected at a cost of £1,850. There are between 4 and 5 miles of pipe track, a continuous supply being obtained by pumping into a tank of 12,000 gallons capacity.

## MISCELLANEOUS.

**Brixham (Devon) U.D.C.**—The surveyor, Mr. J. Silley, has prepared a plan of an additional wooden-piled landing stage, with two landings on the outside of the pier, estimated to cost £232. The consideration of the matter has been deferred.

**Eastbourne T.C.**—The annual reports of the municipal electricity and motor omnibus undertakings, which have just been issued, show in each case an increased income. Owing, however, to a reduction in the charge for current, the electricity nett profit of £1,089 is smaller than usual.

**Leeds T.C.**—The Watch Committee have decided to buy a new motor fire engine from Dennis Brothers, Limited, for £987, and a new motor tender from Messrs. Mann and Overton for £520.

**Newcastle-upon-Tyne T.C.**—The net profit of the tramway undertaking for the past year amounted to £8,427.

**Ossett T.C.**—It has been decided to purchase a motor fire engine.


## FOR OTHER ADVERTISEMENTS

See End of Paper.

THE ST. HELENS CORPORATION invite applications for the following positions in their Borough Engineer and Surveyor's Department:—

An Architectural Assistant, with experience in taking out quantities, and with a knowledge of Building By-laws and Regulations, to act as Building Inspector. Salary £120 per annum, rising £5 per annum to £150 per annum.

An Engineering Assistant, with experience in the design, construction and supervision of engineering works. Salary £2 per week.

For both positions preference will be given to applicants with municipal experience.

The persons appointed must, if required, become contributing members to the No. 2 Superannuation Fund.

Applications, stating age and previous experience, and accompanied by not more than three recent testimonials, must be sent to Mr. Arthur W. Bradley, M.INST.C.E., the Borough Engineer and Surveyor, at the Town Hall, not later than June 25th next.

Canvassing will be a disqualification.

W. H. ANDREW,
Town Clerk.

Town Hall, St. Helens.
June 5, 1912

PORTHCAWL URBAN DISTRICT COUNCIL.

The above Council invite applications for the appointment of a Temporary Assistant in the Surveyor's Department. The appointment will be determined by one week's notice at the Council's pleasure.

Applicants must not be more than 30 years of age, and must have received a municipal training and experience, and be competent to discharge the general duties of a Municipal Engineer's Office, including inspections under the Housing and Town Planning Act, 1909.

Applications, endorsed "Assistant Surveyor," in Candidate's own handwriting, stating age, qualifications, and salary required, accompanied with copies of not more than three recent testimonials, are to be addressed to the undersigned and delivered at the office of the said Council not later than 12 noon on Monday, the 17th June, 1912.

Canvassing, directly or indirectly, will disqualify.

WM. CHORLEY,
Clerk.

Council Offices,
Porthcawl.
June 4, 1912.

TO PARENTS AND GUARDIANS.—An immediate opening for a suitable Pupil in the Office of a Surveyor to an Urban District Council about 10 miles from South Coast. Small premium required.—Apply B., office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.


## MUNICIPAL WORK IN EXETER.

### CITY ENGINEER'S REPORT.

In his report for the year ended March 31st last, Mr. Thomas Moulding, M.INST.C.E., city engineer and surveyor of Exeter, states that during that period 7,438 tons of stone—Haldon flints, granite and limestone—were used in repaving 14½ miles of macadamised roads, and that of 1,112 tons of gravel and sand 881 tons were used in gravelling roads, 111 tons were dried and used on tramcars, and 120 tons on cemetery paths. Some 17 miles of streets were tar-sprayed. The cost of this work was £774, and from a dust-laying point of view the result has been fairly satisfactory; but Mr. Moulding is of opinion that the treatment should be confined to by-streets and *culs-de-sac*, in preference to main-traffic roads. During the twelve months under review 45 lin. ft. of kerb and 382 lin. ft. of channel were fixed, and 373 lin. ft. of kerb and 408 lin. ft. of channel refixed. In connection with footpaths, 812 sq. yds. of York flags were laid, and 3,633 sq. yds. of Limmer asphalt paths were laid or renewed; also 3,303 sq. yds. of tar-paving were laid, and nearly 6 miles of paths were tarred and sanded.

Of the 51½ miles of streets and roads in the city of Exeter, 48 miles are macadamised, the length of wood paving being a few yards only over a mile.

SCAVENGING.

Dealing with scavenging, Mr. Moulding states that the horse brooms swept 140 miles of roads, and 3,438 loads of mud were taken up and either tipped at the nearest dumping ground or washed. Some 668 loads of mud were washed, and the sand resulting either used in council work or sold. In addition, 344 tons of street sweepings were collected by barrowmen in the principal streets and sold. House refuse was removed daily from approximately 3,556 houses, twice weekly from 6,102 houses and thrice weekly from 1,038 houses, shops and business premises.

REFUSE DISPOSAL.

A method of disposing of the household refuse collected daily suggested by a councillor has had a complete year's trial. Over 9,900 tons of refuse were delivered to farmers by traction engine. This included a considerable amount of the old heap, in addition to the refuse actually collected. The cost of disposal amounted to £1,347, not including any capital expenditure, and the refuse was sold for £1,409. Unfortunately the engines purchased for the scheme proved themselves too light for the work they had to do, consequently a large amount of repairs had to be done, the repairs alone accounting for £172.

Mr. Moulding considered that if more powerful engines were obtained, the cost of disposal would be very much reduced and a corresponding increase in takings would result. "This method of disposing of the house refuse" he says, "has for the time being been very successful, but there is a doubt in my mind whether it will continue; however, this depends entirely upon the farmers taking the refuse. The difference in cost between this method and a destructor compares, from a financial point of view, very much in favour of the present system."

TRAMWAYS.

Mr. Moulding mentions that a considerable amount of packing has again been necessary throughout the whole length of the tramway track, and the joints of the rails have required tightening in various places. The length of track is nearly 5 miles, there being nearly 8 miles of single line.

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**Aberdeen Water Supply.**—The report of the water engineer upon an improved water supply for the city of Aberdeen from the Dee at Cavington, states *inter alia* that the cost of the scheme will amount to £500,000 at least.

**No Bicycle for Falmouth Borough Surveyor.**—It was recommended to Falmouth Town Council by the Highway Committee that the borough surveyor be provided with a bicycle at a cost not exceeding £13. A great deal of discussion took place on the report, in the course of which Alderman J. Grose contended that the surveyor would next be wanting an aeroplane with which to do his work. It was decided not to provide the machine. Mr. J. S. Walton, the borough surveyor, stated that if he could not have it by the unanimous vote of the council he did not want the bicycle.

# Personal.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

Mr. W. R. Denbow, of Devonport, has been appointed highway surveyor to the Kingsbridge Rural District Council.

Mr. C. T. Chadwick, assistant to Mr. Percy Johns, borough surveyor of Maidenhead, has had his salary increased by £15 per annum.

Mr. A. Dorren, of Blyth, has been appointed surveyor and sanitary inspector to the Seaton Urban District Council, at a salary of £130 a year.

Mr. S. E. Lowsley, a member of the borough surveyor's staff, has been appointed deputy borough surveyor of Harrogate, at a salary of £200 per annum.

Mr. S. L. Hopley, assistant surveyor to the Pontypool and Llantrisant Council, has been appointed assistant surveyor to the Bedwellty Urban District Council.

Mr. A. G. Robinson, a member of the Southend borough engineer's staff, has been appointed assistant engineer under the Public Works Department in the Malay States.

Mr. John D. Hurst, assistant surveyor and sanitary inspector of Hindley, has been appointed surveyor and sanitary inspector to the Wardle (Lancs) Urban District Council.

Mr. E. D. Groves, surveyor to the St. Austell Urban District Council, has been presented by the councillors and official staff with an oak dining-room mantel clock on the occasion of his marriage.

Mr. Measham Lea, for some years city surveyor of Truro, who has recently been engineer of Karachi, has now been appointed chief officer and chief engineer of the city at a salary of £960 per annum.

Mr. H. Asher, sanitary surveyor, has been appointed highway and sanitary surveyor to the Atcham Rural District Council, in succession to Mr. T. Fortune, resigned, at a salary of £260, rising to £300 per annum.

Mr. Alltwen Williams, Birkenhead, surveyor and clerk to the Blaenau Festiniog Urban District Council, died recently, we regret to state, at the age of seventy. Mr. Williams was a chaired bard, and was known in Welsh bardic circles as "Gwilym Alltwen."

Dr. Gilbert J. Fowler, D.SC., F.I.C., has been retained, along with Mr. Oswald J. Wilkinson, ASSOC.M.INST.C.E., of the firm of J. P. Wilkinson & Son, consulting civil engineers, as chemist and engineer respectively, in connection with the sewerage and sewage disposal of Market Drayton.

Mr. P. C. Cowan, D.SC., M.INST.C.E., chief engineer to the Local Government Board, Ireland, will preside over the Municipal Engineering, Architecture and Town Planning Section of the Congress of the Royal Institute of Public Health, which will be held in Berlin from July 25th to 28th next. Lord Beauchamp, First Commissioner of Works, will be the president of the congress.

Mr James S. Gibson was last week appointed by the Middlesex County Council to prepare designs for and to supervise the construction of the fittings and furniture required for the principal rooms at the new Guildhall, at a commission of 7½ per cent upon the amount authorised as expenditure, such commission to include any necessary copies of the designs and all travelling and other expenses.

Mr. W. Rees Jeffreys, secretary of H.M. Road Board and hon. general secretary of the Local Organising Committee of the Third International Road Congress, to be held in London in June next year, was the guest on Wednesday, at a dinner at the Hotel Astor, New York City, given in his honour by the American Road Builders' Association. Mr. Arthur H. Blanchard, M.AM.SOC.C.E., Professor of Highway Engineering, Columbia University, officiated as chairman, and the Dinner Committee consisted of Prof. Blanchard, Mr. Clifford Richardson, M.AM.SOC.C.E., and Mr. George W. Tillson.

Mr. C. H. Rust, the city engineer of Toronto, was on May 10th the chief guest at a farewell dinner given by the Engineers' Club of Toronto on his relinquishing his appointment for a similar one at Victoria. One of the speakers on the occasion, Ex-Controller F. S. Spence, said that Mr. Rust was to be commended for having done his duty in the face of the most trying opposition from "ignorant politicians"; and he added that the present-day municipal engineer required "the wisdom of Solomon, the courage of David, the meekness of Moses, the patience of Job, the executive ability of a Napoleon Bonaparte, and the administrative skill of a G. R. Geary."

Mr. Sidney Palmer, chief assistant to Mr. H. C. Fread, surveyor to the Esher and the Dittons Urban District Council, who has been with practical unanimity appointed borough surveyor, waterworks engineer and sanitary inspector of St. Ives, Cornwall, had experience in Southwark and Westminster before proceeding to the Thames Valley. Mr. Palmer, who is thirty-two, has the following "passes" to his credit:

MR. SIDNEY PALMER.

Institution of Municipal and County Engineers, Surveyors' Institution (Intermediate) and the Royal Sanitary Institute. In addition, he holds first-class certificates for land surveying and levelling, and elementary and advanced building construction from the City of London College, while he also obtained second place (1900 and 1901) in building construction at the Goldsmiths' Institute, London.

Mr. J. S. Pickering, borough surveyor and water engineer of Cheltenham, whose installation as president of the Institution of Water Engineers took place yesterday, was articled to the late Mr. J. T. Eayrs, of Birmingham, who then occupied the position of borough engineer of West Bromwich. He afterwards became an assistant to the late Mr John Austie, of Westminster, under whom he was engaged in the general practice of a civil engineer. He left Westminster to take up the position of engineer and manager to the East Warwickshire Waterworks Company, and afterwards became engineer and surveyor to the Nuneaton Council. Nine years ago he secured the appointment of borough engineer of Cheltenham. He has specialised in works of water supply, sewerage and sewage disposal, but his large experience embraces practically all the important works which come under the control of a municipal engineer. A portrait of Mr. Pickering appears in the form of an inset with the present issue.

Mr. O. Claude Robson's report as engineer and surveyor to the Willesden Urban District Council is the subject of a long article in the *Engineering News* of New York, dated May 23rd. The writer notes that "the office of city engineer in the United States rarely carries with it either the number of duties or the dignity pertaining to the similar office in Great Britain," and he proceeds to comment upon some of

the more important municipal works described in Mr. Robson's report, comparing the practice with that obtaining in America, generally to the advantage of the British system. In conclusion, some surprise is expressed that the report does not contain more unit-cost data, though this criticism is qualified with the supposition that this and other efficiency data are given more fully in other Willesden departmental reports.

Major Walter W. Crosby has resigned the office of chief engineer of the Maryland State Roads Commission, and has been succeeded by Mr. Henry G. Shirley, of Baltimore County. Major Crosby's work is warmly eulogised in the *Baltimore Sun*, in the columns of which journal the foregoing announcement is made, gratification being at the same time expressed at the selection of Mr. Shirley, who is described as a competent and able engineer, a broad-minded and likable man, with the energy, the courage and the capacity to do big things in the right way. For nearly ten years Major Crosby has been engaged in the work of road building in Maryland, and to him a large part of the credit for the progress made in the State along this line in the last decade is due. He has had many obstacles to overcome, and at times has laboured under a heavy handicap. He has made many friends and some enemies in doing his duty, but his work speaks for itself, and it is hoped that in some way the State of Maryland will continue to profit by his advice.

Mr. Arthur H. Blanchard is the subject of the following biographical notes in the *Contract Record* of Toronto, under the heading, "A Distinguished Road Engineer": "Mr. Blanchard, who occupies the position of Professor of Highway Engineering at Columbia University, received the degree of C.E. from Brown University and A.M. from Columbia University," says our contemporary. "For twelve years he was a member of the Faculty of Civil Engineering at Brown University. Prof. Blanchard has also been connected with the city engineer's office of Providence, the Berlin Iron Bridge Company, the American Bridge Company, and for seven years was associated with the State Board of Public Roads of Rhode Island as deputy engineer. During 1910-11 he investigated the roads and pavements of Europe. At present, in addition to having charge of the graduate course in highway engineering at Columbia University, he is a consulting highway engineer to various States and municipalities and consulting engineer to the United States Office of Public Roads. Prof. Blanchard has contributed to various technical periodicals in this country and abroad, and to the proceedings of various engineering societies in the United States, England, and France. He is author with Henry B. Drowne of 'Highway Engineering as Presented at the Second International Road Congress.' In 1910 Prof. Blanchard was one of the United States reporters to the Second International Road Congress in Brussels, and has recently been appointed United States Expert on Road Materials in the International Association for Testing Materials. He is a member of the committee on 'Bituminous Materials for Road Construction,' of the American Society of Civil Engineers, of the committee on 'Road Materials' of the American Society for Testing Materials, and of the committee on 'Paving Nomenclature' of the American Society for Municipal Improvements. Prof. Blanchard is a member of the American Society of Civil Engineers, Membre Sociétaire Titulaire of the Société des Ingénieurs Civils de France, Fellow of the American Association for the Advancement of Science, and member of the Honorary Scientific Society of Sigma Xi, American Society for Testing Materials, American Society for Municipal Improvements, American Road Builders' Association, American Chemical Society, American Association for Highway Improvement and other societies in this country and abroad."

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*Concrete and Constructional Engineering* for June, in referring to changes in the council of the Concrete Institute, says: "That Mr. William Dunn, whose name has been prominent in matters relating to concrete, has also retired, is certainly to be regretted in one sense. On the other hand, his well-known antagonism to reinforced concrete regulations, in which he figured so largely in the Royal Institute of British Architects, put him very much out of sympathy with the general interests of the institute, and his replacement by so eminent an authority as Mr. Boulnois—who was till lately connected with the Local Government Board—is again an advantage to the institute."

## SOME RECENT PUBLICATIONS.*

Applied Mechanics and Mechanical Engineering. Vol. iv. Hydraulics. Eighth Edition. By Prof. A. Jamieson. Price 5s. London: Charles Griffin & Co., Limited.

The popularity of Prof. Jamieson's standard work on Applied Mechanics and Mechanical Engineering (which has increased since its division into five volumes of convenient size) is continually attested by the appearance of new editions. For the eighth edition the volume, which deals with hydraulics and kindred subjects, has been thoroughly revised and enlarged by the addition of some fifty pages. Among the new matter which has been introduced may be mentioned descriptions of the Venturi meter, and the Pitot and Ferris Pitot tube meters, and also the mathematical investigation of the discharge through a long pipe, consisting of a number of pipes of different diameters. In our opinion "Jamieson" well retains the position which it long ago attained as a leading text-book for the examinations of the Institution of Civil Engineers and other bodies.

The Clayworkers' Hand-book. By Alfred B. Searle. Price 6s. nett. London: Charles Griffin & Co., Limited.

This second edition of Mr. Searle's work has been revised, corrected where necessary, and partly rearranged. It is intended chiefly as a guide to those actually engaged in the routine of clayworking, and for this reason such matters as detailed descriptions of machines and of the sources and characteristics of various clays are, in general, omitted. There are, however, very useful chapters treating these subjects more generally, and the various processes with which the clayworker is concerned are fully and practically dealt with, while the work concludes with an exhaustive chapter on Tests, Analysis and Control. While, as above stated, the book is intended primarily for the handicraftsman, there is much in it which will be of interest and value to the users of clayware in considerable quantities.

The History of Prahran, 1836-1911. By J. B. Cooper. Melbourne: Modern Printing Company, Limited.

In this volume the author traces the history of Prahran, which, although so near to Melbourne, has for many years been an independent municipality with the rank of a city, from the time of the early settlers to the present day. It is a fascinating story of progress which has in less than three-quarters of a century resulted in the growth of a prosperous city of over 45,000 inhabitants. The author pays a tribute to the part which has been played in the modern development of Prahran by Mr. William Calder, who has been the city surveyor since 1897.

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We have received a copy of the seventh annual report of the British Institute of Social Service, a body which has for its objects the collection, registration and dissemination of information relating to all forms of social service. The headquarters of the institute are 4 Tavistock-square, W.C.

"The Moselle."—A new illustrated booklet, by Percy Lindley, has been prepared by the Great Eastern Railway Company, and can be obtained free by sending a postcard to the Continental Manager at Liverpool-street Station. As the Moselle is one of the least frequented and most beautiful rivers in Europe, and can be reached easily and inexpensively by the company's Harwich route to the Continent, the little brochure should be appreciated.

"Homeland Hand-books."—From the Homeland Association, Limited, we have received two daintily-produced little books on, respectively, "Westward Ho! (Devon)" and "Reading," each price 3d. nett. The former is the official guide of the Northam Urban District Council and of the Bideford, Westward Ho! and Appledore Railway Company, and contains a special chapter on golf facilities in the district; the latter is the official guide of the Corporation of Reading and the Reading Chamber of Commerce, and is the first of a new series which will deal with provincial towns and their residential and industrial possibilities. Both are charmingly and liberally illustrated, and amply worth the low prices at which they can be bought.

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* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price

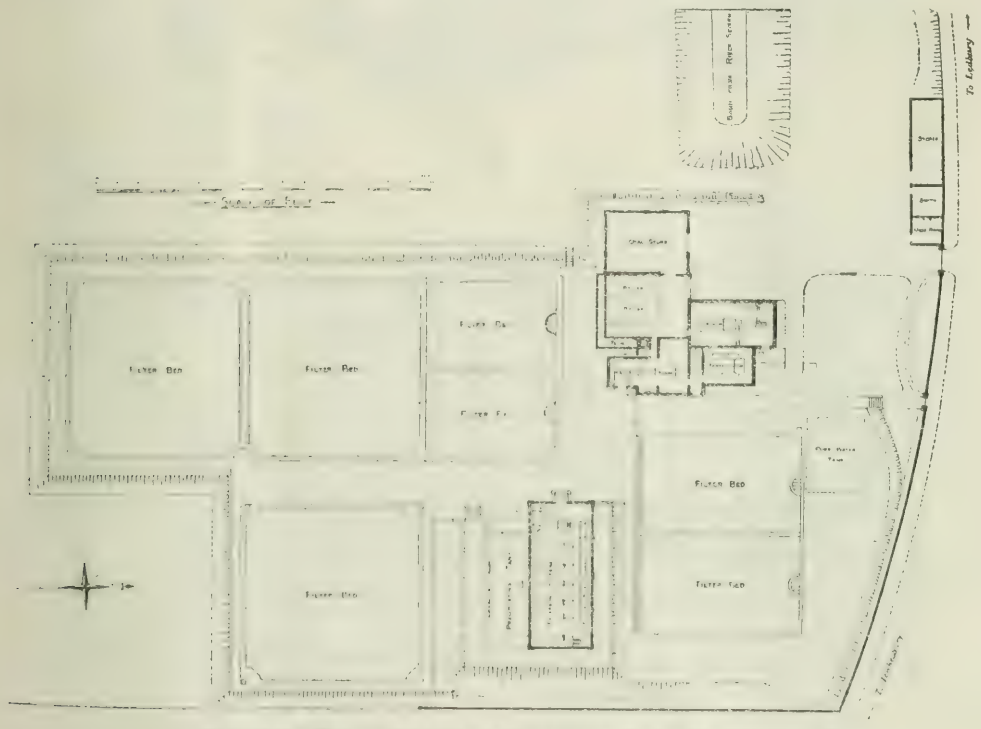
# Cheltenham Waterworks.*

By J. S. PICKERING, M.INST.C.E., Water Engineer.

The present area of supply is about 60 square miles, and comprises the borough of Cheltenham and twenty-two surrounding parishes. The water is derived from three sources—*viz.*: (1) Springs in the inferior oolite of the Cotswolds; (2) the head waters of the Chelt; and (3) the river Severn.

The spring water is supplied unfiltered, and is stored in two open brick reservoirs having a combined capacity of 30,500,000 gallons, two covered reservoirs holding 2,000,000 gallons, situated at Hewletts, and in an open brick reservoir at Leckhampton containing 1,750,000 gallons. An impounding reservoir at Dowdeswell, having a capacity of 100,000,000 gallons, stores the head waters of the Chelt, which are mainly from the oolite. The Severn water is pumped from Severn water. Accordingly, in 1900, a new pumping engine was erected at Tewkesbury, and in order to appease the opposition, the size of the pumping main was limited to 9 in. in diameter. This small main proving insufficient, a second main 12 in. in diameter was laid three years later. Since the author's appointment nine years ago, additional pumping and filtering plant has been installed at Tewkesbury, and at the present time the town depends upon the Severn for about a third of its water supply.

The various sources and levels of supply make the distribution somewhat complicated and difficult. The ordnance-level in the centre of the town is about 195 ft. The top water-level at Hewletts reservoirs is 408 ft., at Dowdeswell pure-water tank 353 ft., at Leckhampton reservoir 380 ft., and the level at Tewkesbury pumping station is about 42 ft. above ordnance datum.




Cheltenham Waterworks: Plan of Tewkesbury Pumping Station.

Tewkesbury, a distance of about 8 miles from Cheltenham.

The undertaking was established by a water company in 1824, their supply works comprising the reservoirs at Hewletts and Leckhampton. In 1865 the company obtained an Act for supplying Tewkesbury, and for this purpose a small pumping station was erected on the Severn in 1869. An attempt was made at that time to supply Cheltenham from the same source, but failed owing to the opposition to a river supply. The proposal was revived by the company a few years later, but was again strenuously opposed, the Cheltenham authorities suggesting an alternative scheme for an impounding reservoir at Dowdeswell. The company being unwilling to entertain this, and the objection to the Severn supply being so strong it was ultimately arranged to transfer the undertaking to the corporation. The purchase was made in 1878, and in 1886 the Dowdeswell reservoir and filtration works were brought into use.

This new source of supply proved to be inadequate to meet the growing requirements of the district, and there appeared to be no alternative but to introduce

Water from the Severn is only pumped during the summer months, when the town reservoirs are low, and is delivered direct into the supply mains. When pumping ceases the borough of Tewkesbury receives its supply from the Cheltenham reservoirs. The population at present supplied is approximately 60,000, and the average daily consumption is about 1,350,000 gallons. The normal consumption for domestic purposes is about 17 gallons per head per day. The capital expenditure has been very heavy, and, after deducting sinking funds, now amounts to about £346,000. The expenditure last year (including £18,263 for payments on capital charges, rates and taxes) amounted to £22,415, and the receipts to £24,075.

### Tewkesbury Pumping Station.

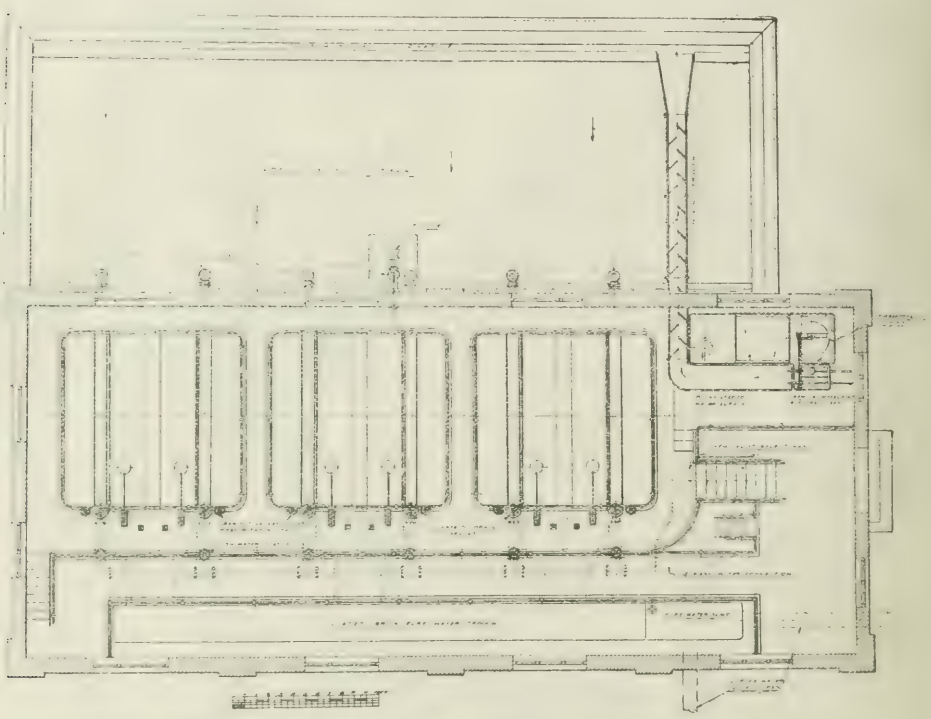
As the works on the Severn at Tewkesbury are the most interesting from an engineering point of view, a brief description will probably be acceptable.

The Severn is one of the largest of the English rivers. It rises on the eastern slopes of Plynlimmon, and flows a distance of nearly 200 miles to its mouth

* A paper presented at the Summer General Meeting of the Institution of Water Engineers at Cheltenham.

in the Bristol Channel. It has a drainage area of something like 4,500 square miles, and the various geological formations over which the water passes alter its composition very considerably at different periods of the year. The river at times is very turbid, this being due mainly to the surface water off the marl, and it is frequently of a brown colour from the peat and decaying vegetable matter in the upper reaches. The summer flow at Tewkesbury is estimated at from 35,000 000 to 40,000,000 cub. ft. per day. The corporation have power to extract 500,000 cub. ft. per day, but the present requirements are met by about a third of this quantity taken only for about six months in the year. The river in its circuitous course undergoes a remarkable process of self-purification, and upon reaching Tewkesbury it becomes, with suitable treatment, a first-class water. Owing to its turbid character and the absence of a storage reservoir, the water is difficult and costly to deal with. The filter-beds are of the usual type, and give good results, but they seldom work for more than two weeks before the surface film has to be removed, and to lift the reagents to the controlling apparatus referred to. The solutions are prepared in concrete tanks on the filter-house floor level, the necessary agitation and mixing being secured by a small propeller driven by a compressed-air motor. The reagents are thoroughly mixed with the water in its passage along a "salmon-ladder" mixing trough, which discharges into a reaction and precipitating tank having a capacity of about three hours' pumping.

The partially purified water overflows through bell-mouthed draw-off pipes into six Paterson rapid gravity filters, each measuring 16 ft. by 8 ft., and having a total filtering area of 768 sq. ft. The filter medium consists of a depth of 30 in. of specially graded quartz sand, resting on a stratum of pea gravel. Situated centrally in each filter is an inlet-distributing and waste draw-off channel. The water from each filter is collected underneath the gravel by about 400 gun-metal strainers having screwed caps and renewable phosphor bronze screens, and is conveyed into a central 6-in. outlet duct, from which it passes through an automatic outlet controller into an



Cheltenham Waterworks. Plan of Paterson Filters at Tewkesbury Pumping Station.

not infrequently they become thickly coated and have to be cleaned after working two or three days. This entails a considerable amount of labour and the waste of a large quantity of water.

*Pre-Filters.*—In order to overcome these difficulties and to provide for a larger supply, a system of preliminary treatment in the form of rapid pre-filters is being introduced. These filters are of the gravity type, and are being installed by the Paterson Engineering Company, of Norfolk-street, London. They are capable of dealing with at least 1,000 000 gallons in twenty-four hours. The water pumped from the river enters an elevated tank in the filter-house and discharges through V notches, which accurately gauge the quantity passing. Arrangements are made for adding a coagulant, and this is most regular when controlled automatically. A float on the surface of the water controls the position of two tapered valves giving annular orifices for the supply of the reagents in precise ratio to the quantity of water delivered. The head of the reagents above the valve seatings is maintained at a constant level by ball-cocks communicating with pressure storage tanks in the basement. The contents of these tanks are continually agitated by compressed air, which also applies the pressure necessary to lift the reagents to the controlling apparatus referred to. The solutions are prepared in concrete tanks on the filter-house floor level, the necessary agitation and mixing being secured by a small propeller driven by a compressed-air motor. The reagents are thoroughly mixed with the water in its passage along a "salmon-ladder" mixing trough, which discharges into a reaction and precipitating tank having a capacity of about three hours' pumping.

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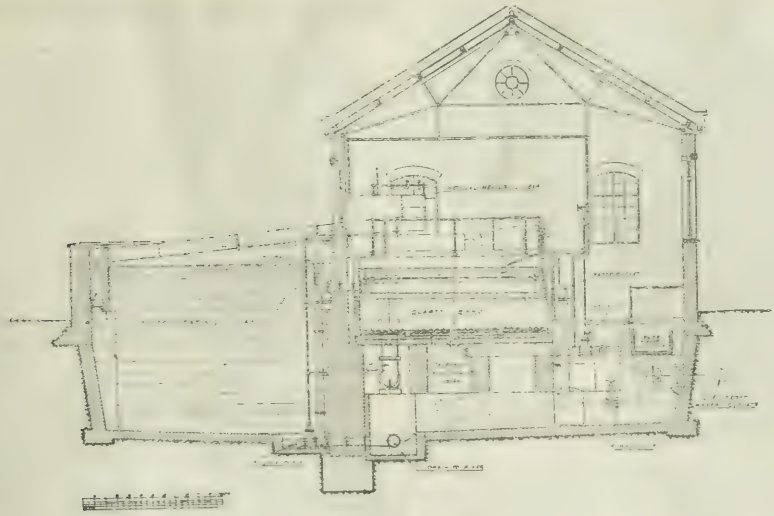
*Outlet Controller.*—The Paterson outlet controller is designed to secure two essentials of successful filtration, viz.:—

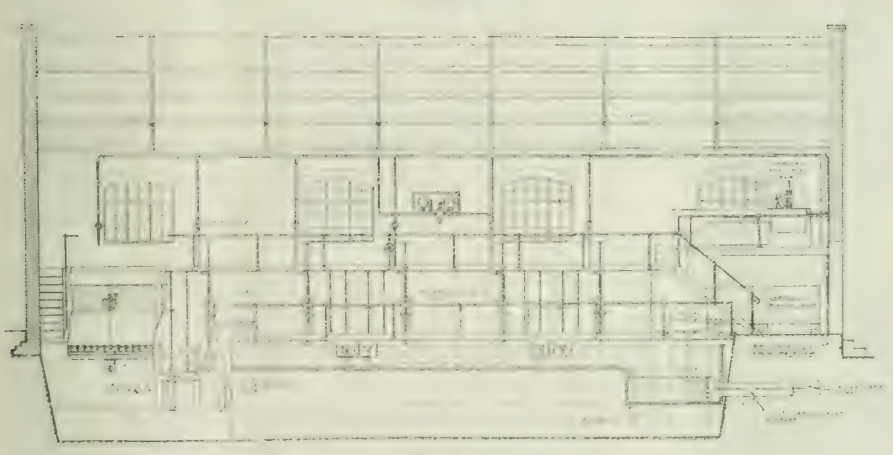
(1) That the filtration process should start gradually after the cleansing of the filter-bed.

(2) That under no circumstances should the rate of flow through the filter become excessive.

The outlet controller is in the form of an equilibrium valve under double control. Thus, when the cleansing process is complete and the water above the filter-bed is lowered to the level of the waste trough, the valve is held in its closed position by the float above the filter, but as the filtering operation recommences the valve is allowed to open gradually until the water has reached a pre-determined level above the filter-bed, when it is released from the restraint of this float, and the discharge is controlled only by the regulating float in the inspection box. The inspection box is fitted with an overflow weir in the form of a V notch, and the arrangement is such that when the water level rises to the height determined by the maximum allowable rate of discharge as measured by the weir, the regulating float partially

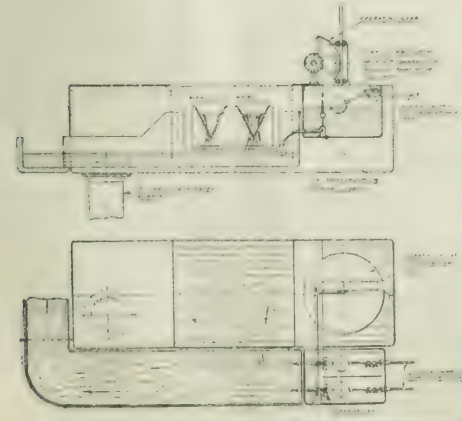


Cross Section.

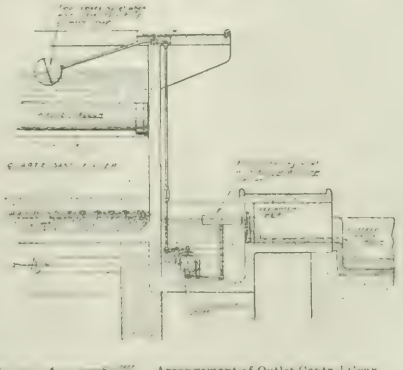


Section.

Cheltenham Waterworks. Sections of Paterson Filters.



Arrangement of Chemical Measuring Gear.



Arrangement of Outlet Control Gear.

Cheltenham Waterworks. Details of Paterson Filters.

closes the outlet valve, so that under no circumstances can this maximum desirable rate of filtration be exceeded. Each inspection box is provided with a valve, so that if desired the filtered water may be run to waste.

*Filter-Cleansing.*—The filter is cleansed by first thoroughly agitating the sand-bed for a minute or so with sterilised compressed air at a pressure of about 5 lb. per square inch, and then by a reverse current of cleansing water flushing the loosened impurities into the central waste-gutter and thence into the drain. In this way each filter is thoroughly cleansed and started to work in a few minutes, although the controller may not allow the filter to come into full operation until ten or fifteen minutes later.

The necessary compressed air is obtained from a direct-acting steam-driven air compressor placed in the boiler-house. The air is filtered and sterilised before passing into the air storage reservoir. The compressor is fitted with an automatic governor, which regulates the speed of the pump in accordance with the demand made for the compressed air, maintaining an uniform pressure of 50 lb. per square inch, the supply to each filter being drawn off through a reducing valve at 5 lb. per square inch. All the valves and fittings are so arranged that the entire filtering and washing operations are controlled from the front gallery.

*Sand Filters.*—After leaving the pre-filters the water will be passed through ordinary sand filters, of which there are six, having a combined area of 2,816 sq. yds. An additional filter is in course of construction, and when this is complete the total area will be 3,566 sq. yds. When the whole of the filters are working, the speed of filtration in dealing with 1,000,000 gallons in twenty-four hours will be at the rate of 2½ in. per hour. When one of the largest filters is undergoing cleaning, the rate of filtration will be increased to 3·2 in. per hour. It is anticipated that the slow sand filters will work for a long period without cleaning, as the pre-filters are expected to remove all visible suspended matter. It is also hoped that by the use of a coagulant the objectionable brown colour of the water will be greatly reduced. As to the final purification of the water, there is no doubt that it will be all that could be desired.

*Pumping Plant.*—The pumping plant consists of two sets of Worthington triple-expansion steam pumps, one set being capable of delivering 50,000 gallons per hour and the other 33,000 gallons per hour. A beam-engine pump delivering 24,000 gallons per hour is used for supplying Tewkesbury when the Worthington engines are not in use for pumping to Cheltenham. The boilers work at a pressure of 150 lb. to the square inch and the steam is superheated to about 120 deg. Fahr. The pressure on the pumping main, when delivering water to Cheltenham, varies from 150 lb. to 200 lb. per square inch, according to the quantity pumped. The high pressure of water is found very useful in connection with the sand washing, this being carried out in an economical manner by a Pettit, Garside & Webster's washer.

**Notice of Removal.**—Messrs. B. J. Hall & Co., Limited, the well-known firm of drawing office stationers, have removed from 39 Victoria-street to Chalfont House, Great Peter-street, Westminster. Their telegraphic address and telephone numbers will remain as before.

**Shoreditch Employees' Sickness Scheme.**—A scheme has been prepared by the town clerk of Shoreditch, by which the municipal employees would be better off in sickness by 4s. or 5s. a week than under the Insurance Act, and would not be called upon to contribute compulsorily. A ballot shows that all the official staff and 151 workmen have voted for the adoption of the scheme, and nine workmen voted against it.

**Cart-Horse Parade.**—The entry of 696 for the London Cart-Horse Society's parade at Regent's Park on Whit Monday was above the average, and of that total 113 were made by borough and urban councils, inclusive of Bethnal Green, Camberwell, Chiswick, Finchley, Fulham, Hampstead, Hornsey, Paddington, St. Pancras, Stepney, Westminster, Wimbledon, and City of London. The general condition of the horses was highly creditable to those who had the care of them, and it is certain that the society is doing good work in encouraging the use of powerful cart-horses suitable for heavy work in the streets of London. Among the best of the single were horses from the borough of Lambeth.

## TRAMWAYS AND TRAFFIC CONGESTION IN LONDON.

### ROADS IMPROVEMENT ASSOCIATION'S MEMORIAL.

The Board of Trade have forwarded to the Roads Improvement Association the observations of the Highways Committee of the London County Council upon the association's recent memorial to the board concerning the congestion to general commercial traffic caused by the alleged unsatisfactory regulation of the London County Council tramway service. After careful consideration of these observations the council of the Roads Improvement Association have communicated with the Board of Trade, submitting that the observations do not meet or answer the allegations contained in the memorial of the association, and that it is desirable that the Board of Trade should, in the public interest, appoint an inquiry to be held at the offices of the Board of Trade into the allegations and observations, or that a meeting between representatives of the parties at the Board of Trade should take place.

## SCRAPING OF WATER MAINS.

### THE "ERIC" MACHINE AT RHYL.

Under instructions from Mr. Leonard G. Hall, Assoc.M.Inst.C.E., waterworks engineer, the "Eric" (Patent) Water Main Scraper Company, Limited, Chepstow (Mon.), have recently completed the cleaning of an old 7-in. water main for the Rhyl Corporation. The total length taken in hand was 6,900 yds., divided into five sections by hatchboxes fixed at the most suitable points for flushing.

The main is very old, having been laid in 1846 by the former water company. It is built of horizontally cast pipes, which, as is well known, are often very thin on one side. The pressure amounted in places to 125 lb. on the square inch, and it was expected by the management that many thin pipes would be broken by the operations. The "Eric" Company, however, undertook that if bursts were occasioned by their machine, they would make good the repairs, and it says much for the proficiency of the "Eric" machine that, with the main in the condition stated—old and thin—not a single burst occurred.

This gratifying result is secured by a special device fitted in the patented head of the machine by which shocks are absorbed. It is also assisted by the manner in which the "Eric" Company manipulate the main valves and retard the pace at which the machine is allowed to travel. The average pace was no more than 1·33 ft. per second. The "Eric" Company claims by this that not only is the prevention of bursts assisted, but that more thorough work is done.

Except in the cases of two lengths, the machine was run through twice, and in three instances three times. In the lengths where the machine was used three times the deposit was excessive and very hard. The cleaning was, therefore, begun by a pilot, followed by an adjustable machine and the finishing machine. The middle length was undertaken last. The main here passes under a railway embankment, and finally over an old bridge, and in view of the many turns and twists taken by the pipe line, Mr. Hall hesitated about having this length cleaned. The very satisfactory running of the machine, especially in one length where a double S bend had been negotiated without a falter, decided Mr. Hall, and orders were given to do this length as well as another which had previously been attempted with another tool. The amount of corrosion in the main taken from lengths cut out in fixing the hatchboxes and weighed when dry was 11 lb. per yard, or 8 tons 12 cwt. per mile.

The deposit is removed by the machine pounding it to a gravel condition, and is driven out of the pipe in a thick red or black stream by the water. It is impossible to collect this, but the rust-coloured deposits on the banks and beds of the brooks, river and ditches into which the washings were carried bore eloquent testimony to the amount of stuff removed. Up to the moment of writing the results of the testing of the delivery of the main before and after cleaning had not been received, but we hope to have another opportunity of giving these.

**Sewage Disposal in Scotland.**—A new scheme of sewage has been completed at Carnoustie by Messrs. Crouch, Hogg & Easton, engineers, Glasgow, and the works, which have cost £5,500, were inaugurated on Saturday.

## STAFFORDSHIRE ROADS.*

By JAMES MONCUR, ASSOC.M.INST.C.E.,
County Surveyor.

In Staffordshire, notwithstanding the long continued drought of last year, comparatively little disintegration of the surface, taking the roads as a whole, took place, and I cannot help thinking that this was largely due to at least three causes: (*a*) The soundness of the foundations, (*b*) the extended use of the best material for the upper or surface crust consolidated by steam rollers, and (*c*) the changed nature of the traffic from horse to mechanically propelled vehicles. Nothing, I think, need be said to demonstrate the fact, which is patent to everyone, of the increased wear when the surface is continually wet, but with regard to frost there may be difference of opinion. I am, however, convinced that more damage results from frost than from any other atmospheric conditions, and more particularly on roads built on a clay subsoil. The injury, of course, can, to a certain extent, be counteracted or minimised by subsoil drainage, but the most effectual protection is a covering of snow, which prevents the frost penetrating to any considerable depth. Frost not only heaves and lifts the whole body of the road, but, when settlement takes place after the thaw, the whole is not only shaken, but the contour of the road is often completely spoiled. Frost also detrimentally affects the surface metal, and particularly that of an absorbent nature. Even some of our toughest and most durable stone, under ordinary conditions of wear, pulverises and breaks up into small pieces under the action of frost.

There is a feeling in some localities that snow ploughs should have been used to clear the roads, but it is obvious that such could only be used where the fall was uniform and not more than 9 in. to 12 in. deep. The greatest inconvenience was experienced where the drifts were from 4 ft. to 5 ft., and even more in depth, and in such cases a snow plough would have been useless. For the reason given as to snow being a serviceable covering to prevent the penetration of frost, it will be seen that snow ploughing, apart from the cost, is not altogether an unmixed blessing. I have seen a road which had been cleared by a snow plough rendered positively dangerous owing to frost immediately following. A snow plough that can be drawn comfortably by horses cannot be made to clear much more than 7 ft. to 9 ft. in width, which is not sufficient to enable two ordinary vehicles to pass, and, as the ridges thrown up by the plough become frozen, it practically renders the road only safe for one vehicle.

### MOTOR TRAFFIC

Ruts or grooves were quite unknown in Staffordshire until the advent of mechanically propelled vehicles, but it has now become a very serious question as to how to get rid of the trouble. If motor drivers had the good of the roads as much at heart as the road surveyor, and had some little regard for their cars, the trouble would not arise. On fairly heavily trafficked roads there is little to complain of. This is not, however, due to the strength of the roads, but to their width and the fact that the passing of ordinary traffic compels the drivers of motors to shift and quarter the road. There is a movement on foot to compel by legislation all traffic to keep to its proper side. This, in my judgment, from a road maintenance point of view, is to be a very serious matter. Instead of having two grooves along the centre there will be four, a pair on each side of the road, and the result will be that the same nuisance and difficulty as is experienced where tramways exist will be perpetuated on practically all roads.

The more I study the result of traffic on roads the more I am convinced that everything possible should be done to induce the traffic to spread and utilise the full width of the roads, and our aim should be to keep the cross-section as flat as possible, always, of course, provided there is sufficient fall from the centre to the sides to carry off the surface-water, and push forward as fast as possible the widening of existing narrow carriageways.

### TAR-SPRAYING.

The year was exceptionally favourable for carrying out this work, and putting it to a practical test as far as laying dust was concerned, and it was generally admitted that it was most effectual in this respect. With regard to the question as to whether tar-spraying will increase the "life" of the road, and thereby justify the expenditure, or even part of it, from a maintenance point of view, I prefer at present to say nothing that would raise false hopes. If the surface of our roads was generally liable to disintegrate in dry weather, the coating of tar might be of considerable advantage, but during the exceptionally dry weather of the past summer the surfaces adjoining the tarred parts kept as sound as the latter.

The actual cost of scavenging during the summer months did not decrease, as it was found necessary from a sanitary point of view to attend oftener to the cleansing of the tarred surface, notwithstanding the fact that there was less bulk of refuse to be removed. The mud formed, particularly on the heavily trafficked roads, was somewhat difficult to deal with owing to its sticky nature, and, after frost, great care had to be exercised in its removal, as there was considerable danger of doing incalculable damage to the surface. During the frosts, and especially the hoar frosts, the surface got somewhat slippery, but I had no complaints.

Where ponds or brooks were likely to be polluted a margin of about 15 in. in width was left untarred by the sides of the channels, which proved very effective.

### BITUMINOUS BINDING.

The Road Board having agreed to contribute 50 per cent of the cost of binding the macadam with Tarvia over and above that which it would have cost if dealt with in the ordinary way with water binding, eighteen different lengths of road were selected throughout the county, on which this bituminous binding was used. The roads selected were not only subjected to varying kinds and volumes of traffic, but the subsoils in many cases also varied. In each case, however, the metal was applied on a good and sound foundation. There was little or no variation in the gradients, but some of the parts were less exposed than others, and therefore a good and fair test will be obtained under different conditions.

The quantity of metal dealt with in this way was 2,221 tons, at a total extra cost of £496. This is equal to an average of 4s. 6d. per ton, and 5¾d. per square yard covered. The cost of the material slightly varied at different stations, according to the distance it had to be carried, but the cost of applying it varied but little. The cost per mile for an 18-ft. and 21-ft. road is £253 and £295 respectively, and to deal with the whole of the foreign metal in this way would mean £9,200 per annum, or an increase of £15 4s. 1d. per mile on the 605 miles.

The year just closed was very favourable for treating the metal in this way, as the work can only be carried out when the metal is perfectly dry. It is therefore obvious that only a comparatively small quantity of metal can be dealt with unless the rolling plant and staff were much increased to enable the work to be carried out during the dry weather. It is too early yet to state whether the extra cost will be justified by the increased "life" of the metal, but up to the present the treated parts have remained much cleaner than other parts of the road. Not only so, but the frost did not evidently adversely affect them. They were also comparatively dustless, but it still remains to be seen how many years the surface will remain so.

### TARRED PATCHING MATERIAL.

This material was obtained from several quarries so as effectually to test its setting qualities, and was used more or less in all districts, but, of course, principally on roads largely used by motors. In every case the depressions were scarified, the loose material removed, and the tarred patch metal applied and rammed with a rammer. The best results were obtained where it was possible to apply the material immediately it arrived. If allowed to lie on the roadside for a time the material sets hard and cannot then be used. Even the freshly delivered material required a good deal of attention from time to time to prevent it being scattered about. Taking labour and everything into consideration, and the result as a whole, I do not think such material is worth the extra cost. I purpose, however, during the ensuing year to use ordinary patch metal and bind it with Tarvia. This, of course, will necessitate the tar boilers being moved from place to place as occasion requires, but should the experiment prove successful it may amply justify all the trouble and cost.

* Extracts from Annual Report.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President*—Mr. Albert D. Greatorex, M.Inst.C.E., Borough Engineer and Surveyor of West Bromwich.

### COUNCIL MEETING.

At a meeting of the council held at the offices of the institution on Saturday, June 1st, there were present Messrs. A. D. Greatorex (president, in the chair), Hayward, Blair, Carter, Brownridge, Cockrill, Elford, Maybury, Thomas, Hooley, Scorgie, Barber, Stilgoe, Newton, Lancashire, Thomas, Cole (secretary) and H. A. Giles (assistant secretary).

Elected as Members: Messrs. G. Calvert, county road surveyor, Maud; R. S. W. Perkins, county surveyor, Southern Division, Isle of Ely; J. R. Mead, deputy borough surveyor, St. Helens; F. Heather, surveyor, South Stoneham Rural District Council; and C. Triffit, deputy city surveyor, York.

Elected as Associate Members: Messrs. C. D. Bright, assistant surveyor, Saffron Walden; H. J. Osborne, assistant surveyor, Bushey Urban District Council; G. A. Ballard, engineering assistant, York; and O. H. Cockrill, engineering assistant, Great Yarmouth.

Transfers, Associate Members to Members: Messrs. W. Forbes, first engineering assistant, Edinburgh, and S. Whitehead, water engineer, Nelson, Lancs.

Elected as Students: Messrs. J. S. Shaw, borough surveyor's office, Wrexham; W. A. Cutting, borough surveyor's office, Cambridge; and H. S. Graves, council offices, Willesborough.

On the recommendation of the acting examiners for the South African examination, Mr. J. O. Parry (Pietermaritzburg) was granted the testamur of the institution.

The council referred the consideration of a mutual defence fund to a special committee for report.

An invitation for a meeting at Wrexham was referred to the incoming president.

An application for the holding of examinations in Hong Kong was referred to the Board of Examiners.

On the recommendation of the Roads Committee Messrs. Maybury, Hooley and Thomas were delegated to represent the Institution at the conference to be called by the County Councils Association in reference to Roads, Traction Engines, Heavy Motors, &c.

### FORTHCOMING MEETINGS.

The following meetings have been arranged:—

June 15th.—East Ham.
June 22nd.—Lowestoft.
June 29th.—Bridlington.
July 6th.—Stourbridge.
July 11th—13th.—Annual meeting, London.

Thomas Cole,
11 Victoria-street, S.W. *Secretary.*

## INSTITUTION OF MUNICIPAL ENGINEERS.

*President*—Mr. E. A. Stickland, Assoc.M.Inst.C.E., Borough Surveyor, Windsor.

A meeting will be held on Wednesday, June 12th, at the London Aerodrome, Hendon, N.W. (by the courtesy of Mr. C. Grahame-White and the directors of the Grahame-White Aviation Company, Limited), at 2.45 p.m., when the following papers will be presented for discussion:—

"The Structures of the Future in Relation to Aviation,"

By Horace Cubitt, A.R.I.B.A., P.A.S.I. (Member).

"Some Suggestions for By-Laws and Regulations in Relation to Aviation."

By B. Wyand, secretary of the institution.

The discussion will be open, and many prominent engineers (other than members of the institution) and aviators have signified their intention of taking part in it.

Programme.

1.45 p.m.—Meet at Charing Cross, on the steps of St. Martin's Church (see Note below).
2 p.m.—Motor vehicles leave Charing Cross.
2.45 p.m.—Arrive at London Aerodrome.
3 p.m.—Meeting for the discussion of the above papers, which will be taken as read.
4.15 p.m.—Tour of inspection of the hangars, workshops, and other buildings, when an opportunity will be afforded of examining many of the most modern types of aeroplanes. It is hoped that Mr. Claude Grahame-White will be able personally to conduct members round the aerodrome.
5 p.m.—Adjourn to the grounds, where exhibition flights will be given (weather permitting).
6.30 p.m.—Motor vehicles leave for Charing Cross. Passengers may alight at points *en route*.

Arrangements have been made for private motor vehicles to convey members and their friends from Charing Cross to the Aerodrome and back, at an inclusive charge of 1s. 6d. per head. This amount must, in every case, be sent to the secretary when applying for ticket of admission, which should be done immediately.

Note.—Members are requested to note that admission tickets may be obtained independently of tickets of conveyance, as many might find it more convenient to go direct to the grounds than *viâ* Charing Cross. These would then meet the party at the Aerodrome at 2.45, as set forth above.

Admission to the Aerodrome will be by ticket only, and tickets, price 1s. each, may be obtained from the secretary of the institution. Tickets and copies of papers to be presented will be forwarded as soon as the latter are in print.

Ladies are invited to attend.

### COUNCIL MEETING.

The next meeting will be held on Saturday, June 22nd, at 3 o'clock.

B. Wyand,
39 Victoria-street, S.W. *Secretary.*

## ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

### VISIT TO WAKEFIELD SEWAGE DISPOSAL WORKS.

By kind permission of the corporation and the city surveyor (Mr. J. P. Wakeford, Assoc.M.Inst.C.E.), a visit will be paid to Wakefield on Saturday, June 15th.

Programme.

2.30 p.m.—Assemble at the town hall.
2.45 p.m.—Proceed to the sewage works, over which the visitors will be conducted by the city surveyor, Mr. J. P. Wakeford, assisted by the manager, Mr. A. Rookby Ward. Mr. Wakeford has promised to prepare a brief description of the method of treatment, &c., and the alterations involved in the remodelling of the works, copies of which will be supplied to visitors.
5 p.m.—Tea will be provided by kind permission of the chairman and members of the Works Committee.

Members intending to be present must notify the district secretary on or before Wednesday, June 12th, so as to complete arrangements.

### JOINT MEETING AT SOUTHALL-NORWOOD AND HANWELL.

By kind permission of the Southall-Norwood and Hanwell Urban District Councils the members will have the privilege of visiting and inspecting the local sewage disposal works on June 22nd. Mr. S. W. Barnes, Assoc.M.Inst.C.E., will give a description of the Hanwell works, and Mr. Reginald Brown, Assoc.M.Inst.C.E., F.S.I., &c., will give a description of the Southall-Norwood works.

Programme.

2.30 p.m.—Meet at Boston-road entrance to sewage works, Hanwell, where the party will be met by Mr. Barnes and Mr. Brown, and proceed to visit works. After inspection of the works the party will adjourn to the town hall, Southall, where tea and light refreshments will be provided, and a paper will be given by Mr. Reginald Brown, Assoc.M.Inst.C.E., F.S.I., &c., engineer to the Southall-Norwood Urban District Council, on "Fixed Sprays *versus* Revolving and Travelling Sprinklers."

Members intending to be present must notify the hon. district secretary on or before Wednesday, June 19th.

## ROYAL SANITARY INSTITUTE.

### ANNUAL CONGRESS AND EXHIBITION AT YORK.

The annual congress of the Royal Sanitary Institute, which is to take place this year at York, will open on July 29th. The proceedings will commence with a reception of the members and delegates in the Mansion House by the Lord Mayor, a public luncheon following, and in the evening the inaugural address to the congress will be delivered by the Archbishop of York.

On Tuesday, July 30th, a conference of municipal representatives and of engineers and surveyors will be held in the Exhibition Buildings, and on Friday, August 2nd, and the following day, the Engineering and Architecture Section will meet in the Museum. Mr. A. D. Greatorex, M.INST.C.E., borough engineer and surveyor of West Bromwich, will preside at the conference of engineers and surveyors, and the section devoted to engineering and architecture will have as its chairman Mr. J. Walker Smith, M.INST.C.E., chief engineering inspector to the Local Government Board for Scotland.

At the conference of engineers and surveyors discussions will take place on, among others, the subjects of Housing and Town Planning Progress, to be opened by H. Gilbert Whyatt, ASSOC.M.INST.C.E., borough engineer and surveyor, Grimsby, and Sewage Disposal in Rural Districts, to be opened by Ascough Rodwell, surveyor to the Skipton Rural District Council. The question of the modification of the Model Building By-laws from the rural point of view will be considered in the Engineering and Architecture Section.

The opening of the Health Exhibition arranged in connection with the congress has been fixed for Saturday, July 27th.

## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

WATERWORKS ENGINEER.—June 8th.—Dee Urban District Council.—Mr. Alfred Cooper, surveyor.

CHIEF ROAD SURVEYOR.—June 10th.—Corporation of Birmingham. £400 per annum.—Mr. Henry E. Stilgoe, city engineer and surveyor.

GENERAL FOREMAN.—June 10th.—Hitchin Urban District Council, 35s. per week.—Mr. W. O. Times, Clerk's Office.

ROAD FOREMAN.—June 10th.—South Mimms Rural District Council. 25s. per week.—Chairman of the Council, 12 High-street, Barnet.

JUNIOR DRAUGHTSMAN.—June 11th.—Corporation of Burnley. 25s. per week.—Mr. P. Thomas, town clerk.

QUANTITY SURVEYOR.—June 11th.—Corporation of Burnley. £200 per annum.—Mr. P. Thomas, town clerk.

BUILDING AND DRAINAGE INSPECTOR.—June 12th.—Borough of Nuneaton. £90—£110.—Mr. F. C. Cook, borough surveyor.

DISTRICT SURVEYOR.—June 12th.—East Suffolk County Council. £170—£200 a year.—Mr. A. Townshend Cobbold, clerk.

FOREMAN PAVIOR.—June 12th.—Corporation of Bedford.—Mr. N. Greenshields, borough engineer and surveyor.

SANITARY INSPECTOR.—June 13th.—Chelsea Borough Council. £120—£150 per annum.—Mr. T. Holland, town clerk.

ASSISTANT SANITARY INSPECTOR.—June 14th.—Heston and Isleworth Urban District Council. £120—£150.—Mr. H. J. Baker, clerk.

ASSISTANT WATER ENGINEER.—June 15th.—Corporation of Merthyr Tydfil. £110—£150 per annum. Mr. T. Aneuryn Rees, town clerk.

WORKING FOREMAN.—June 17th.—Worcestershire County Council. 35s. per week.—Mr. C. F. Gettings, county road surveyor.

INSPECTOR OF NUISANCES.—June 17th.—Berwick Urban Sanitary Authority. £115 per annum.—Mr. W. Weatherhead, clerk.

ARCHITECTURAL ASSISTANT.—June 24th.—West Riding County Council. £120 per annum.—Mr. J. Stuart, education architect, County Hall, Wakefield.

## MUNICIPAL COMPETITIONS OPEN.

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LLANELLY.—June 18th.—Designs for school buildings, comprising boys', girls' and infants' departments, for the urban district council. Premium 50 guineas.—Mr. I. W. Watkins, clerk, Education Office, Coleshill-terrace, Llanelly.

HALE.—June 28th.—Designs for a town planning scheme for the urban district council. Premiums of £50 and £25 are offered.—The Clerk.

REIGATE.—June 29th.—Plans and schemes for laying out and developing part of the Reigate Lodge estate, belonging to the town council. Premiums of 30 and 10 guineas.—Mr. Alfred Smith, town clerk.

PADIHAM.—June 30th.—Designs for town hall and baths. Premiums £40 and £20.—Mr. J. Gregson, surveyor.

DUSSELDORF.—July 1st.—Plan for the extension of the city. Premiums of £1,000 and £375 are offered.—The Chief Burgomaster.

CARDIFF.—August 6th.—Designs and estimates for fire station.—The Town Clerk.

WANDSWORTH.—Plans for a public bath at Balham, at a cost not exceeding £10,000. The Town Clerk.

## MUNICIPAL CONTRACTS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

### Buildings.

ALTRINCHAM.—June 8th.—For the erection of thirty-two cottages, for the urban district council.—Mr. W. S. Stokoe, clerk.

WORCESTERSHIRE.—June 8th—12th.—For the erection of a council school, for the Education Committee.—Mr. A. W. Priestley, director of education, 37 Foregate-street, Worcester.

SELBY.—June 8th.—For the erection of fifteen cottages, for the urban district council.—Mr. B. Gray, Council Chamber.

DERBYSHIRE.—June 10th.—For the erection of a secondary school at New Mills, for the county council.—Mr. G. H. Widdows, architect, County Education Offices, St. Mary's-gate, Derby.

MERTHYR.—June 10th.—For the erection of forty-eight workmen's dwellings, for the corporation.—Mr. T. A. Rees, town clerk.

ALTRINCHAM.—June 10th.—For the erection of shelter and conveniences, for the urban district council.—Mr. W. S. Stokoe, clerk.

STRETFORD.—June 10th.—For alterations and additions to town hall and erecting new baths, for the urban district council.—Mr. Geo. H. Abrahams, clerk.

EVESHAM.—June 10th.—For the erection of ninety cottages, for the rural district council.—Mr. E. H. Wadams, clerk.

TOTTENHAM.—June 10th.—For repairs to a school, for the Education Committee.—Mr. W. Mallinson, clerk, Education Offices, Philip-lane, Tottenham.

HANWELL.—June 10th.—For the construction of a refuse destructor, for the urban district council.—Mr. Percy Scott, clerk.

BRIGHTON.—June 10th.—For laying a new floor in the Royal Pavilion, for the corporation.—The Borough Surveyor.

WEST HAM.—June 10th—17th.—For cleansing and repairing schools, for the Education Committee.—Mr. W. Jacques, architect to the committee, 2 Fencourt, Fenchurch-street, E.C.

MALDENS AND COOMBE.—June 10th.—For the building of an office, extension of mortuary and conversion of store, for the urban district council.—Mr. J. W. Johnson, clerk.

SWINDON.—June 10th.—For the erection of two domestic centres, for the Education Committee.—Mr. W. Seaton, secretary.

GLASGOW.—June 10th.—For the erection of a substation, for the electricity department.—Mr. J. Lindsey, town clerk.

LLEYN. — June 11th. - For the construction of a bridge, for the rural district council.—Mr. Hugh Pritchard, clerk, Pwllheli.

SOUTHALL-NORWOOD.—June 11th.—For the construction of an open-air swimming bath, for the urban district council.—Mr. R. Brown, engineer, Town Hall.

BRIDGWATER.—June 11th.—For alterations at the town hall, for the corporation.—Mr. W. T. Baker, town clerk.

WARE.—June 11th.—For the erection of a brick urinal, for the urban district council.—Mr. G. H. Gisby, clerk.

BETTWS-Y-COED.—June 11th.—For laying iron pipes and fittings, and construction of three concrete dams, for the urban district council.—Mr. Salisbury Jones, clerk, Llanrwst.

ESSEX.—June 12th.—For the erection of a school at Ingrave, for the county council.—Mr. N. J. Dawson, architect, 17 Duke-street, Chelmsford.

LANCASHIRE.—June 12th.—For alterations and additions to council schools, for the Education Committee.—Mr. Harcourt E. Clare, clerk, County Offices, Preston.

SOUTHEND-ON-SEA.—June 13th.—For alterations to a council school, for the Education Committee.—Mr. J. W. Barrow, clerk, Municipal Buildings.

CHELMSFORD.—June 14th.—For repairs at the recreation ground, for the corporation.—Mr. W. Smith, town clerk.

DEWSBURY.—June 15th.—For the construction of a concrete water tank and chalk-mixing house, for the Waterworks Board.—Mr. H. Ellis, clerk, Town Hall, Dewsbury.

CHESHIRE.—June 15th.—For the erection of a school at Haslington, for the Administrative Sub-Committee.—Mr. C. E. Speakman, clerk, Education Office, Crewe.

SLEAFORD.—June 17th.—For the rebuilding of culverts, for the rural district council.—Mr. E. Clements, clerk.

SOUTHEND-ON-SEA.—June 17th.—For the construction of administrative block at the Sanatorium, for the corporation.—Mr. H. J. Worwood, town clerk.

HASTINGS. — June 17th. — For the erection of twenty-five hard-wood screens upon the sea front, for the corporation.—Mr. P. H. Palmer, borough engineer.

GODSTONE.—June 18th.—For the construction of concrete embankments, weir chamber, concrete tube overflows, steel cofferdam, and water carrier, for the rural district council.—Mr. G. E. Crowter, engineer and surveyor.

GRIMSBY.—June 18th.—For the construction of a school, for the education authority.—Mr. D. Chandler, clerk.

HALIFAX.—June 18th.—For the erection of a salt shed, for the Tramways Committee.—Mr. J. Lord, borough engineer.

BRISTOL.—June 19th.—For the erection of engineers' and workmen's mess-rooms, for the Electrical Committee.—The Engineer.

BRECON.—June 20th.—For repairs to bridge and construction of a culvert, for the rural district council.—The Clerk.

WEST RIDING.—June 21st.—For the erection of a new school at Bracewell, for the county council.—The Clerk, County Hall, Wakefield.

WILLESDEN.—June 21st.—For the construction of an engine-house, for the Metropolitan Water Board.—Accountant, Savoy-street, Strand, W.C.

FINCHLEY.—June 21st.—For the construction of an engine-house, formation of roads, and drainage works, for the Metropolitan Water Board.—The Clerk, Savoy-street, Strand, W.C.

HYDE.—June 22nd.—For the erection of public hall, police courts and offices, for the corporation.—Mr. Thos. Brownson, town clerk.

KEIGHLEY.—June 24th.—For alteration at public baths, for the corporation.—Town Clerk.

ESSEX.—June 24th.—For repairs and alterations to schools, for the Education Committee.—Mr. D. T. Williams, clerk.

WATFORD.—June 25th.—For the construction of a public convenience, for the urban district council.—Mr. W. Hudson, clerk.

## Iron and Steel.

ASHTON-UNDER-LYNE. — June 10th. — For the supply of cast-iron pipes and special castings, with bolts, nuts and washers, for the corporation.—Mr. Fred. J. Dixon, water engineer, Town Hall Chambers.

BRISTOL.—June 10th—17th.—For the supply of wrought iron and mild steel, for the corporation.—City Engineer.

STOURBRIDGE.—June 10th.—For supplying 400 yards of unclimbable iron fencing, for the urban district council.—Mr. F. Woodward, surveyor.

HOWRAH (India).—June 18th.—For the supply of steel pipes, cast-iron specials, sluice valves and air valves, for the municipality.—The Chairman, Howrah Municipality, India.

BELFAST.—June 18th.—For the supply of cast-iron pipes and special castings, for the corporation.—City Surveyor.

BECKENHAM.—June 24th.—For the supply of wrought-iron railings and gates, for the urban district council.—Mr. F. Stevens, clerk.

## Roads.

WILLINGTON.—June 8th.—For works of levelling, paving, metalling and channelling, for the urban district council.—Mr. J. H. Gardner, surveyor.

RAMSGATE.—June 8th.—For work of making up, for the corporation.—Mr. T. G. Taylor, borough engineer and surveyor.

ALNWICK.—June 8th.—For road widening works, for the rural district council.—Mr. H. W. Walton, clerk.

TYLDESLEY-WITH-SHAKERLEY. — June 8th.—For the supply of grit setts, Haslingden and concrete flags, and kerbstones, for the urban district council.—Mr. W. J. Matthews, clerk.

WAKEFIELD.—June 10th.—For the execution of private street works, for the corporation.—Mr. J. P. Wakeford, city surveyor.

ALTOFTS.—June 10th.—For the execution of private street works, for the urban district council.—Mr. A. E. Graves, clerk, 26 Wood-street, Wakefield.

FAREHAM.—June 10th.—For the supply of granite, basalt, or other road stone, for the rural council.—Mr. J. F. Whitear, surveyor.

STANLEY.—June 10th.—For making up roadways, for the urban district council.—Mr. A. Routledge, surveyor.

ISLINGTON.—June 10th.—For the extension of road at cemetery, for the borough council.—Mr. W. F. Dewey, town clerk.

CAMBERWELL.—June 10th.—For works of kerbing, channelling and foundations for asphalt paving and road work, for the borough council.—Mr. C. William Tagg, town clerk.

HANWELL.—June 10th.—For laying 1,800 yds. of tar-paving, for the urban district council.—Mr. Percy Scott, clerk.

TOTTENHAM.—June 11th.—For repairs to tar and asphalt paving and making up, for the urban district council.—Mr. W. H. Prescott, engineer.

COLCHESTER.—June 11th.—For sewering, metalling, kerbing, channelling, paving and making good, for the corporation.—Mr. H. Goodyear, borough engineer and surveyor.

DUNDALK.—June 11th.—For laying out streets and forming roadways, for the urban district council.—Mr. M. Comerford, town clerk.

WANDSWORTH.—June 11th.—For laying wood paving and other works, for the borough council.—Mr. P. Dodd, borough engineer.

LANCHESTER.—June 12th.—For setting kerb and channelling, for the rural district council.—Mr. W. H. Ritson, clerk.

RYTON.—June 12th.—For the construction of street works, for the urban district council.—Mr. Henry Dalton, clerk.

ENFIELD.—June 12th.—For providing and laying granite kerbing, granite channelling, artificial stone paving and granite crossings, for the urban district council.—Mr. T. W. Scott, clerk.

WHICKHAM.—June 13th. For making-up work and tar macadamising, for the urban district council. —Mr. J. B. Renton, surveyor.

CHILDWALL.—June 13th.—For the supply of macadam and limestone chippings, for the urban district council.—The Clerk, 22 Lord-street, Liverpool.

LEIGH.—June 15th.—For the supply of granite setts, for the corporation.—Mr. W. H. Cowburn, town clerk.

WEST SUSSEX.—June 15th.—For the hire of steam rollers, for the county council.—Mr. H. W. Bowen, county surveyor, North-street, Horsham.

EARBY.—June 15th.—For works of kerbing, channelling, flagging and paving, for the urban district council.—Mr. J. E. Aldersley, surveyor.

ALTON.—June 15th.—For the supply of road materials, for the urban district council.—Mr. J. B. Trimmer, clerk.

HAM.—June 17th.—For the supply of granite, granite chippings, flints, haulage and steam rolling, for the urban district council.—Mr. R. W. Hindhaugh, surveyor.

SKIPTON.—June 17th.—For works of making up, for the urban district council.—Mr. A. E. W. Aldridge, engineer and surveyor.

EPSOM.—June 17th.—For making up a road, for the rural district council.—Mr. T. R. Ware, surveyor of highways, Waterloo-road, Epsom.

BRISTOL.—June 17th.—For relaying and retarring tar paving in certain school grounds, for the Education Committee.—Mr. W. A. Adam, secretary.

EAST SUSSEX.—June 17th.—For the hire of steam rollers and scarifiers, for the county council.—Mr. Fred. J. Wood, county surveyor.

DOVER.—June 17th.—For the supply of Guernsey or Welsh granite and granite chippings, for the corporation.—Town Clerk.

WEMBLEY.—June 18th.—For private and public street improvement works, for the urban district council.—Mr. F. W. Rodd, clerk.

SOYLAND.—June 18th.—For the supply of broken and tarviated granite for the urban district council.—Mr. W. Whitehead, surveyor.

BEXLEY.—June 19th.—For the execution of tar paving, for the urban district council.—Mr. T. G. Baynes, clerk.

HORNSEY.—June 19th.—For making good certain roads, for the corporation.—Town Clerk.

READING.—June 20th.—For work of making up, for the corporation.—Mr. J. Bowen, borough engineer and surveyor.

LEWES.—June 22nd.—For scarifying and steam rolling, for the corporation.—Mr. Montague S. Blaker, town clerk.

NORTH WALSHAM.—June 22nd.—For the supply of broken granite, granite chippings and granite setts, for the urban district council.—Mr. E. J. Simpson, surveyor.

WEST SUFFOLK.—June 24th.—For the supply of broken material for the main roads, for the county council.—Mr. W. Lionel Jenkins, county surveyor.

ROMFORD.—June 24th.—For the supply of Norwegian kerb, for the rural district council.—Mr. T. W. A. Greenhalgh, clerk.

## Sanitary.

CHESHAM.—June 8th.—For construction of outfall works and laying out additional land for sewage disposal purposes, for the urban district council.—Mr. Percy C. Dormer, engineer.

LANCHESTER.—June 10th.—For work of scavenging, for the rural district council.—Mr. J. R. Lupton.

BLAYDON-ON-TYNE.—June 11th.—For scavenging work, for the urban district council.—Mr. H. Dalton, clerk.

GOSFORTH.—June 11th.—For constructing rainwater sewer, for the urban district council.—Mr. G. Nelson, engineer and surveyor.

SOUTHALL-NORWOOD.—June 11th.—For extensions to the sludge-press house, for the urban district council.—The Clerk.

WREXHAM.—June 12th.—For the removal of house refuse, for the rural district council.—Mr. R. C. Roberts, clerk.

ISLE OF WIGHT.—June 12th.—For laying 9-in. flanged pipes, for the construction of sewer outfall, for the rural district council.—Mr. H. Eldridge Stratton, clerk.

LYMINGTON.—June 13th.—For the construction of a sewer, for the rural district council.—Mr. A. E. Hayter, surveyor, New Milton, Hants.

TOWCESTER.—June 15th.—For constructing sewers and sewage disposal works, for the rural district council.—Mr. W. K. Higham, clerk.

WATFORD.—June 25th.—For the supply of sanitary fittings to a public convenience, for the urban district council.—Mr. D. Waterhouse, engineer.

NEWPORT PAGNELL.—June 25th.—For laying cast-iron and stoneware sewers, and the construction of sewage disposal works, for the rural district council. —Mr. Charles W. Powell, clerk.

BLEAN.—July 2nd.—For the construction of about 12,689 yds. of stoneware and cast-iron pipe sewers, cast-iron rising and air mains, manholes and ejector chambers, for the rural district council.—Mr. J. E. Burch, clerk.

DENTON.—July 6th.—For the erection of a gas engine, suction-gas plant, air compressor, ejectors, lime and sludge mixers, sludge presses, pipes and valves, for the urban district council.—Mr. W. Richards, clerk.

## Stores.

ASHTON-IN-MAKERFIELD.—June 8th.—For the supply of sanitary pipes, lime, slag, macadam, spades and general stores, for the urban district council.—Mr. A. Sykes, clerk.

BLACKPOOL.—June 10th.—For the supply of 1,000 tons of Portland cement in accordance with the British Standard Specification, for the corporation.—Mr. John S. Brodie, borough surveyor.

## Miscellaneous.

SALFORD.—June 10th.—For work of electric wiring, for the corporation.—Town Clerk.

NORTHFLEET.—June 11th.—For the supply of Guernsey granite and other stone, Thames ballast, coal, gas tar, castings, steam rolling and scarifying, and horsing sewage vans, for the urban district council.—Mr. Chas. E. Hatten, district clerk.

ATHERTON.—June 12th.—For the supply of coal and the purchase of tar produced by the council.—Mr. W. Garnett, clerk.

MANCHESTER.—June 15th.—For the supply of materials, for the Gas Committee.—Mr. Thomas Hudson, town clerk.

OLDHAM.—June 18th.—For the purchase of tar and ammoniacal liquor produced at the corporation works. —Mr. J. H. Hallsworth, town clerk.

# TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BONNYBRIGG.—For the construction of sewers, sewage tanks and filters, for the corporation :—

| | |
|---|---|
| A. F. Reid & Turner, Glasgow | £8,340 |
| Dunlop & Co., Lanark | 7,184 |
| R. Wallace, Edinburgh | 6,602 |
| Henderson & Duncan, Edinburgh | 6,256 |
| Jackson & Anderson, Edinburgh | 6,238 |
| G. Mackay & Son, Edinburgh | 6,077 |
| R. C. Briebner & Co., Edinburgh | 6,065 |
| J. Kinniburgh, Glasgow | 5,845 |
| W. G. Flett, Lenzie | 5,769 |
| Crawford Brothers, Largs | 5,710 |
| Casey & Darragh, Larbert | 5,705 |
| J. Monteith, Dalkeith | 5,419 |
| J. & J. Street, Cowdenbeath | 5,385 |

BRIDGWATER.—For supplying and laying pipes in connection with the extension of the water supply scheme, for the rural district council :—

W. E. E. Evans, Newport, £2,011.

DUNDEE.—The town council have accepted the following tenders for the additions to the assembly room and the superintendent's house at the slaughter house :—

Mason work.—T. S. Dick, £95.
Joiner work.—J. Pollock, £150.
Plumber work.—J. Robertson & Son, £123.
Slater work.—J. Costello & Co., £13.
Plaster work.—L. Reoch, £21.
Painting work.—W. R. Macdonald, £29.

HORSHAM.—For making up Victoria-road, Albany-road, and Princess-road, Crawley, for the rural district council.—Mr. W. Dengate, surveyor :—

| | |
|---|---|
| T. Wood & Sons, Swanley | £1,260 |
| H. M. Blaker, Leatherhead | 1,176 |
| G. Bell & Sons, Tottenham | 1,129 |
| W. Pearce, Forest-hill | 1,127 |
| R. Easton, Crawley | 1,102 |
| T. Adams, Wood-green | 1,102 |
| E. Ilea, Croydon | 1,051 |
| J. May & Sons, Ashtead | 1,014 |
| A. Streeter & Co., Guildford | 992 |
| H. Farrow, Brixton * | 933 |

MACCLESFIELD.—For laying sewers and water mains, for the rural district council.—Mr. F. May, solicitor and clerk:

| | |
|---|---|
| H. & F. Law, Birmingham | £759 |
| F. Barke & Son, Stoke-on-Trent | 714 |
| W. Jowett, Prescot | 708 |
| Sanders & Torrance, Stoke-on-Trent | 628 |
| S. Hutton & Co., Northwich | 568 |
| Martin & Element, Smethwick | 555 |
| T. Kearsley & Son, Leigh, Lancs* | 526 |

MELKSHAM.—For steam rolling and scarifying, for the rural district council.—Mr. F. U. Greenhill, district surveyor:—

Edison Steam Rolling Company, Dorchester, £1 12s. 11d. per day.
Oxford Steam Plough Company, £1 15s. 6d. per day.
Barnes Brothers, Trowbridge, £1 13s. per day.
F. Gaylard, Melksham, £1 12s. 6d. per day.*

SHEPSHED.—Tenders for a new scavenging cart to hold 150 gallons were received by the urban district council as follows:—

E. Hunt, Shepshed.*—£21; galvanised, £23.
T. Baker & Son, Compton.—£21 10s.; galvanised, £3 10s. extra.
Phœnix Engineering Company, Chard.—£21 10s.
Bristol Waggon Works.—£21 15s.; galvanised, £23 12s. 6d.

Tenders for carting for the gas department were received as follows:

Tomlin Brothers.*—Coal and lime from station to works, 8½d. per ton; coke delivered in town, 9d. per ton; coke to station, 9½d. per ton; tar to station, 1s. 3d. per ton; liquor to station, 11d. per ton.
Briers Brothers.—9d., 9d., 10d., 1s., 1s. 4d., 11d.
H. Tivey.—9d., 9d., 9½d., 10d., 11d.

WIGAN.—Accepted for the supply of paving materials, for 12 months, for the corporation:—

5-inch setts.—Parbold and Horwich Quarries, Limited; Webster & Winstanley; Howitt Hill Quarry Company.
Setts and stones.—Waring Brothers, J. Marsden, J. Southworth.
Concrete flags.—Hard York Non-Slip Stone Company, Shap Granite Company, Wigan Coal and Iron Company, Limited, Premier Artificial Stone Company, Limited, W. Livesey.
Best flags.—Webster & Winstanley, Hard York Non-Slip Stone Company.
Gravel.—Wigan Coal and Iron Company, Limited, W. Livesey.
Chippings.—Wigan Coal and Iron Company, Limited, Shap Granite Company, W. Livesey.

Tenders for the supply of 500 tons of 6-inch setts were also opened, and that of J. Southworth was accepted.

## MEETINGS.

*Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.*

JUNE.

7-8.—Institution of Water Engineers: Summer Meeting at Cheltenham.
7-8.—Institution of Municipal and County Engineers: Meeting at Stirling.
8.—Association of Managers of Sewage Disposal Works: Meeting at Glasgow.
12.—Institution of Municipal Engineers: Meeting at London Aerodrome, Hendon, N.W., 2.45 p.m.
15.—Association of Managers of Sewage Disposal Works: Visit to Wakefield Sewage Works.
15.—Institution of Municipal and County Engineers: Meeting at East Ham.
22.—Association of Managers of Sewage Disposal Works: Metropolitan District Meeting, Southall-Norwood and Hanwell.
22.—Institution of Municipal and County Engineers: Meeting at Lowestoft.
24.—Royal Institute of British Architects: Presentation of Royal Gold Medal, 8.30 p.m.
29.—Institution of Municipal and County Engineers: Meeting at Bridlington.

JULY.

6.—Institution of Municipal and County Engineers: Meeting at Stourbridge.
11-13.—Institution of Municipal and County Engineers: Annual Meeting, London.
27-28.—Royal Institution of Public Health: Congress in Berlin.
29.—Royal Sanitary Institute: Congress at York opens.

## APPOINTMENTS OPEN.

### BOROUGH OF BEDFORD.

FOREMAN PAVIOR.

Wanted, in the Borough Engineer and Surveyor's Department, an experienced man as Working Foreman Paviour. Age not to exceed 40 years.

Candidates must be thoroughly well up in the execution of all classes of paving works, and must be able to work correctly to levels.

Applications (in candidates' own handwriting), stating wages required, and giving age, together with full particulars as to experience, and accompanied by three recent testimonials, to be sent to the undersigned not later than 12 noon on Wednesday, June 12, 1912.

N. GREENSHIELDS, A.M.I.C.E.,
Borough Engineer and Surveyor.

Town Hall, Bedford.
May 23, 1912.

### NORTHERN POLYTECHNIC INSTITUTE, HOLLOWAY, LONDON, N.

The Governors invite applications for the appointment of Head of the Building Department. Commencing salary £400. Particulars and application form may be obtained from the Clerk to the Governors.

### CITY OF BIRMINGHAM.

The Public Works Committee are prepared to receive applications for the appointment of Chief Road Surveyor in the City Engineer and Surveyor's Department. Candidates, whose age should not exceed 40 years, must be thoroughly qualified persons having had active practical experience in the construction, scavenging and maintenance of roads and streets, and of the various classes of pavement used therefor, and have a good knowledge of and experience in the most approved and up-to-date methods of constructing and treating macadamised roads. They must also have had the management of large bodies of workmen, and be able to supervise the setting out and measuring up of works and preparation of estimates.

It will be a condition that the person appointed shall subscribe to the Superannuation Scheme, and shall devote the whole of his time to the duties of his office.

The salary will be at the rate of £400 per annum, and a motor car will be provided by the Corporation for the work of the department.

Applications, in the candidate's own handwriting, stating age, qualifications, present and past experience, together with copies of not more than four recent testimonials, and endorsed "Appointment of Chief Road Surveyor," to be sent to the undersigned not later than Monday, the 10th of June next.

Canvassing, either directly or indirectly, will be considered a disqualification.

HENRY E. STILGOE,
City Engineer and Surveyor.

The Council House, Birmingham.
May 24, 1912.

### COUNTY BOROUGH OF MERTHYR TYDFIL.

WATERWORKS DEPARTMENT.

APPOINTMENT OF ASSISTANT WATER ENGINEER.

The Corporation invite applications for the post of Assistant Water Engineer. Salary £110, increasing by annual increments of £10 to £150 per annum.

Applicants must have had previous experience in a Water Engineer's Department, be able to prepare plans, sections, drawings and estimates, and organise and supervise the work of the Department.

Applications, endorsed "Assistant Water Engineer," stating age and experience, together with copies of not more than three recent testimonials, must reach the undersigned not later than Saturday, the 15th instant.

T. ANEURYN REES,
Town Clerk.

Town Hall,
Merthyr Tydfil.
June 3, 1912.

### WORCESTERSHIRE COUNTY COUNCIL.

HIGHWAYS AND BRIDGES DEPARTMENT.

WORKING FOREMAN.

Required at once, an active man who has had experience with Pitch or Tar Grouting Work and Tar-painting. Age not to exceed 40 years. Applicants must be able to keep time sheets and other records, if required, and must be a good cyclist.

Wages commencing at 35s. per week. Permanent appointment to suitable man.

Applications, together with copies of three recent references, to be sent to the undersigned by Monday, the 17th June, 1912.

C. F. GETTINGS,
County Road Surveyor.

Shirehall, Worcester.
June 4, 1912.

## APPOINTMENTS WANTED.

SUCCESSFUL COLLECTOR, specialist in collecting overdue Accounts (town or country), could similarly assist another high-class Weekly Journal. Personal attention given to individual accounts. Nominal salary and commission on accounts collected. Apply Box 1,159, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

# The Surveyor

And Municipal and County Engineer.

Vol. XLI. JUNE 14, 1912. No. 1,065.

## Minutes of Proceedings.

**The Value of the Lightning Conductor.**

In this age of vigorous scepticism no rule of practice in either the arts or sciences can claim a right to continued existence on the mere ground of precedent. The argument that the observance of such a rule has been followed invariably by satisfactory results is at once countered by the criticism that this is no definite proof that good results would not otherwise have ensued. Theories are received with impatience; it is facts that are required. It might have been thought that the provision of lightning conductors on important buildings was a rule of practice which no one would think of questioning. It would appear, however, that the Metropolitan Asylums Board have been suffering qualms of conscience as to whether the provision of lightning conductors is not in the nature of a luxury, and as such should be discontinued. A report recently presented to the board by their engineer makes interesting reading, and is worthy of consideration by all persons who are concerned with either the erection or upkeep of large buildings, and, in consequence, are liable to be confronted with the questions: Are these lightning conductors really necessary? Could not the expenditure under this head have been avoided?

The case for and against the use of lightning conductors is set forth very clearly in the report. It is emphasised that the efficient provision of a lightning conductor on a building is sometimes rendered very difficult owing to the existence of continuous lines of metal guttering and piping which may themselves act as rival conductors, though only ineffectively on account of their lack of entire continuity. It is stated that in England about 400 buildings are damaged by lightning every year, and that of these only about 2 per cent are "protected" buildings. This information is, of course, interesting; but as the great majority of buildings belong to the "unprotected" class no reliable deductions can be made from the percentage figures. The experience of the late London School Board, and of the Education Committee of the London County Council, as set forth in the report, is of much more value in leading to a definite conclusion on this question of the utility of lightning conductors. In the early days of the School Board several unprotected schools, being loftier than the surrounding buildings, were struck by lightning, and conductors were consequently installed on all the buildings under the control of the board, and no further damage occurred. On the schools being taken over by the London County Council it was thought that the conductors were unnecessary, and in some instances they were disconnected. Almost immediately afterwards one of the schools thus dealt with was struck by lightning, and the council, on the advice of their electrical department, immediately decided to refix the conductors.

The report we have alluded to, after a statement of the evidence in regard to the subject, strongly advises the continuance of the present procedure of the Metropolitan Asylums Board in installing conductors, and examining and testing them every five years. The ground on which this recommendation is principally based is the danger to life which results in large unprotected buildings. It may, it is admitted, be cheaper financially to repair damaged buildings than to instal efficient protective systems, but it is recognised that such a policy would involve serious risk to life, and is therefore undesirable of adoption. It may be remembered by our readers that in April, 1905, the Lightning Research Committee—a representative body of engineers, architects and scientists—issued a report dealing with the protection of buildings from lightning. Many useful practical observations were contained in that report, and it will doubtless remain for some time to come the most important literary contribution on lightning protection, and may be consulted with advantage when the protective scheme of a large building is being arranged.

**The Disposal of Road Detritus.**

The time has come when the matter of the disposal of road detritus must be taken up in earnest. The present lack of organisation in this matter leads to a large amount of useless expenditure, no inconsiderable degree of discomfort, and some danger to health, while the disfigurement of otherwise beautiful country roads is a matter for regret on general public grounds as well as from the point of view of the considerable numbers of persons who, in various parts of the country, make a part of their living by providing for summer visitors. It is not

suggested that the condition referred to is one which applies to all roads. Far from it. Very often the rate of removal of material by heavy rains is quite equal to the rate at which material is added by the road engineer. On some by-roads a large part of the material which is added to the crust from time to time is that needed to make up for loss by weathering action alone, and even on roads with a large amount of traffic the steepness of the gradients and the effects of other conditions may be such that no difficulty arises in the matter of this disposal of road detritus. We employ the word "detritus" as a general term to include road sweepings and scrapings, the material cleared out from cross-cuts, and the silt dug out when ditches are cleared, as well as any other waste materials which are to be found from time to time on the roadsides as the results of the roadmen's work. When ditches are cleared out the spoil should not be placed in heaps upon the roadside waste, but should be used where the general level is lower than it ought to be. When this has been done, the material may be spread evenly so as, without killing the turf, to raise the general level, if that is lower than it need be; and where there is ample width there may even be a lower terrace and a higher terrace—though this is not a plan which surveyors are likely to regard as suitable in more than a few places. But sooner or later there is an end to all this, and all that can fairly be put on the wastes is the small spreading required from time to time, and that not everywhere, to make up for the loss of material by actual erosion of light soils, or, where the soil is clay, by treading down and a general squeezing into the ditch. In some places, moreover, large quantities of material are brought into the road ditches from the neighbouring lands, especially when, as is so often the case on hillside roads, the ditch has to play the part of a catch-water drain as well as that of a roadside ditch.

Even more troublesome, in some districts, are the heaps of dry road-sweepings which the roadmen, having nowhere else to put them, make up into little heaps on the grass margins or perch precariously upon the banks. Hence, if the weather remains dry and is windy, a part of the material is blown back on to the road, whence it has to be swept again. Such dust is very disagreeable to users of the road, and is specially likely to be a nuisance in adjoining houses and on neighbouring lands. Successive grindings—especially if as the result of drizzling rain it passes through an incarnation as mud—give it that fineness which results in its being wafted through upper windows and carried far afield into the crops. Like the mud heaps, these heaps of dust are somewhat dangerous to traffic; children step off the grass margins in order to avoid these thistle-crowded mounds, and the emergency width of the road is reduced.

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**Garden Railways and Slummy Country Roads.**

As touching the unsightliness and the smells of dust-heaps, mud-heaps, tar-barrels, smeared patches and other evils of the roadsides, some of our railway companies put the local authorities to shame by the practical and enlightened manner in which they adapt their cuttings and embankments to the scenery on the one hand and the maintenance of their roads on the other. The railway companies would not for a moment tolerate, as do the local authorities, the hideous dumping of broken pots and pans, old boots, old bottles and tins, and other rubbish, on the roads along which their public passes, and the surveyor may well despair of keeping his roads as they should be kept in the neighbourhood of the houses of rich or poor. But difficulties in the matter of the disposal of road detritus extend over many miles of road beyond any considerable influence of wayside houses, and the subject must needs be considered apart from problems of refuse disposal and the education of the ratepayer.

**Classification of Road Detritus.**

In many urban and semi-urban areas the rates could be reduced if every householder would ask himself the question: What can I burn, what can I stamp upon, and what must be removed by the dustman as it is? Such classification is what will reduce the cost of dealing with road detritus. Let every surveyor who finds the difficulty a serious one, or the expense considerable, issue a set of orders to his men, in two parts. First, what is to be done with detritus which can be disposed of within the limits of the highway, "worked off" by means of the ditches in storms (where that course is justified), or placed on immediately adjoining land by arrangements with the farmers. Secondly, directions to classify, and as far as possible keep separate, materials which cannot be so dealt with, as follows: (*a*) Material fit to be put directly on the land, if applied properly, and not likely to be charged with the seeds of weeds; (*b*) Material which may be used to fill holes, or which, after removal by farmers and standing in heaps, may be fit to be applied to the land; (*c*) Noxious materials, such as very tarry sweepings, which are not produced in large quantities, but must be dealt with by the local authority. Such a classification should pave the way for a satisfactory solution of the problem; but the matter needs to be discussed, and we should be glad to learn that it is not too late to add it to the "Programme of Questions" to be discussed next year at the Third International Road Congress, or, at least, to introduce it under one of the existing heads.

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**Municipal Engineers and Aviation.**

The novelty of holding a meeting of the Institution of Municipal Engineers at the London Aerodrome was in itself no small attraction, and the governing body of the Institution are to be congratulated on their enterprise in arranging such a gathering. There can be no doubt that in the near future the municipal engineer will be faced by a series of problems connected with aviation which, although they may not so directly affect his daily work as the advent of the motor car has done, will call for solution at his hands. Two papers were read at Wednesday's meeting of the Institution at Hendon, the first being by Mr. B. Wyand, the secretary, on "Some Suggestions for By-laws and Regulations in Relation to Aviation," and the other by Mr. Horace Cubitt, A.R.I.B.A., on "The Structures of the Future in Relation to Aviation." Mr. Wyand suggested that any regulations should be national and not local in character, and with this we agree. It would appear to be impossible to apply any local boundaries to questions touching breaches of the law by aviators flying at considerable altitudes and great speed. We are further in accord with Mr. Wyand when he says that the first consideration in framing any regulations must be given to the protection of life and property; but we must draw the line at his suggestion that every claim for damages as regards both life and property should be made to a society consisting entirely of the aviators themselves, before whom no professional pleader or lawyer should be allowed to appear! Appended to Mr. Wyand's paper, which by the way is full of originality and suggestion, is a note by Mr. Arthur Goddard on the hydro-aeroplane on Lake Windermere.

Mr. Cubitt's paper dealt in a very interesting manner with the probable best forms of construction for such structures as hangars, aviation workshops, and starting and landing places. The writer pointed out that the treatment of such subjects might be regarded as somewhat premature having regard to the present state of the science of aviation. Nevertheless, there can be no question that these subjects will arise for consideration how quickly, who can say? Mr. Cubitt's paper, which, together with the contribution submitted by Mr. Wyand, will appear in a future issue, will be read with great interest by

all who wish to be prepared for dealing with those new phases of construction which will result from the development of aviation and will no doubt soon arise in actual practice.

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**The Select Committee and Trailer Cars.**

The decision of the House of Commons Select Committee on Tuesday in favour of the clause in the London County Council's Tramway and Improvements Bill authorising the council to run trailer cars is very satisfactory. It would be regrettable from many points of view, but chiefly, of course, from the point of view of those mainly concerned—*viz.*, the public—if Parliament by its action did anything to the prejudice of a vast municipal undertaking like that of the tramway service of the London County Council, in which so much public money has been sunk. The application for power to run trailer cars under strictly defined and limited conditions was made in good faith with the paramount object of surmounting the difficulties caused by the increasing congestion of the streets of London, and with a view to making the most of things as they are rather than multiplying the number of tramway routes. The contention of the London County Council that the use of the trailer would tend to diminish congestion was met by the converse argument from the opponents of the clause that it would increase the volume of obstruction. Obviously both could not be right, and the Select Committee were unanimous in the decision that the weight of evidence rested with the promoters. One of the last witnesses called was M. Chapuis, assistant to the general manager of the Paris tramways, who stated that trailer cars had been successfully used in that city for seventeen years, with the result that accidents had been lessened by half, and the time taken up at stopping-places reduced by half. The condition laid down by the Select Committee is that the motor should only be attached to the leading car, and this is manifestly a judicious precaution. The chairman, Sir Luke White, expressed the opinion that the trailers would be a great convenience to certain districts, and he added the declaration, in itself significant of the views of the Select Committee, that the routes could be extended in the future without applying to Parliament.

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**The Royal Institute of Public Health.**

It is generally recognised that the great German people have attained a high degree of excellence in all matters relating to hygiene and the science of health, and that their administrative and scientific methods are worthy of the closest attention and study. The Anglo-German Congress, which is to be held in Berlin from July 25th to the 28th, will afford an excellent opportunity for public health administrators and others to gain a first-hand acquaintance with German practice. The congress, which is under the auspices of the Royal Institute of Public Health, is being influentially supported by the authorities of both nations, and has been honoured by an invitation from the Berlin Municipality. The arrangements made include the representation of the interests of municipal hygiene, while matters connected with the purely scientific aspect of the subject of the congress and with industrial and domestic hygiene will receive full consideration, and various institutions will be visited. Particulars of the arrangements (both for ladies and gentlemen) which have been made for travelling and hotel accommodation may be obtained at the offices of the institute. We agree with Sir T. Vezey Strong, the chairman of the Organisation Committee, who stated in a letter which appeared in a recent issue of the *Times* that no more fitting occasion could be found for promoting the highest interests of both nations than the one which the congress affords for their representatives in all branches of public service, to meet in conference on the subject of health—and all that health means to the British and the German peoples, and through them to the world.

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**Electrolytic Disinfectant.**

We have on more than one occasion drawn attention to the success which has attended the use in the Metropolitan Borough of Poplar of the electrolytic process of disinfection. Under the advice of Dr. Alexander, the medical officer of health, the process has been adapted for use in a variety of circumstances, not the least important of which is the purification of the water in the swimming-baths. It is a matter of some surprise that but little attention has hitherto been given to the evils and dangers lurking in public swimming-baths as possible means of conveying infection. The observations which have been made by Dr. Alexander certainly point to the conclusion that the ordinary impurities of the swimming-bath are undoubtedly sources of danger in this direction. The sterilisation of the water by the use of electrolytic fluid, a solution containing hypochlorite of magnesia, has been undertaken with complete satisfaction in Poplar. The result has been that at a comparatively trifling cost the water has been rendered not only free from danger, but also more refreshing and pleasant to the bathers. The water is purified both chemically and biologically by the electrolytic process, the advantages of which are so obvious that it is to be hoped that the authorities responsible for other public baths may speedily follow the excellent example set by Poplar in treating their water in this way.

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**Water Engineers at Cheltenham.**

Last week we commented on the address delivered by Mr. J. S. Pickering, M.INST.C.E., borough surveyor and water engineer of Cheltenham, on the occasion of his inauguration as president of the Institution of Water Engineers. It is pleasing to record that the attendance at the meeting constitutes a record for the institution. The elements, however, were not over kind on the first and second days, but a great improvement took place on Saturday, when an inspection was made of the Gloucester waterworks. The mayor welcomed the delegates, and Mr. Pickering was very warmly received on taking the chair. In addition to the president's address the meeting was occupied at its first sitting on Thursday with the discussion of the paper descriptive of the new waterworks at Skegness which was read at the winter meeting by Mr. Percy Griffith, M.INST.C.E. The success of this, the first meeting of the institution over which Mr. Pickering has presided, augurs well for the success of his term of office as president.

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**Institution of Municipal and County Engineers.**

The Eastern District Meeting of the Institution of Municipal and County Engineers which takes place at East Ham to-morrow (Saturday) promises to be of considerable interest. The members will be received at the town hall by the mayor, Councillor J. Murrell Oakes, J.P., and on the conclusion of the district business a series of interesting visits to works will be made. The electric power station and car sheds should prove particularly interesting, as should also the visits to the isolation hospital and sewage works in the afternoon. A paper on "The Public Works of East Ham" will be submitted by Mr. J. E. W. Birch, the borough engineer, who will also entertain the members to tea. Other meetings of the Institution in the near future will be held at Lowestoft on June 23rd and at Bridlington on June 30th. In another column also will be found a preliminary programme of the annual meeting which will open in London on July 11th.

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# Institution of Municipal and County Engineers.

## SCOTTISH MEETING AT STIRLING.

The meeting of the Institution of Municipal and County Engineers at Stirling, on Friday and Saturday last, brought together the largest attendance of members which has ever gathered at a Scottish meeting of the institution. The business proceedings were held in the Town Hall, Stirling, where the members were received and welcomed by the Provost and members of the town council. Two excellent papers were presented, and produced an ample discussion. Mr. A. D. Greatorex (West Bromwich), the president, was in the chair, supported by Messrs. T. Aitken (Cupar Fife), R. S. Anderson (Peebles), J. Andrews (Helensburgh), R. Blackwood (Kilmarnock), J. S. Brodie (Blackpool), C. Brown (Hawick), J. Bryce (Partick), vice-president, R. Callen (Dunoon), J. Cameron (Strathaven), A. H. Campbell (Edinburgh), W. A. Chapman (Airdrie), S. L. Christie (Montrose), T. Cole (Westminster), secretary, D. R. Cox (Stirling), D. A. Donald (Grangemouth), A. Forbes (Dunfermline), J. A. Ford (Montrose), A. H. Goudie (Stirling), A. Hamilton (Bellshill), A. Hogg (Elgin), F. G. Holmes (Govan), J. M. Hunter (Arbroath), H. Inglis (Airdrie), J. Kirkland (Kirknewton), G. Landale (Musselburgh), J. Lee (Partick), W. D. Low (Greenock), J. L. Lumsden (Kirkcaldy), K. Macrea (Oban), C. Massie (Falkirk), D. B. Morris (Stirling), J. B. Paterson (Dundee), A. Robertson (Crieff), J. B. Robertson (Dundee), R. Robertson (Inverness), T. K. Roddan (Broughty Ferry), D. Ronald (Falkirk), hon. district secretary, G. Ross (Clydebank), J. Scott (Perth), J. Sim (Edinburgh), W. Sim (Stonehouse), P. C. Smith (Arbroath), T. Smith (Coatbridge), J. P. Spencer (North Shields), R. Spittal (Hamilton), A. Stevenson (Ayr), J. Thomson (Dundee), J. D. Watson (Birmingham), J. Watson (Strathaven), W. Watson (St. Andrews), W. Weaver (London), past-president, C. Young (Coatbridge), and J. Young (Ayr).

Provost Bayne offered the members of the institution a hearty and sincere welcome to the ancient and royal burgh of Stirling. Many of those before him had no doubt been in Stirling before, and those who had not visited the "City of the Rock" would have read of Stirling from their childhood. They in Stirling were proud of their ancient history, they were proud of their Castle and of many of their ancient buildings, and, in fact, they revelled delightfully in the antiquarian relics, which the visitors would perhaps see that day. He knew there were a lot of philosophers among the engineers, and he knew that there were also theoretical and practical men. They had not got into their jobs by commission; they had scrambled into them; but they had got into a position which was like that of the Pope of Rome—once they were there no mortal man could get them out of it.

Sir Alan Seton Stewart said he wished to support what the Provost had said in welcoming the visitors to Stirling, in the name of the county and of the County Council of Stirling. He thought that in Stirling we were in a very happy position. We need never be ashamed or afraid to welcome strangers to the town by reason of any fear of their not seeing something to interest them, whatever their bent might be. Stirling and its district were replete with beautiful old, historical memories of the past, and there was something for everybody—whether it was the philosopher or the man of skill. Sir Alan afterwards dealt with the claim of the burgh of Stirling for favourable consideration from the Imperial Road Board.

The President, on behalf of the institution, thanked Provost Bayne and Sir Alan Seton Stewart for the very kind welcome they had given to the members. The institution met many times in the year at district meetings, when they always received the same kind welcome from the representatives of the various towns they visited, but he ventured to say they never received a heartier welcome from any town than they did when visiting Scotland. At this time there were very important subjects before the institution, but there was no more important subject than that referred to by Sir Alan Stewart of the construction and maintenance of roads. He was pleased to welcome to that meeting the Scottish road surveyors, who, as they knew, had been affiliated with the institution and he was delighted to see so many present at that meeting.

CONFERENCE ON ROAD MATERIALS.

Mr. D. Ronald, hon. district secretary, read the following letter from the Engineering Standards Committee:—

"Dear Sir,—My Committee have been approached by the Road Board to consider the question of the standardisation of road material, and, with a view of ascertaining in what direction standardisation may most usefully proceed, the main committee have decided to hold a conference of those more particularly interested in this subject, and I have been instructed to communicate with you and ask your society to nominate a gentleman to represent them at the suggested conference. The conference will be held at the Surveyors' Institution, Great George-street, on Friday, June 21st, at 11.30 a.m., under the chairmanship of Sir John Wolfe Barry (chairman of the Engineering Standards Committee), and on learning your acceptance of the invitation which I have been instructed to extend to you I will forward your representative a formal notice of meeting and particulars of subjects to be discussed thereat.—Yours faithfully, Leslie J. Roberton, Secretary."

The President stated that the council of the institution at their last meeting appointed three English county surveyors as their representatives.

The meeting elected Mr. Robt. Drummond, county surveyor of Renfrewshire, as their representative.

## STIRLING AND ITS MUNICIPAL WORKS.

By A. H. Goudie,

Burgh Engineer.

Mr. Goudie was "brought up" in the office of the burgh surveyor of Paisley, and went to Stirling fourteen years ago. Since that time a good many improvements have taken place in the town, these including altering the line of the main road through a populous part, at a cost of £8,000, an extension of the water supply, costing £12,000, the erection of a new slaughter-house, at a cost of £6,500, an improvement at the quay, at a cost of £2,000, and of the river bank, at a cost of £1,500, and numerous other small schemes. At present Mr. Goudie is engaged with a scheme for clearing out a congested area, widening the streets, and forming an improved housing scheme, this being the most important work now in hand. He has also a mile and a half of the main north road under surface treatment, under a scheme subsidised by the Road Board, and a new public bowling-green is being made in the upper part of the town

The ancient and royal burgh of Stirling is one of the most interesting towns in Scotland. Situated on the Highland border, it has held for centuries a most important place in Scottish history. The Romans had a station on the Castle Hill, this superseding the former defensive works of the Caledonian warriors. After the withdrawal of the Romans in A.D. 450 it is said that the Picts built a stronghold on the hill, and continued till driven out by Kenneth Macalpine in 843. From that time forward to 1746 the Castle was subject to many sieges and varying fortunes of war.

The burgh of Stirling is mentioned in a charter by King David I. in 1124, and in a number of other charters by the same monarch and King William the Lion throughout the twelfth century. The earliest royal charter known to have been granted to the burgh of Stirling is that of King Alexander II., dated August 18, 1226, but it is well known that Stirling had a municipal existence for a long time before that date.

To tell the story of Stirling and its castle would be practically to recount the history of Scotland. From the earliest times until the Union of the Crowns the palace was a favourite residence of the Sovereigns and the Court, while the Scots Parliament frequently met in the Parliament Hall. Some leading incidents only may be mentioned. The battle of Stirling Bridge in 1297, and Bannockburn in 1314, secured for Scotland her independence.

Stirling was one of the burghs forming the Court of the Four Burghs, the records of which go back to 1295. In 1403 the Court met at Stirling and formed themselves into the Convention of Royal Burghs, still the most important municipal body in Scotland.

James II. was born at the Castle in 1430; the Earl of Douglas murdered in the Castle by James II., 1452; James III. born there the same year; James IV. born in the same building, 1472; James V. crowned in 1513, when only a year old; Queen Mary brought from Linlithgow Palace and crowned in the Castle at ten months old, she spent her infancy in Stirling. Her son, James VI., was in 1567 crowned in the Parish

Church, which is still used for public worship. General Monk besieged and took Stirling Castle, 1651; in 1746 Prince Charlie entered the town and besieged the Castle, but failed to take it.

PLACES OF INTEREST.

The places of interest in and around Stirling are very numerous. The Castle is of first importance. Placed on a commanding eminence, it dominates the landscape, and, before the days of improved artillery, was recognised as the key to the Highlands. It is of historical and antiquarian interest too great to be described here. The buildings have suffered much in times past from war, fanaticism, vandalism, and neglect. They have now been put under the care of His Majesty's Office of Works, and they are being gradually brought into a state of better preservation. The most interesting buildings still standing are the Royal Palace, the Parliament House, the Old Mint, the Chapel Royal, and the Douglas Room, where James II. murdered the Earl of Douglas; the walls are still flanked with batteries, both ancient and modern. From the walls a magnificent view may be had of the surrounding country, and the devious windings of the river can be traced for miles.

The Old Bridge of Stirling is a fine old structure of four arches, older than any of the existing Castle buildings, built in 1410. Partially destroyed in times of war and repaired in times of peace, it stands on or near the site of the ancient bridge, the scene of the fierce fight in 1297, when the English forces were cut to pieces by the patriot Wallace, a monument to whom is erected on the Abbey Craig, in a most commanding position overlooking the scene of his victory.

The High or Parish Church, although one building originally, is divided into the east and west churches. A church was founded here as early as 1124, and in 1414 it suffered severely from a fire, but was rebuilt, this second building forming the present west church. The east church was built early in the sixteenth century. The buildings are of great interest to students of church architecture.

Cowane's Hospital or Guildhall is a quaint building standing close to the High Church, the home of the Stirling Merchant Guild, at one time an important body. Their benefactor, John Cowane, is represented in the stone figure above the doorway. Cowane's benefaction still exists, and, along with a similar foundation by Robert Spittal, tailor to King James IV., is managed by the town council. The revenues which are derived from feuing and agricultural land in and around the burgh are devoted to charitable and educational purposes.

Argyll's Lodging, as it is now called, was built in 1632 by the Earl of Stirling. It is a beautiful specimen of the architecture of the period, and is now used as a [illegible] hospital.

There are a great many other old historical buildings of great interest still to be seen, but the author is afraid that he has taken up too much space already.

DESCRIPTIVE.

The town is beautifully situated. Built on the slope of a rocky hill rising up at the head of the Carse of Stirling, it is almost surrounded by hills, having the Ochils on the north and south, with a row of pretty little villages extending along their base, commonly called the Hillfoots. The Grampian range to the westward forms a rugged line to the landscape in that direction, while the Touch Hills, from which the town derives its water supply, gives a soft tone to the varied beauties of the scene.

Toward the south or south-east the village of Bannockburn, which gives the name to the famous battlefield, is situated; then, looking to the east, the river Forth can be seen for miles winding its devious course to the sea. Having from an early date been a walled town, the houses within the line of the walls are crowded together. This is most marked towards the upper part of the town, and would probably be caused by the desire of the inhabitants to live near the Castle, which would be the centre of attraction when it was a royal residence. The houses were originally very substantially built, although now many of them are in rather a dilapidated condition. Some of them were the town houses of the nobility and gentry, but when the Castle ceased to be a royal residence the hangers-on of the Court also migrated, leaving their houses to become the homes of the successful merchants. But, as the town could only develop towards the lower parts, new houses sprung up in this district, and it became the new business centre of the town, the merchants also removing their homes to modern houses, which were erected in more healthy surroundings, and more conveniently situated to their business premises. The old houses in the upper part of the town thus gradually came down to be occupied by the poorest classes in the town, although a few of the older residents still retain their love for their old homes, and wherever that occurs the buildings are still upheld in good condition.

The population is given at the last census as 21,200, and the valuation amounts to £123,420 19s.

WATER SUPPLY.

A good water supply plays a most important part in the success and development of any community, and, from the foresight of our former rulers, Stirling has been well supplied with wholesome and pure water, at a rate which can compare favourably with any town in Scotland of its size.

The works are situated on the Touch Hill, the storage tanks and filters being about 4 miles to the south-west of the town, and the reservoirs, three in number, are placed one above the other, the largest and newest being fully a mile above the filters. The reservoirs are admirably situated, as the whole of the gathering ground presently in use, 1,300 acres in extent, consists of wild rocky moorland which is quite unsuitable for cultivation. There is therefore no danger of contamination from the drainage of cultivated fields.

The water rights are held from the Superior on reasonable terms; the reservoirs are feued at £1 per acre, the ground at the filters at £4 16s. 9d. per acre, the other payments being percentages on the money collected by the Commissioners, the rate charged decreasing as the collected sums increase.

The largest and latest constructed reservoir, called No. 4, is 887 ft. above ordnance datum, it covers an area of 31·805 acres, is 59 ft. 4 in. deep, and has a holding capacity of 121,540,710 gallons. It has been constructed by forming an embankment at the low end of a sloping gully. It is supplied from three small streams, the main stream passing outside the lower end of the reservoir, but this water is taken in farther down the stream. The water from the waste weir also discharges into the main stream above the intake mentioned. The water is drawn off from the reservoir at three different levels through a wet well, circular in plan, built of concrete, and is carried down in a 2-ft. fireclay pipe to the compensation well, which is placed close to the main stream, a weir being built in the stream just below the well. The water in the stream is there impounded and taken into the well, thus combining with the water from No. 4 reservoir. The compensation water is given off through a rectanglar orifice in the face of a concrete weir, said orifice measuring 30 cub. ft. per minute, or 269,568 gallons per day. The remainder of the flow into the well passes over the concrete weir and flows into a stone culvert which forms the main supply into the next, or, as it is called, No. 3 reservoir.

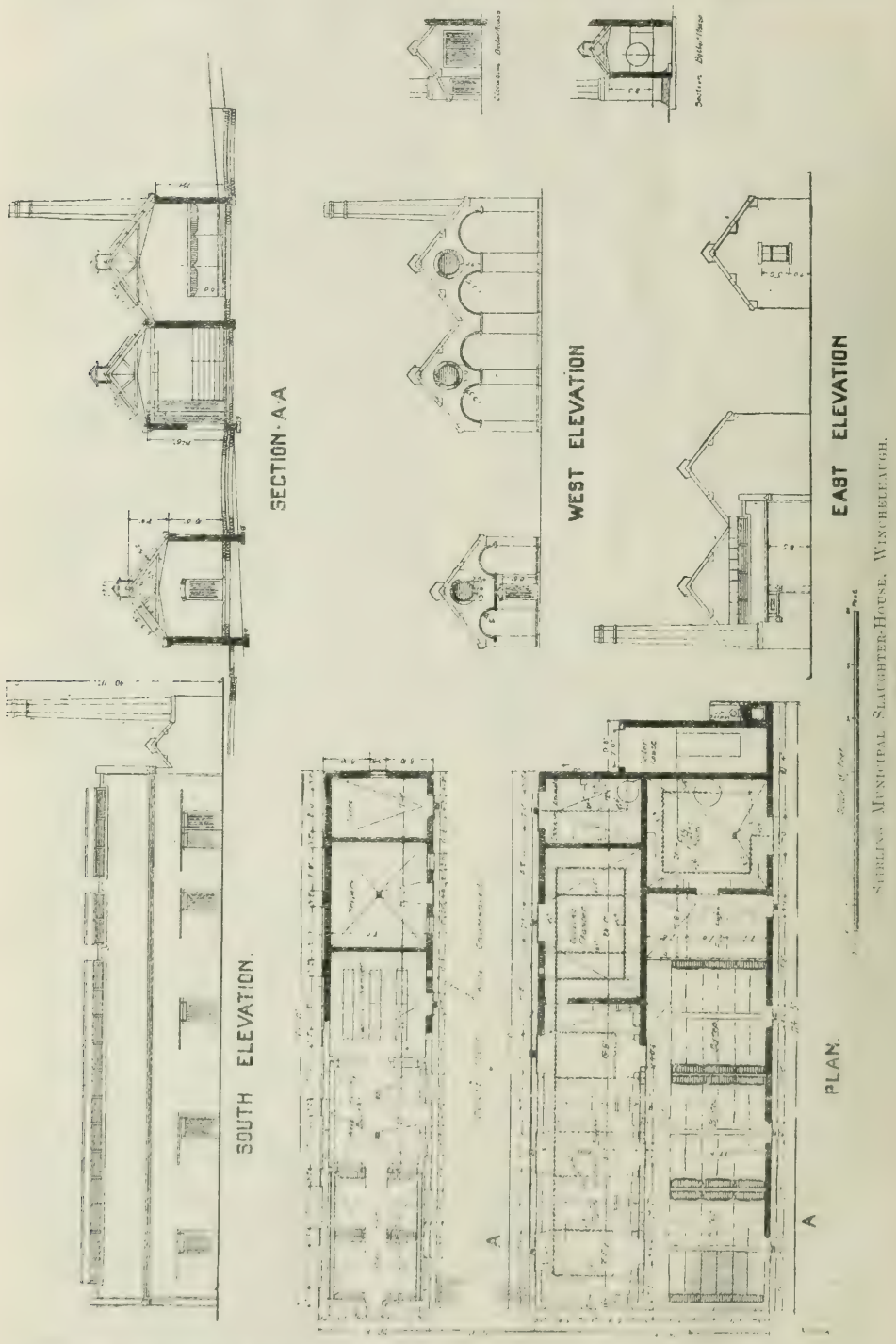
No. 3 reservoir is basin-shaped, covers an area of 15·173 acres, is 779 ft. above ordnance datum, 30 ft. deep, and contains 48,009,000 gallons. The embankment is a fairly long one for the size of the reservoir. The water is drawn off at two different levels through a circular wet well built of brick and discharges into the next, at No. 2 reservoir. There is a by-pass pipe from No. 4 which discharges into No. 2, thus allowing the water from No. 4 to be used without passing through No. 3. A similar arrangement carries the water from No. 3 past No. 2. It is therefore possible to use the water from any one of the reservoirs separately, thus providing for the cleaning or repair of any of the reservoirs.

No. 2 reservoir is situated immediately below the bank of No. 3. It covers an area of 6·606 acres, and is 707 ft. above ordnance datum, 20 ft. deep, and contains 15,859,640 gallons. The embankment is a small one. This reservoir has a small intake at its upper end, which helps to augment the supply, otherwise it is principally fed from Nos. 3 and 4 reservoirs. The water is drawn off at two different levels through a small circular wet well, and is carried down in a 16-in. iron main to the settling pond lower down. There is also a 16-in. from No. 3 discharging into the same pond.

The settling pond is a small reservoir, 484 ft. above ordnance datum, and holding 3,213,000 gallons. Its principal duty is to act as a break-pressure pond before the water reaches the filters; it has rough concrete walls, and the water is drawn off by three valves set at different levels. The supply pipes coming in to this pond discharge under water so as to cause as little disturbance as possible. A small

burn also passes the side of the pond, and can be turned into it when the water in the stream is clear. When it has been disturbed by heavy rains it is sent down the by-pass. Two 15-in. pipes from this pond supply the filters. There is also a by-pass pipe, so that the water could be sent to the town without filtering, if necessary, but this has never been done since the filters were put in.

The filters are four in number; their level is 455 ft. above ordnance datum, they are 76 ft. by 52 ft. by 6 ft. 6 in. to 7 ft. deep, built of concrete, the upper or exposed portion of the walls lined with white glazed brick. The water is drained off through centre and cross channels covered with pavement having open joints, the filtering material is regulated as follows: 1 ft. 3 in. of 2½-in. whin metal, 9 in. of 1½-in.




SLAUGHTER-HOUSE, WINCHESTER.
(Plate 1.)

whin metal, 6 in. of ¾-in. gravel, and 2 ft. of Arran sand. Two Glenfield sand washers are provided, and lately when washing the sand the finer material is taken off the top of each batch in the sand washers, and this is put on in a 3-in. layer on the top of the filters to prevent the discolournig matter from sinking down into the sand. One filter has been so treated, and it has proved a decided success. It has to be cleaned a little oftener, but a very thin skin requires to be taken off. When the filters have run a certain length of time it is easy to distinguish between the filter with fine sand and those without, a much thicker coat of deposit being found on the top of the filter with the fine sand than what is on the others, thus showing that a fair portion of the deposit is sinking down into the coarser-grained sand, and causing extra cost in washing.

The water from the filters is drawn off by four Glenfield decanter valves, and the water taken in to two circular storage tanks 100 ft. diameter and 16 ft. deep, the two of them together holding about one day's supply. They are built with concrete, and lined with white enamelled brick.

The pipes from the storage tanks join together at a three-way piece, which is connected to the three mains supplying the town—*viz.*, an 8-in., 12-in. and 15-in. Those pipes pass through the meter-house separately, the 8-in. and 12-in. having the older type of Deacon meter, and the 15-in. being provided with the newer type of meter, having the Kelvin disintegrator, this being a great improvement on the older type, the dials registering the quantities and thus checking the reading of the diagrams.

The whole of the water district is supplied by the above three mains. The 8-in. is reserved for the Castle and upper part of the town, and is an entirely separate supply. The 12-in. comes in about the centre of the town, and the 15-in. at the north end; they are then joined together. The pressure, especially at night, is very heavy—about 150 lb. in the lower districts; but to obviate unnecessary waste the pressure is reduced wherever possible by putting in reducing valves. This is only done on side districts, as the direct mains have to be left under full pressure to enable the water to be sent to the outlying districts, the pipes supplying those districts being to the small side. To further assist in the prevention or detection of waste, the town is divided into districts, each being supplied with a Deacon meter, so that whenever the meters at the works show an increase in the consumpt, diagrams are put on the town meters, and this enables the inspector to locate the district where the increase has taken place, and by shutting down the district one after another he can tell in which street the waste is going on. This is found to be a great help not only in checking waste, but in checking the work of the inspectors.

The population supplied numbers 28,050 and the daily consumpt averages for the last year 1,489,483 gallons, giving a consumpt of 53·10 gallons per head over all, or a consumpt for domestic use of 38·59 gallons per head. This the author considers not bad for a residential population like Stirling, but it should be very much less if the people would exercise ordinary care. As a proof of this statement the author may say that owing to the long dry summer we had last year the supply was restricted, and the people were asked to assist by paying strict attention to see that no preventable waste should occur. So well had this request been attended to that when the reservoirs were filling up, and an unrestricted supply was turned on, the habits of carefulness engendered during the scarcity seemed to bear good fruit, as in the first few months the consumpt was only 33·51 per head for domestic use, showing how much of the waste is attributable to the carelessness of domestic consumers.

The average rainfall at the reservoirs during the last thirty years was 44·63 in., the average for the three driest years being 34·77 in., and the heaviest fall being 63·25 in.

SEWERS.

The diameter of the sewers ranges from 6 ft. to 6 in., and from the raised ground on which the greater portion of the town is built they have a good fall to the river, where they discharge mostly at or under low water. A few of the older sewers, where they run along the base of the rock, are rather deficient in fall, probably to avoid rock cutting, and have to receive regular attention. Thus the present generation is paying annually for the saving propensities of their predecessors. The ventilation of the sewers is by open grids through dirt boxes connected to the manholes, which are placed at or near the centres of the streets, and, although perhaps not exactly an ideal system of ventilation, still appears to give very good results, as in no case have our sewers been found heavily charged with sewer gas, the workmen being able at all times to go into them without any ill-effects. All house and other drains are trapped off before entering the sewers.

STREETS.

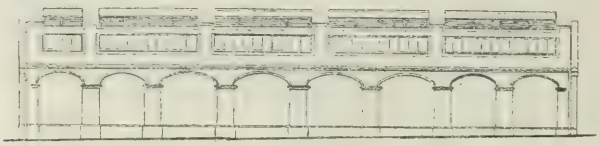
The total length of streets and roads within the burgh is 21·018 miles, of which 2·829 miles are causewayed and 17·057 miles are macadamised. These comprise turnpike roads, statute labour roads, and roads taken over by the town council; there are also 1·132 miles of private roads not yet taken over. The principal streets are bottomed with concrete, and paved with granite or whin blocks grouted with pitch, the remainder and lighter trafficked streets being paved with whin rubble. The macadamised roads are of the usual type of water-bound road, but recently the town council have become alive to the fact that a better system of surfacing has become necessary, and they have sanctioned a limited length of roadway being treated with improved surfacing each year. The council have also been successful in obtaining a grant from the Road Board for improved surfacing on the main north road, which runs through the centre of the burgh. The grant is only for tar-treated roads, the board refusing to give any grant for Rocmac, but as the author was of opinion from actual experience that tar would not stand on a part of this roadway, which is between high banks and heavily shaded with trees, the town council have agreed to lay this portion with Rocmac without any assistance from the grant, the metal to be used on the improved surfacing to be from selected quarries, the local metal not being of the hardest nature. The metal, blocks, kerbs, &c., presently in use are quarried in the town council quarry, where stones are dried and tarred in a tarring machine; but as Mr. Cox, the district road surveyor, is to give a detailed description of tarred and Rocmac roads, the author need not go further into this matter.

CLEANSING AND REFUSE DISPOSAL.

The system of refuse removal within the burgh is by daily collection, the carts starting at 7 o'clock and finishing about 11.30. As the whole town is on the water-carriage system the refuse is of a light and comparatively inoffensive character, and might be even more so if the householders would recognise how much of it could be burned in their kitchen fires at a reduction in their coal bill. The refuse up to the present has been disposed of by tipping on land belonging to one of the trusts under the town council, low-lying ground being raised to a higher level, and the whole surfaced over with from 18 in. to 2 ft. of soil and then sown in grass. It has been found that ground treated in this manner gives a good crop of grass, but should there occur a dry summer in the first two or three years after the surface has been sown down, the grass is apt to be burned up owing to the heat from the partially decayed refuse underneath. There is also the danger to health from vermin, and the nuisance inseparable from such a tip from loose paper put out by the householders blowing over the adjoining fields. This latter nuisance might be altogether stopped if householders would burn their papers. The paper from all shops, warehouses, &c., is collected in bags by the cleansing department and sold to the paper mills, a small profit being derived from this source. The town council have had under consideration for some time the advisability of erecting a destructor, but the difficulty of finding a site where the steam could be properly utilised, and at the same time be free from objection by the surrounding householders, has so far been against it, they seemingly being under the impression that such a work would be a nuisance in the neighbourhood. This is a difficulty, of course, inseparable from such a town as Stirling, but will no doubt be got over as it has in other places, and the people will find that they have been needlessly alarmed.

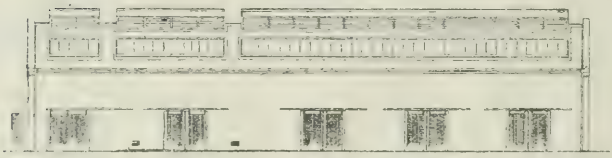
PUBLIC BUILDINGS.

The public hall was erected and is controlled by a company of local gentlemen. This is a very fine building, and acts as a town hall, being let for all public purposes. The Smith Institute, which houses the picture gallery and museum, was a gift to the town by Mr. Thomas Stuart Smith, a local gentleman, and is now under the care of a board of trustees. The Free Library was a gift to the town from Mr. Andrew



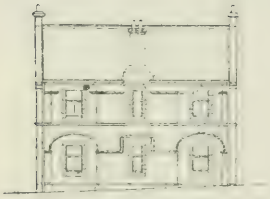
NORTH ELEVATION

SOUTH ELEVATION S.B.



NORTH ELEVATION C.B.

SUPERINTENDENT'S HOUSE.



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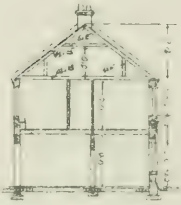
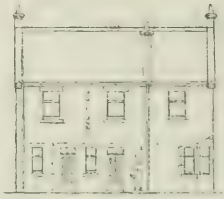
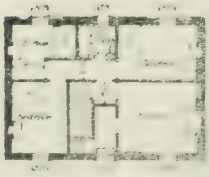


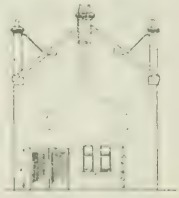
SECTION



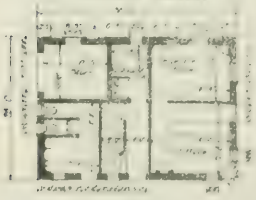
BACK ELEVATION



UPPER FLOOR

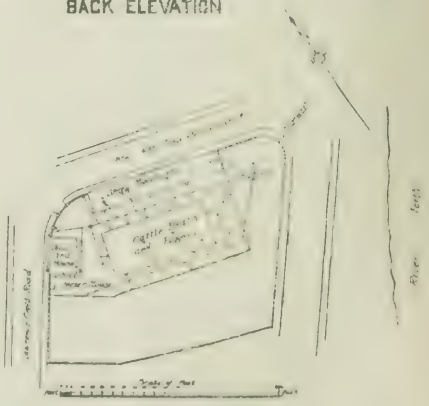


END VIEW



GROUND FLOOR

END VIEW



SITE PLAN

STERLING MUNICIPAL STOCKPIECE HOUSE, WINCHESTER.

Carnegie, and as a fine building, which is greatly taken advantage of by the [illegible] pic

The police buildings and courts are in an old part of the town, near the [illegible], where at one time all the public life of Stirling congregated, and at that time the town council were located in the same buildings. With the changes of time the business population removed to the lower part of the town, the town council finding accommodation in the buildings in King-street, where they and the officials are very indifferently housed, the work of the burgh being very much hampered for want of sufficient space. The town council some years ago became alive to the difficulty of carrying on the work of the town in the present buildings, and they inaugurated a scheme for new municipal buildings, first putting past the equivalent grant to form a sum for this purpose. They then gave a premium for competitive designs, and although a very fine design was selected by the assessor, they unfortunately agreed to have a plebiscite, with the usual result—*viz.*, a small vote and the decision cast against expenditure.

PUBLIC PARKS.

Stirling is possessed of a fine park and other ground open to the public.

The King's Park, 156 acres in extent, is beautifully situated on the south-west of the town, and from the [illegible] parts a view can be obtained [illegible] in Scotland, or, indeed, anywhere else. This park is Crown land, and a part of the ancient royal Park of the Scottish kings. It is free to the public, and the council exercise a general supervision over it; part is laid off for football in the winter and cricket in the summer. There is also a very fine nine-hole golf course, which is presently being converted into one of eighteen holes. The course is kept up by the Stirling Golf Club, but anyone is allowed to play at a very small charge. The Gowan Hills are another very fine breathing space and recreation ground situated at the north-east end of the town, amounting to 34 acres in extent. In addition, there is a fine walk, called the Back Walk, which is beautifully shaded with trees for about the half of its length. It then rises fairly high as it passes round behind the Castle, and is a favourite walk with the inhabitants.

INFECTIOUS DISEASES HOSPITALS.

The general hospital was erected in the year 1904, at a cost of £14,000, and comprises two hospital blocks, an observation block, an administration block, and a disinfecting and laundry block. It is a fine building, by a local architect, fitted with all modern appliances considered necessary in such an institution. The sewage is treated by the septic system before passing into the river. After the above hospital was finished the board of management were requested by the Local Government Board to erect a small-pox hospital, for which the author was instructed to prepare plans. Those buildings were erected on a separate site about 2 miles from the town, and are of very unpretentious character, having a hospital block of two wards with four beds in each, an administration block with accommodation for three nurses, and an office block with laundry, washhouse, mortuary, &c. The building is erected with 11-in. brick, hollow walls harled on the outside; the whole cost, including laying out the grounds, a double iron fence round same, water supply, and a small septic arrangement for treating the sewage, only amounted to £1,200. The hospitals were erected and are now maintained by the Combination Board for the [illegible] Bridge of Allan, Dunblane, Callander, Doune, and St[illegible] Ling. The county authorities are also [illegible] with the [illegible] and [illegible] the small-pox hospital that they are presently negotiating with the board for an extension of that hospital for the use of a certain portion of the county area about equal in population and valuation to the combined burghs.

CEMETERIES.

The Stirling cemetery is situated on high ground just below the Castle. This is a very old burial place, being the churchyard of the parish, and contains many interesting stones. This cemetery has had two additions at different times, which, although now all in the same enclosure, have different names—*viz.*, Mar Place and the Valley cemeteries. The above cemeteries having become valuable owing to the number of persons even from outside the burgh desiring lairs, the town council were under the necessity of providing another cemetery to supply cheaper lairs for the [illegible] Hills about the same level as the other cemeteries, and to the north of the Castle. This place, being wholly of a rocky formation, was rather an expensive piece of work to start to; however, the council purchased the ground from the Government, a plan was prepared by a local engineer, and the work was started by the town's workmen. The rock was used for road metal, and the work was only carried on as metal was required. This was found to be a very expensive method of carrying out the work, and when the author came to Stirling it was one of the problems which he was expected to solve. Before long, on going into the matter the author found that the expense of making the lairs was far above the sums at which they were being sold, but as the council wished the cemetery for the poorer classes, there was no use suggesting the raising of the price of the lairs, so, after consideration, a new plan was produced with an estimated cost, of which the council approved, and gave their sanction for the work being proceeded with at once. The actual cost came out below the estimate, and the council were enabled to sell cheap lairs without any financial loss, the price of the lairs in this cemetery ranging from 30*s.* to £6.

GASWORKS.

The gasworks belong to a company incorporated under a private Act. The works have been in recent years almost wholly rebuilt and considerably extended. This has been done mostly out of revenue, and at the present time the company has a capital of £70,000. They pay 10 per cent on the original shares and 5 per cent on the shares issued since 1898. Twenty-candle power gas is 2*s.* 6*d.* per 1,000 cub. ft.

ELECTRICITY STATIONS.

In the year 1895 the town council procured a Provisional Order for supplying electricity within the burgh, and in the year 1899 the works were erected at a cost of £25,000, including plant, cables, &c. Since that date additional plant has been put in at a cost of £17,000. The undertaking had its difficulties like many others, and for some years required to be assisted from the rates, but it is now in a more prosperous condition, able to pay its way and put a few hundreds to reserve fund. In addition to this the rate to consumers was reduced last year; formerly current was sold on the maximum demand system, but it is now sold at a flat rate of 4*d.* per unit for lighting and 4*d.* to 1*d.* per unit for power, the output per annum being 397,324 units for all purposes.

SLAUGHTER-HOUSE.

Previous to the erection of the present building the old slaughter-house was the property of the Common Good, the killing being done in private booths, the larger butchers being allotted one each, and the smaller butchers sharing the use of one or more booths between them. The ancient Incorporation of Butchers had certain privileges whereby their members only paid half dues, but when the new building was projected it was recognised that such privileges could not be continued, so an arrangement was come to whereby the Common Good paid the Incorporation a lump sum in lieu of all privileges, and the Incorporation agreed that their members would pay the same rate as the other butchers. After this difficulty was cleared up, the author was instructed to prepare a plan of a slaughter-house to be built on a different site belonging to one of the trusts under the town council, this plan to be on the open hall principle.

The buildings, which were erected in 1909, comprise three separate structures built of pressed facing brick with red stone dressings, the insides of the slaughtering and dressing premises being faced with white [illegible] brick. The cattle and sheep pens are faced with brown enamelled brick. The building at entrance contains the superintendent's office and inspector's room, with lavatory accommodation and store on the ground floor, with the superintendent's house above. The main building contains the cattle-pens, slaughter-hall, cooking-room, diseased-meat chamber, pig-pens, pig-killing booth, and furnace-room. The cattle-pens are fitted up with white enamelled water-troughs and iron hay-racks above. The animals are all tied up, the stalls having open divisions formed of malleable tubes between every two; each set of stalls communicates with a passage which is separate from the stalls by a partition formed of malleable iron tubes, access being had through doors of the same construction. From this passage access is had to any of the killing-chambers through sliding doors. The cattle-stalls and killing-chambers are so situated that the animals are roped in their stalls and led direct into the killing-chambers. The slaughter-hall is

divided into three chambers, with open partitions formed of malleable iron tubing, so that the superintendent can see all that is going on. Each chamber is fitted with two killing places and two wall hoists. The carcases, when dressed, are lifted by the wall hoists and transferred to the trolleys on the runways; they are then run right through into the cooling-room without further handling. The trolleys, when first fitted up, were single, but it was found that when loaded with a whole carcase they did not run easily, and it was difficult to get them to pass the switches, so we traced two single trolleys together, and they ran so well that the author believes the makers have adopted this improvement. Each of the killing-chambers is supplied with hot and cold water, the hot pipes being on the flow-and-return principle.

The cooling-chamber is placed at the end of the slaughter-hall, and is cut off by a double door high enough to allow the carcases to be run through on the runways. There is also a weighing machine fitted up in this chamber, so that the carcases can be weighed while on the trolleys.

The diseased-meat chamber is in this range of buildings, but is only entered from the outside. It is fitted up with a steam digester for destroying the diseased carcases. This is a very necessary and, as it has proved, also a very valuable fitting, being almost constantly in use. When not destroying diseased meat, it is used for extracting tallow, which goes to help the revenue of the slaughter-house. In this chamber is also placed a calorifier for supplying hot water to the various parts of the building.

The pig-pens are situated next to the pig-killing booth, the pens being enclosed with iron railings and supplied with feeding troughs. The pig-killing booth is fitted with a jib crane for lifting the carcases into the plotting tub; it then transfers them to the trolleys, which run to any part of the room for hanging up. There is also a trolley with pulley blocks for transferring to the hanging hooks and also for loading on to the butchers' carts. The furnace-room is the only other part of this block, and it is fitted with a small Cornish boiler for supplying steam for all purposes, the other block of buildings including sheep-pens, killing-room, cooling-room, tripery, and hide-room.

The sheep-pens are fitted up with malleable iron railings, white enamelled water-troughs, and malleable-iron hay-racks.

The sheep-killing room is placed next to the pens, and is fitted with the necessary dressing hooks, small pulley, blocks, &c. The cooling-room is next to the killing-room, the carcases being hung on flat bars fixed to malleable-iron standards. The tripery is fitted up with white enamelled lireclay tubs, supplied with hot and cold water. There is also a steam box for plotting feet; in addition a small portion is partitioned off for gut-cleaning purposes. The hide and tallow store is merely fitted with shelves divided to suit the different butchers. The whole cost of the buildings, including boundary walls, paved courts, water supply, drainage, &c., amounted to £6,000.

By-laws were drawn out by the council and approved by the Local Government Board. A table of rates was fixed, which evidently was quite satisfactory to the butchers, as no grumbling has taken place, although they are roughly double what they used to be, the butchers evidently considering that the improved accommodation and better facilities for carrying out their work are well worth the extra charge. If all the butchers had loyally supported the scheme, the new place would have been self-supporting instead of having an annual loss of about £250, this loss being caused by three of the largest butchers killing in private slaughter-houses outside the burgh, which have been licensed by outside authorities.

A properly qualified inspector of meat has been appointed for the new slaughter-house, and the amount of meat condemned during last year amounted to 9 tons. The, without any legal proceedings, goes a long way to prove the need for a proper supervision of the public meat supply and to show the necessity for some alteration in the laws which govern the erection and licensing of private slaughter-houses and the inspection of all meat to be used for human food.

HOSPITAL TRUSTS UNDER THE TOWN COUNCIL.

There are two hospitals and an educational trust under, or partly under, the council, and they own a very large portion of the land available for feuing in and around Stirling. A good portion of the land has been or is being feued at present, the remainder being let as agricultural ground. We have no less than ten farms, three orchards, one nursery, and fifteen parks let for grazing. This, of course, entails a large amount of work on my department in carrying out repairs and improvements on the above properties. In addition to this there is the preparing of all feuing plans, and providing the plans for the feu tities. Although this does entail a lot of work which does not usually fall to the lot of a burgh surveyor, still, the author thinks it is a position which many councils would be happy to find themselves in, as it gives them great power over the class of buildings to be erected in any district. Recent legislation has proceeded on the lines of compelling owners of land to feu, and placing a tax on the increased value of the land, evidently proceeding on the assumption that there are large profits derived from feuing, and also that the ground would be more readily taken up if it were not for the heavy feu duties charged. This has not been the experience in Stirling. The highest-priced land we have—and unfortunately we have only a small portion of this left—is in what we call the Terrace district. It is now feued at about £25 per acre, but a very much less sum was got for most of the ground. This may seem a large sum, but when we consider the loss there is to the Superior for roadways and ornamental ground for which no feu duty is charged, also the loss of grazing value from the ground being broken up during the slow process of feuing, and the money that has to be expended in laying out roads, which is not recovered in many cases for a number of years, not to speak of the yearly upkeep of the ornamental grounds, it does not work out to be such a money-making business as one would be led to believe.

We have other ground for small self-contained houses, or two-storey tenements of a good class let at £12 per acre; this ground is fairly well taken advantage of. Again, we have ground in another district, which we let at £10 per acre for workmen's dwellings. We have tried to favour the building of workmen's cottages, but so far these have not been taken up. Since we get from £4 to £5 per acre for grazing, it may be seen that, when you deduct the loss of area for roads and open spaces, and the cost of laying out roads, &c., then the profits cannot be so great after all.

The foregoing statement shows that the greater portion of the feuing ground in and around Stirling is owned by one or other of the trusts under the town council. That being so, we are in the position, to some extent at least, of directing the lines on which our town shall develop, and have not the same clamant need, as many other burghs, for putting the Town Planning Act into force.

We have a very good example of what is called modern town planning in our Terrace district. In two of the roads there is the centre road for heavy traffic, and the two side roads for light traffic, with a grass bank between. Then there is the occasional small open space, or ornamental plot, all the roads being planted with trees. This design has been carried out in a quite inexpensive manner, and has rather a pleasing effect. The district is feued wholly for villas of a fairly good class. You can therefore conceive that the inhabitants will have some regard for the manner in which the grass plots and trees at the roadsides are kept, but in spite of that there are difficulties with message boys, who will form paths on the grass and also damage the trees.

So one can appreciate the extra difficulties that will have to be encountered when we have grass plots and trees in working-class districts. The author may say that the care of the trees and grass devolves on the hospitals, which own the superiority of the ground, at least that is what it comes to if you want the place to retain its good appearance.

In some of the recent proposals for town planning money is to be saved by putting in back service roads of small width and light construction. Well, we have a somewhat similar arrangement in the district above quoted, only we call them Mews Lanes, and our experience has been such that we dropped this arrangement in all our newer plans, as it has been found that the people use those lanes for depositing their garden refuse, and difficulties have been experienced in getting them kept even in a half-respectable manner.

The description which the author has tried to give of the municipal works of Stirling may, he trusts, be of some little interest to the members of the institution.

## DISCUSSION OF MR. GOUDIE'S PAPER.

Mr. W. Weaver (London) proposed a vote of thanks to Mr Goudie for the paper, which he had read carefully through and found most interesting.

Mr F. G. Holmes (Govan) seconded the vote of thanks to Mr. Goudie for the interesting and valuable paper he had given to the meeting. With reference to refuse disposal, some years ago he read a paper in Perth before the Scottish Institution dealing with the subject of destructors. At that meeting he mentioned specially a point which Mr. Goudie had endeavoured to enlighten the public upon. He was surprised in these enlightened days they could not get people to do a little for themselves, when it was known that it would be of advantage to them and to the community. Mr. Goudie said as the whole town was on the water-carriage system, the refuse was of a light and comparatively inoffensive character, and might be even more so if the householders would recognise how much of it could be burned in their kitchen fires at a reduction in their gas bill. It was amazing to find the amount of garbage which was sent to a destructor, and also in towns where they had no destructor. Where they had no destructor, and had to tip the refuse, the objection was greatest because the tendency was to breed vermin and rats all over the place. In Stirling some fifteen years ago the state of the tips was a perfect hermits nest for rats. In these days when they were raging war against rats and vermin, it was of importance for people to destroy their garbage in their own fires, and not send it away to breed vermin. He hoped Mr. Goudie and other surveyors would continue preaching that principle and that in time they would get people to listen to it and act upon it. There was one other point as to the parks of Stirling. There were very few places so fortunate as Stirling in the matter of parks. There was in the town one of the most beautiful parks to be found anywhere—the King's Park. At present [illegible] Stirling and he had often thought the corporation might consider the advisability of buying a few acres of land at Shiphaugh, on the side of the Forth, for a public park, as it was one of the most beautiful sites in Stirling, looking across to the Wallace Monument, and was also a most desirable and safe place for children.

Mr. J. Lee (Paisley) said he was particularly interested in Mr. Goudie's method of putting 3 in. of fine sand on the top of his filters. He thought, however, with so thin a layer as 3 in., a three-inch, in the course of scraping, they would get down very quickly to the rough sand—in fact, that they might work the filters until there was less than the 1 ft. 9 in. of rough sand on the top of the metal. In that way it meant renewing the filters oftener than they would otherwise do. With reference to the disposal of refuse the council had evidently some difficulty in finding a site for a refuse destructor from the fear that it would be a nuisance to the neighbourhood. He could assure them that a refuse destructor was no objection whatever. They had a destructor in the centre of the town in Paisley, and such a thing as a complaint of a nuisance they never had. The people of Stirling were needlessly alarmed.

Mr. J. L. Brown (Hawick) asked whether the council owned or hired horses, and which Mr. Goudie considered the cheaper method.

Mr. P. C. Smith (Arbroath) asked what was the cost of road metal, seeing that they had a quarry within the burgh. Some of them had quarries 3 or 4 miles away, and if Mr. Goudie gave them his figures it would enable them to approximate the cost when the quarry was in the burgh. As to the disposal of refuse, other councils were in the same position as to the advisability of erecting a refuse destructor. People would get the idea into their heads that a destructor was going to be a nuisance. Over and over again they had been assured by representatives of firms who made destructors, and by surveyors who had destructors in use, that they could be worked without nuisance. As to the putting of garbage into ashbins, his council some time ago sent out a representation to residents to assist by burning their paper and garbage in their own fire-grates, and this had had a remarkable effect. If they could get the people to burn the garbage in their own homes it would go far to solve the question of refuse destruction.

Mr. Archibald (Edinburgh) said they had a destructor in the town, and their latest idea was to practically abolish it. It was a nuisance and their cleansing inspector had gone to the length of building a small destructor at a quarry some miles out of Edinburgh.

Mr. Forbes (Dunfermline) asked if there was any explanation of the apparent anomaly of the refusal of the Road Board to give Stirling a grant for Roemac while they gave Mr. Cox a grant for laying 3 miles of road with Roemac just outside Stirling.

Mr. J. S. Brodie (Blackpool) said that at some personal sacrifice he rose at an early hour that morning to look round the burgh of Stirling, and he must say that a more beautifully situated town he had rarely seen. It was also well cared for, the streets kept clean and sweet, and he congratulated Mr. Goudie and the council upon the very excellent way in which they looked after their sanitary duties. With regard to the paved parts of the burgh, he noticed that Mr. Goudie ventured to put setts upon gradients which he would hesitate to use setts upon. He would like to ask if there was any difficulty with the traffic in those sett-paved streets. He noticed he had also some 18 miles of macadamised streets, and he would like to ask whether he had used tar or bituminous asphalt in those streets, or whether he had done any tar-spraying. They were very keen in the sister country on tar, but some of them were not altogether satisfied with their efforts, and would like to know if it had had any effect there. He had had charge of a refuse destructor for a good many years. He must say, speaking with great respect, one could hardly say it was a thing of beauty and a joy; it was at best an attempt at solution of a very difficult problem—the successful conversion by burning of house and other refuse appertaining to a municipality at the least possible cost and with the least possible nuisance to its neighbours. It was perfectly true there were destructors and destructors. Where they handled their refuse with the minimum of labour, and where they did not store their refuse preparatory to burning it, then he thought they could conduct their destructor without being a nuisance to the immediate surroundings. But there were so many destructors where there was a huge pile of refuse dumped down preparatory to being cremated, and there came in the nuisance. Very often the nuisance was felt from the uncremated stuff rather than from the work of the destructor itself. He would give them a hint to be careful on no account to allow refuse to be dumped at the destructor works. Instead of spending money in storage bins for storing up refuse and destroying it at a uniform rate, they had spent their money in providing about three times the number of collecting vans they would ordinarily use, so that after the refuse was put in the vans it was no more accessible to the outside influences until it was dumped straight into the destructor itself. If they never allowed the refuse to be exposed at all after it was collected until the time they put it into the destructor they had reduced the risk of nuisance from a destructor to the minimum. That method they had found successful. Their destructor was in the centre of the town, fairly near to the sea front, and in such a place they would see it would never do to have a nuisance, so far as it could be avoided. Acting upon these principles during the past four years, they had found instead of complaints they were having people building houses close up to the destructor. He did not know a better testimonial than that people were trying to rub shoulders with it in their dwellings. The water supply appeared to be very good, and they in England always envied the Scottish towns on the quantity and quality of their water. Two years ago they were at Hawick, where they actually had a beautiful water supply running down the channels of the streets at full bore, washing the streets night and day. That was an ideal state of things that they sighed for and never attained. During the past four years at Blackpool he had had to extend their sea waterworks for washing and watering the streets and for flushing the sewers, so they would understand that they envied them the beautiful supplies of water in Scotland.

Mr. J. Young (Ayr) said the two points in the paper which particularly appealed to him were the waterworks and the public slaughter-houses. In regard to the slaughter-houses, he thought it was a good and novel method Mr. Goudie had adopted of putting a fine sand on the top of the filters. He would like to ask if he did that at all seasons, or only during the time of the year when he had flocculent matter and peaty material coming down from his reservoirs that he found it necessary to do so. He would also like to ask as to the type of reducing valve. Mr

Goudie might have found it impossible in a small area like Stirling to introduce the zone system of pressure in his work. He had introduced the system of reducing valves on the side districts, and he would like him to say whether the valve was of a patent type or an adaptation of his own, whether it was reliable in working, and whether he had any means of adjusting it so as to give the full pressure in the case of a fire breaking out. He also wished to ask his testimony on the question of a refuse destructor as to whether it was a nuisance or not. He had had experience of a refuse destructor being a nuisance and also of one which was not a nuisance. In Ayr they had a very up-to-date type of destructor, and if it was properly worked no municipality need hesitate to go in for this method of destroying refuse. He did not think it was right to store refuse; if that was done it showed there was something wrong in the beginning. He would rather put in additional cells to destroy the refuse on the day it was collected. Provided the destructor was put on the leeward side of the town, and the prevailing winds carried the smoke away, and they had the chimney 180 ft. high, there would be no nuisance arising from the destructor. Very careful precautions would need to be taken of the trapping of dust, because at times they would get dust from the chimney unless they had traps and pockets, and these were regularly cleaned out. As to smell, in the modern type of destructor there was no smell from the chimney as in the past. It was only the possible nuisance from dust that they might get deposited in the neighbourhood of the chimney on a calm day. That might be obviated by a proper system of pockets in the flues. With regard to the private roads, he would like to ask if Mr. Goudie took them over only after the road and footpaths had been made, or when the carriageway was made, the footpaths being made afterwards. It seemed a hardship that Mr. Goudie was not able to get a grant for Rosemar when the county was fortunate enough to get one. Mr. Goudie was to be congratulated upon having an up-to-date slaughter-house, a thing which could not be boasted of in many towns in Scotland, especially the older towns, which had adhered to the ideas of former ages in the slaughtering of cattle.

Mr. J. Bryce (Partick) asked the price of tarring metal per ton. Mr. Goudie had a machine for doing this work, and as he also had one he wanted to compare the cost. Then he was much interested in the reference to the destructor. They thought they were pretty far ahead in that respect, especially of a gentleman from Edinburgh who advised them not to have destructors in populous places. He would have liked to hear Mr. Campbell on that point. They had heard stories of the Edinburgh destructor. It all depended upon the system and the construction of the destructor. In Partick their destructor was in the very heart of the town. While in the beginning there was a sentimental complaint, there had not been any real complaint from any resident in the neighbourhood. In fact their business street had been built up with new and highly rated shops in the very vicinity of the destructor. He would mention a point in this matter which might be of interest. Their burgh electrical engineer had introduced a new cell which he thought would lead to a revolution in the design of destructors, and mean a great saving in their cost. This was a travelling chain grate, and the utilisation of water gas and he hoped by the adoption of this method that instead of burning the refuse in four cells he could do it all in one cell. The station was not always up by them to be used as a generating plant, and they got it at a very low rate if possible. They did not find it paid to have a lying steam and it was destroyed within a few hours of being delivered. Another point which occurred to him was the value of ground for workmen's dwellings. Mr. Goudie said, "We have ground [illegible] which we let at £10 per acre for [illegible]." We have tried to favour the building [illegible] but as far as they have not been taken up. He was surprised at this. Of course, it showed the rooted affection of the people of Scotland to the old style of building, probably also a preference to live in the old historical streets of Stirling than to go out to a modern house or cheap cottage in the country. That prejudice had to be overcome by education, but there was [illegible] an increased necessity due to overcrowding and the insanitary conditions which must accompany full working time, when [illegible] to go home for some nourishment at [illegible] the municipality or by some support that [illegible] should be done on behalf of the people to provide them with cheap dwellings. He did not know many towns in Scotland or England which had this opportunity of land at £10 per acre. They could put twenty houses on an acre, which would only mean 10s. for the ground for one house. It seemed to him amazing that there was no public-spirited gentleman about Stirling who should take advantage of this, and advocate the removal from many congested houses in the streets of Stirling out to a more open country. Mr. Goudie said "one could appreciate the extra difficulties that would have to be encountered when they had grass plots and trees in working-class districts." Mr. Goudie was referring to town planning. He thought it would be very foolish to lay out any grass plots on streets in working-class districts. He thought it would be better to arrange to have 2 or 3 acres of open space for an area of about every 50 acres as a playground for children. There was no doubt a good many people had an objection to keeping a garden in order, but by this provision of a small open space of 2 or 3 acres dotted about here and there they would get the best results in any laying out of a town planning scheme.

The President wished to associate himself with the remarks which had been made as to the way in which the town appeared to be managed. He congratulated Mr. Goudie and the council on the cleanly condition of the town. He would like to add one or two words in reference to refuse destructors. There was no necessity for a refuse destructor to be a nuisance, if it was of proper design and, above all, properly managed. There was in West Bromwich for many years a strong objection to the erection of a destructor—in fact, for many years the townspeople would not hear of it. They continued what he considered the abominable practice of dumping the refuse in disused marl-houses—not only the house refuse, but, what was a greater abomination, the refuse from the old middens, which many in England still unfortunately possessed. It was a great nuisance and detrimental to health. After a long time they persuaded the council to have a refuse destructor, and they built the most up-to-date plant they could obtain, and he had never seen or heard any complaint since it had been erected. They adopted somewhat the same principle as Mr. Brodie—they did not allow the refuse to accumulate. They destroyed it as fast as it came on the ground; but he certainly thought the suggestion of Mr. Brodie to have extra wagons was a very good one. In the very enjoyable visit which the institution paid to Paris at Whitsuntide, they found the Paris authorities had decided to take the whole of their house refuse 8 or 9 miles from the city. They had what he thought was a poor show; they were sorting their house refuse, taking the paper and tins out of it; but later on they intended to erect a destructor 8 or 9 miles out of the city. They evidently did not wish to have a destructor built in the city. That was a question of cost. It was an expensive matter to cart their house refuse 8 or 9 miles out of the city, and if they could have it within a reasonable distance there was no reason at all why it should be a nuisance.

The vote of thanks having been passed,

Mr. Goudie, in reply, thanked the members for the way in which they had dealt with his paper. Mr. Holmes had spoken about the burning of garbage in the kitchen grates. There was something in that if the public would take advice. Their refuse was of a very light character. It was difficult to handle as they used it in the tip, and as it was so light it was difficult to keep down. As to Mr. Holmes's suggestion for the making of the Shiphaugh into a park, there was no prospect of such a thing at present, but they were using part of it. Mr. Lee spoke of the 3 in. layer and on the top of the filters, and suggested the difficulty of handling it owing to the layer being so thin. His experience had been that, by putting 3 in. of sand on the top of the filtering media, it caught the stuff they wanted to catch in the water, and it was deposited on the top of the sand in the form of a skin, and it did not go into the sand at all. The reason he could not put it on all his filters was that the consumpt was up to such an extent in the winter, owing to the people turning on the water at night, and if there was this layer of fine sand on all the filters he would not get sufficient water through to the town. Mr. Lee had said there was no complaint of the destructor at Paisley. He thought Edinburgh was the only town where there was a complaint. The Edinburgh destructor had been a nuisance to all the people connected with it. They believed it was cheaper to contract for horses rather than to buy them, and they

certainly had less trouble. Mr. Smith asked as to the cost of the road metal. He debited the roads with the metal at 3s. 6d. per ton. The quarry got some profit out of that price, which covered all charges, including royalty: Mr. Forbes asked as to the road grant. The explanation of the Road Board was that Rocmac was not dustless, and they were giving grants only for dustless roads. In his interview with them he said that tar-macadam was not altogether dustless. They admitted that, but said there was less dust on tar-macadam than Rocmac, and could not see their way to give them a grant, although they had given grants to other authorities. Mr. Brodie asked if they had difficulties with setts on some of the gradients. They had had some difficulties in the higher part of the town, and had got over them by cutting out a space between the setts. Mr. Brodie also asked as to tarred roads. They had had a grant of £500, and on the main North Road they were laying a mile to a mile and a quarter of tarred road. The metal was mixed through a small tarring machine. It was made locally. The tar he was using was 80 per cent of refined gas tar and 20 per cent of bitumen. Mr. Young asked about the reducing valve. It was a very simple type; it could not be adjusted at all. They had to reduce either one half or one third. He was also asked what was done in the case of fire. There was a by-pass worked by string to each valve, so as to shut them off at any time. Mr. Young also asked as to private roads. In their case they only took over the carriageways. They did not have any specification for roads. Almost all the ground belonged to themselves, and the roads were made by their own workmen under his supervision. There was only one other road which had been made in his time, and it was not taken over until they had made it to their own satisfaction. He gave the owner an estimate of what it would cost to put it into a satisfactory condition. He was also asked whether the Rocmac was put down on the concrete system. No; it was brought up from below. Mr. Bryce spoke about grass plots and trees in working-class districts being foolish. He was of the same opinion, but it seemed to be one of the things that was coming. He was afraid the people would have to be educated to it before it was in good order. Mr. Bryce also suggested two or three acres of open space in every 50 acres. That seemed a very good idea for children to play in, with a large park for adults. He could only thank Mr. Greatorex and all the members for the kind manner in which they had received the paper.

The members were entertained to luncheon by the council at the Golden Lion Hotel, and the afternoon was devoted to the inspection of the public works and roads and Stirling Castle.

*(To be concluded.)*

## ANNUAL DINNER.

In the evening the annual dinner was held at the Golden Lion Hotel, Mr. A. D. Greatorex, president, in the chair.

Mr. J. P. SPENCER (North Shields) proposed the toast of "The Stirling Town Council." He had, he said, twenty-four hours to qualify himself for the performing of this task. The history and prosperity of Stirling was of world-wide renown, and travellers from all parts of the world who visited Scotland made Stirling a visit, and he was pleased to say they found an up-to-date town. He also thanked the corporation for fostering the beauties of the town. With every modern convenience and comfort he found that the council had determined that the ancient and historic landmarks of the town should not suffer. They had heard that day of two Stirlings—a modern town and the ancient. The old town was full of historic interest, and the modern town was up to date, and what might be called a suburban town. It was to the credit of the town council that they had done everything to preserve the landmarks. The visitors had been pleased with the wide streets, the excellent shops and the appearance of cleanliness.

Provost BAYNE, in reply, said Mr. Goudie and Mr. Murray and other officials gave the best of service, and were always at their post.

The PRESIDENT said they had arrived at an important point in their proceedings—a presentation to Mr. Bryce, vice-president of the institution.

Mr. F. G. HOLMES (Govan) said it was fully ten years ago since Mr. Bryce conceived the idea of forming a Scottish Institution of Municipal and County Engineers, which was highly approved of, and seventy-two members joined the institution. The then president (Mr. Weaver) suggested that they should join the English association, and gave excellent reasons for the faith that was in him. Eventually they came to see it was a wise course, and everyone now agreed that it was a wise thing to do, and we are part of an institution with 1,200 or 1,300 members, and we are getting the benefit from these members in all parts of the globe. On that ground he thought it was a proper thing they should link their forces together. For years he acted as secretary of the institution, and also of the Scottish district of the institution. He brought the Scottish branch to its present state of great prosperity. It afforded him great pleasure to hand over to Mr. Bryce a standard drawing-room lamp as a memento of his services, and to Mrs. Bryce he had the pleasure of handing over a watch-bracelet, for the great help she had been to her husband.

Mr. BRYCE, in acknowledgment, said it was difficult for him to say anything. Their kindness was so overbounding that it was difficult almost to return thanks, though he wished most sincerely, on behalf of his wife and himself, to thank them. For twelve years he had given service to the institution. With others he started the Scottish association, and still remained a member of the old association. The Scottish association was short-lived, but it had a very stimulating effect on the old association. Soon afterwards the old association started a Scottish district, and then the wedding took place between the two associations. He was pleased that Mr. Weaver was present on an occasion when they marked another step forward. They had had some good meetings in Scotland, but the Stirling meeting stood out among them, and they had the members of the Road Surveyors' Institution with them as members of the institution. Though they had only decided yet to have half-yearly meetings, they might have quarterly meetings; they wanted to be heard, and not treated always as children by Local Government Boards and Road Boards. They wanted to be treated as men.

Bailie BUCHANAN proposed the "Institution of Municipal and County Engineers." He said since the union of the institution its fortunes had gone up steadily, no doubt due to the infusion of Scottish blood. It was the wish of all that this institution might prosper and increase in usefulness.

The toast having been honoured,

The PRESIDENT, in reply, briefly referred to the growth and prosperity of the institution. The present membership was over 1,300, including most of the chief engineers and their chief assistants, both in the United Kingdom and the Colonies. He referred to his friend Mr. Cole, who had been secretary of the institution for thirty years. The council were considering the formation of a Mutual Defence Fund, and had appointed a committee to consider the question with a view to the defence of any member who needed assistance.

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The second day's proceedings were devoted to a motor drive to Lochearnhead by way of Doon, Callander and Strathyre, the return journey being made by way of St. Fillans, Comrie and Crieff. The trip was most delightful and was thoroughly enjoyed.

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**Chloros Disinfectant.**—The United Alkali Company, Limited, of Liverpool, have issued a useful booklet in which are given directions for the use of that widely used disinfectant, "Chloros." The value of "Chloros" for disinfection purposes in hospitals, sanatoria, asylums, and workhouses has long since been established, and its use in connection with the deodorisation of drains and sewage and for street washing is extending more rapidly than ever.

**Callender's Sheeting.**—Messrs. George M. Callender & Co., Limited, 25 Victoria-street, London, S.W., have issued a new catalogue, which, in addition to pointing out the value of their famous bitumen sheeting as a waterproofing medium, contains a large number of admirably produced photographic views of works on which that material has been employed. It is not too much to say that Callender's sheeting is an important factor in the economical waterproofing of such structures as reservoirs, filter-beds, swimming baths, aqueducts, and so forth; its reliability in these connections has now been practically demonstrated throughout the world. The material is stated to be absolutely free from coal tar, pitch, or any artificial product, while the special asphaltum from which it is made possesses a great range of elasticity and permits of a variation of tempering to suit all climatic

# Association of Somerset Surveyors.

## MEETING AT GLASTONBURY.

The Association of Somerset Surveyors held their bi-monthly meeting at Glastonbury on June 1st. There was a good attendance, those present including the Mayor of Glastonbury, Messrs. H. T. Chapman (county surveyor of Somerset, president, in the chair), F. Parr and W. A. Collins (Bridgwater), vice-presidents; F. W. Jones (Frome, hon. secretary), G. Alves, H. N. Alves, O. W. Berry, C. Brown, J. A. Beynor, L. Caplin, W. H. Cousins, C. Durie, H. A. Endsor, E. H. Knapman, J. Lovell, E. H. Padfield, E. J. Hains Padfield, H. B. Rogers, E. Stead, R. M. Stone, R. Stephens, C. H. Sunderland, E. A. Wadmore and G. A. Taylor. The visitors included Messrs. H. R. Carr, of Bristol, and C. A. Fothergill and J. W. Smith, of Exeter.

The Mayor of Glastonbury extended a kindly welcome to the association, and the president afterwards called upon Mr. Carr to explain the scheme of sewerage and sewage disposal which has been designed for Glastonbury by Messrs. Cotterill & Carr, MM.INST.C.E., of Westminster and Bristol.

A paper by Mr. R. Morton Stone, on "Bridge Building on Sedgemoor for the Somerset County Council," then came up for discussion, after which a visit of inspection was paid to Pons Perilis Bridge, where the contractors for the new bridge, Messrs. Fothergill Brothers, of Exeter, had kindly arranged for the work of driving the reinforced piles to be in progress.

The members and others present next had the pleasure of being conducted over Glastonbury Abbey.

At the kind invitation of the mayor the association partook of tea at his residence, and, following votes of thanks to those who had contributed to the success of the meeting, the proceedings terminated.

### BRIDGE BUILDING ON SEDGEMOOR

By R. Morton Stone,
Assistant Engineer.

The rebuilding of Hartlake and Pons Perilis Bridges on Sedgemoor, close to Glastonbury, is of interest chiefly owing to the means adopted to ensure stable foundations for the new structures. For a considerable area Sedgemoor may be described as a peat bog, of an average depth of 16 ft., overlying clay which becomes harder as the depth increases until the bed is reached, below which our borings have not been taken. In some cases it was found that a layer of peat occurred some feet below the top of the clay.

#### THE OLD BRIDGES.

The great weight and vibration of modern traffic would seem to have been mainly responsible for the failure of the old structures. In each case the bridge was broken more or less regularly along its centre, longitudinally with the span. The piers and abutments had settled unequally, each half inclining in opposite directions.

The sinkage appeared greatest at the abutment ends, and one reason which may be assigned for this is that the friable peat supporting the raft would probably be rendered less stable here than in the centre of the structure, by the natural scour of the stream against an obstruction, such as a pier or abutment end. In the case of Pons Perilis Bridge the crack, which had not before been considered dangerous, was found to have perceptibly widened during the drought of last summer, probably owing to the shrinkage of the clay bottom following an unusually wet winter. After the severe frosts early this year a further opening was observed and the bridge at once closed to traffic.

Hartlake Bridge, near Glastonbury.

#### RELICS FOUND IN EXCAVATION.

At a depth of 13 ft. below the road at Hartlake, and 3 ft. or 4 ft. under the raft, a number of squared oak baulks were found, jet black, of large scantling, and in a good state of preservation. These seemed from the position they occupied to have formed part of an early roadway; some pieces contained dowel holes, and were shaped after the manner of a ship's rib. It is also of interest to note that at the same depth a moulded plinth or column base block of Doulting stone was found, this being of similar design to those at Glastonbury Abbey.

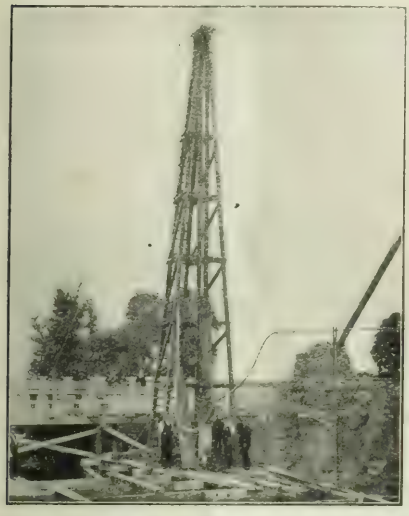
At Pons Perilis portions of a former masonry arch and paved invert were discovered, showing that the road and river had been at a considerably higher level.

#### COMPARISON OF OLD AND NEW METHODS.

The demolition of the old bridges clearly showed that the methods of foundation construction have not altered much during the last century, while execution and materials have vastly improved. A reference to the accompanying sketches of old and new methods will illustrate this point.

The old bridge at Hartlake was founded about 1 ft. below the bed of stream on elm-slab rafts, supported by round timber piles about 5 ft. in length and driven into the peat.

At Pons Perilis, which was a modern structure in comparison (eighty-five years old), the abutments were founded on elm slabs, 9 in. thick, bearing on transverse baulks of the same timber, laid at a depth of 2 ft. below the bed of river. In each case the rafts thus formed had given at half-way through their length where the joints in the slabs also occurred.



PONS PERILIS BRIDGE REBUILDING: DRIVING CONCRETE PILES WITH STEAM "MONKEY."

### THE NEW BRIDGES.

Enough has been written to show that the problem which in each case confronted the engineer was to provide for a secure and reliable foundation, with due regard to economy and the possibility of still heavier traffic in the future. The live load allowed for in the design of the new bridge is 4 cwt. per square foot of load surface, or 25 tons per axle on two axles 12 ft. apart.

### MODERN METHODS OF DEEP FOUNDATION WORK.

It will be evident that to carry the solid foundation down to the clay would be an extremely costly matter. Iron screw piles may be regarded as anything but permanent supports. Steel cylinder foundations are often utilised, but in the author's opinion are unsuitable in many ways for small highway bridges over shallow rivers. A reinforced-concrete piled foundation seems most desirable from every point of view, and this has been adopted with, in the case of the completed bridge (Hartlake), eminently satisfactory results.

Generally speaking, this may be described as an immensely strong table on which the ordinary arch abutment is built. It will be seen that the piles form legs, the beams rails, and the slab the table top. Further, should the whole of the friable peat be washed away at any time, which might easily occur in tropical countries, the piles are driven to a sufficient depth in the hard subsoil (lias clay in this case) to form secure column supports, so that the structure would remain stable and still serve the purpose for which it is designed.

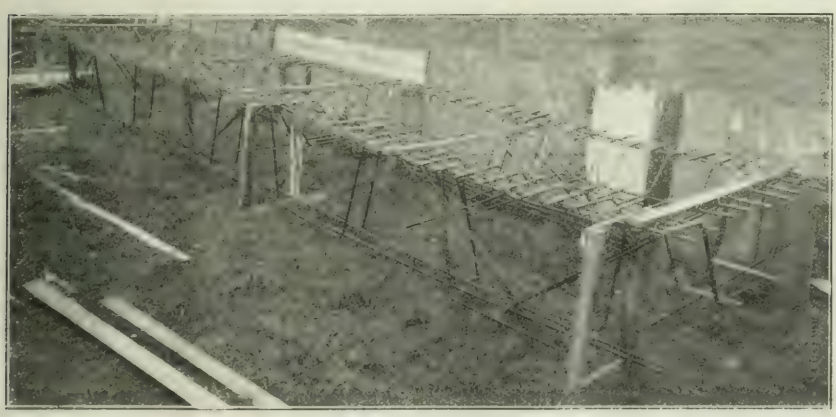
### PILES.

The piles are reinforced longitudinally with four 1¼-in. indented steel bars, bent at the foot, to fit the iron shoe, and laterally to resist bursting stresses with 9-32 in. diameter patent helical-steel wire bindings, the pitch of which varies according to position of the pile. The piles were moulded horizontally, the concrete being composed of two and two-thirds granite chippings, one and one-third sand, and one of Rugby Portland cement, and were allowed twelve weeks to set before being driven.

### PILE-DRIVING.

The driving gear consists of an ordinary pile frame, with a 2¼-ton monkey. The operation of driving is as follows: The pile having been pitched truly and secured to the frame, a bag of sawdust is placed on the head as a cushion between the concrete and the cast-steel driving cap fitted over the head; this cap carries the usual elm timber dolly, which actually receives the blows of the monkey.

The modern steam monkey used at Pons Perilis is much more satisfactory for driving concrete piles than the old solid pattern used at Hartlake, and the regular and rapid succession of steady blows obtained keeps the pile "on the quiver," and thus enables the water to find its way round the pile, which facilitates driving. Some of the piles at Hartlake were driven until the set was only one-third of an inch in ten blows. In two cases the sawdust cushion was dispensed with, and the driving cap placed directly on the pile head, where two piles were not considered to have been driven to a sufficient depth. There was no perceptible difference between the set of these and adjacent piles driven to level with cushion. In the case of the pile which made one-third of an inch in ten blows the concrete head began to scale away from the reinforcement for about 15 in. below the head only. To drive a pile to such an extent is, in the author's opinion, quite unnecessary for any ordinary purpose, as experience proves that the skin friction is so considerable, even in peat, as to be a very great factor in determining the bearing capacity. Anyone



PONS PERILIS BRIDGE REBUILDING: STEEL REINFORCEMENT IN BEAMS AND SLABS FORMED ON HEADS OF PILES IN ABUTMENT FOUNDATIONS.

who may have had occasion to draw a pile which has been partly driven, and which may have been standing for a short time, will no doubt have realised this. The piles are comparatively blunt-pointed, and are designed to be driven through the peat to a bearing in the lias clay.

Pile-driving formulæ seem to vary considerably, and in any case of doubt it is well to apply a test load, which can be easily arranged.

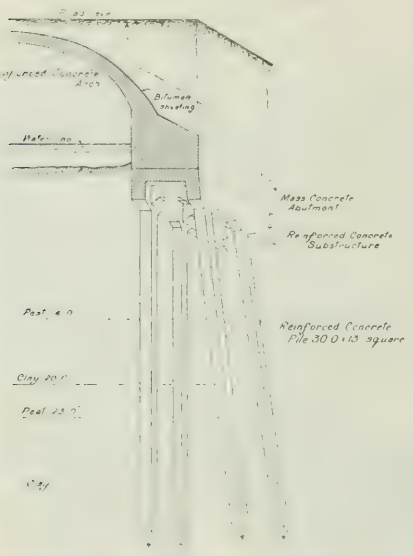
Obstructions such as large stones or tree trunks in the peat caused the feet of some of the piles in the early stages of driving to shoot, throwing the pile out of perpendicular. Timber-raking struts from adjacent walls or piles soon brought these upright again, each successive blow naturally tightening the strut and forcing the obstruction on one side.

### LOAD ON PILES.

The total load on each pile is 28 tons at Pons Perilis, and rather less at Hartlake. Taking the safe supporting power of the peat as 5 cwt. per super. foot of pile,* and allowing 28 ft. effective length of pile, each will carry 30 tons. As, however, the greater length of the pile is in hard clay, it will be evident that this is much below its safe bearing capacity.

### SUBSTRUCTURE.

All pile heads in each pier and abutment are connected longitudinally and transversely by beams. Upon and monolithic with these are the foundation




New Bridge at Pons Perilis: Section of Abutment.

(Piers and abutments at Hartlake are of similar construction.)

labs. The cut-waters provided at the end of each pier at Hartlake are built up on cantilevers from the outer piles.

### METHODS OF ERECTION.

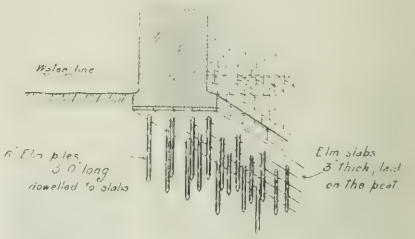
In forming the slabs and beams connecting the heads of piles, the excavation was first carried down to a depth of 12 in. below the abutments and piers. Ordinary wooden shuttering was then fixed round the pile heads, which had been previously denuded of concrete, leaving the four main reinforcing bars protruding into the beams; the beam and slab bars are then fixed in position, and concrete rammed round them to the depth shown on plan. Each pier and abutment substructure apart from the piles was completed at one operation, care being taken to make a good joint between concrete of beams and pile heads.

### REINFORCEMENT.

Top and bottom reinforcement in beams and slabs of indented steel bars is designed to take all the tensile stresses; also, shearing stress in excess of 60 lb. per square inch in the beams is resisted by steel shear bars connecting the reinforcement. The arrangement of these shear bars, believed to be original, gives a perfect mechanical bond, and forms the beam reinforcement into a truss in a most economical manner. The concrete in beams, slabs and arches consists of three parts of ¾-in. granite chippings, two parts of sand, and one of cement. The safe stresses allowed are steel, 17,000 lb. per square inch, and concrete, 600 lb.

### PIERS AND ABUTMENTS.

The faces of piers and abutments are reinforced with vertical rods, which resist any tendency of the mass concrete pier or abutment to overturn. These vertical rods also form a connection between the steel in the beams and slabs and the arch reinforcement, which consists of carrying and distributing bars in the form of a mesh in two rings, as shown on the plan. Therefore it may be fairly claimed that the structure is monolithic from the feet of the piles to the crown




Old Bridge at Hartlake: Section of Pier.

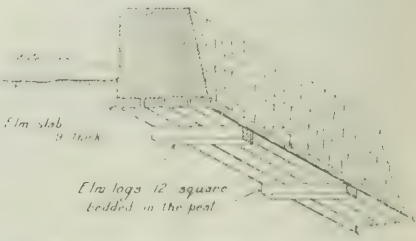
of the arch. And in this respect alone the great advantage of reinforced concrete construction is clearly shown for bridges and almost any other structures.

### ARCHES.

The arches were designed by the ordinary graphic method, steel reinforcement being introduced to take all tensile stress. The arch at Pons Perilis is 10 in. thick at the crown and 13 in. at the springing. The span is 25 ft. and the rise 6 ft. The arches at Hartlake were thinner and of lesser span. The arches are covered throughout with a waterproof layer of Callender's bitumen sheeting, which is carried up the spandril walls and bedded under the string courses. Spandril walls are provided in each case of mass concrete, with freestone string courses, parapets and coping. The hood mould is not run in the ordinary way, but moulded with the arch.

### DETAILS OF CONSTRUCTION.

Local labour was employed, and no difficulty was experienced in getting all portions of the work carried out as specified. A fairly wet concrete was mixed by hand, and thoroughly rammed round the rein-




Old Bridge at Pons Perilis: Section of Abutment.

forcements with iron rammers.

Experience shows that the simplest way of obtaining the correct proportions in the concrete is to have gauge boxes made to suit one bag of cement. Unskilled labour then finds it easier to do right than wrong, and such a batch is conveniently handled by a small gang of men.

All bars were bent on the site, the "bloom" on the steel being got rid of by the simple process of leaving them exposed to the weather prior to bending and fixing, when the handling involved effectually removed the rust which had formed.

Hartlake Bridge was completed, at a cost of about £1,200, during the winter of 1910-11, by Mr. Ernest

* Ellis on Reinforced Concrete Wharves. Proceedings of Institution of Civil Engineers 1911-12.

Ireland, of Bath, whose skill in such work was clearly demonstrated during the almost continual floods which occurred during that period, and which rendered deep foundation work extremely difficult.

The contract for Pons Perilis Bridge has been let to Messrs. Fothergill Brothers, of Exeter, who are making excellent progress with the work.

The author desires to thank Mr. H. T. Chapman, the county surveyor, for permission to read this paper. Mr. Chapman's strong advocacy of reinforced concrete as a bridge-building material has been amply justified by the successful completion of no fewer than sixteen bridges in the past four years.

These bridges have been designed by Mr. E. J. Stead, ASSOC.M.INST.C.E., with whom the author has been associated.

## SOME RECENT PUBLICATIONS.*

THE THEORY AND PRACTICE OF HEATING AND VENTILATION. By A. H. Barker, B.SC., B.A. Price 25s. nett. London: The Carton Press.

This book may best be described as an attempt to deal in a comprehensive manner with the subject of heating and ventilation treated scientifically. The author brings to his task very considerable qualifications, both practical and theoretical, and the result is a volume which we have no doubt will speedily take its place as the standard work on the subject in the English language. The earlier chapters are devoted to a *résumé* of the leading principles of those branches of pure and applied science which form the stock-in-trade of the heating and ventilating engineer. Following upon a consideration of air currents and the means, natural and mechanical, by which they may be produced, there are exhaustive chapters on the calculations required in the design of ventilation schemes, in which graphical methods are liberally and effectively used. The chapter on Fans affords an excellent illustration of the principle which the author has adopted in dealing with the practical parts of his subject. The actual details of construction are not described, but only sufficient information is given to enable the reader to apply the scientific principles to the problems of daily practice. The transmission of heat is dealt with at considerable length, as its importance demands, and the various methods of heating are fully discussed. Then follow practical chapters on the combustion of fuel, boilers, chimneys and draught control. The all-important subject of pipe sizes is fully discussed, both theoretically and in a simplified manner for practical use. The various systems of heating are described and considered, and the final chapter treats of the testing of plant. It will be seen from the foregoing summary that Mr. Barker's book covers all the ground appropriate to his subject, and in the space of its 640 pages, clearly written and well reproduced, both as regards letterpress and diagrams, the heating and ventilating engineer will find any required branch of his profession dealt with on scientific principles. The book forms a most important contribution to the literature of the subject, and its value lies in the fact that every question is dealt with theoretically and not in the empirical manner which is adopted by so many writers on such matters.

CONCRETE COSTS. By Frederick W. Taylor and Sanford E. Thompson. Price 21s. 6d. nett. New York: John Wiley & Sons.

It is not an over-statement to say that this is one of the most important books on concrete that has yet appeared in the United States, if, indeed, it is not the most important book on the subject that has been published. It is written by the well-known authors of "Concrete, Plain and Reinforced," which was published a few years ago. In brief, it may be said that "Concrete Costs" is a treatise in which the principles of scientific management have been applied to this type of building construction. Mr. Taylor's work on the general subject of Scientific Management is well known. Mr. Thompson has been applying these principles for seventeen years, and during this long and elaborate study has accumulated an enormous amount of valuable material. The data secured by this investigation are here condensed into tables and diagrams for the practical use of engineers.

At first glance the reader will be confused by the abundance of the material presented, but on further examination of the book he will discover several chapters in which the information has been generalised. Starting with these, he will gradually become interested in the details of the work as they are developed, and will appreciate the enormous amount of time and thought that has been given to it. The first three chapters of the book summarise the general results in about fifty pages, and include tables that will be found useful in making estimates. These tables give approximate [illegible] tures, of mixing and placing concrete, of miscellaneous forms, of labour on steel reinforcements, of finishing concrete surfaces, and of miscellaneous work entering into completed buildings. Methods are given for computing the cost of buildings on the basis of square foot of floor area, and on the basis of cubic capacity, and examples are given showing the manner of applying the methods suggested. These approximate figures are intended for rough estimates only. For more accurate work the tables given in subsequent chapters are to be used. With Chapter IV. begins the detailed account of the collection of the data. This consisted in making observations of the time required by men to perform the various kinds of work in concrete construction. This time study was taken as the basis of the method of estimating. The work of the labourers was divided into small units, and the cost of each of these units was accurately determined. These were finally combined to obtain the cost of the whole. One cannot help admiring the patience that must have been required in estimating these minute details. Taken by themselves, they seem trivial, but combined as they have been, the results are of great practical value. Chapters IX. to XII. relate to methods of mixing and using concrete. These are set forth with much detail. Subsequent chapters describe methods of constructing arch centers, forms for reinforced concrete, and the cost. The last chapter in the book covers the general subject of methods of estimating, and describes the manner of using the tables in practical work.

This book is one which no engineer or contractor can afford to be without, for even though the costs refer to American conditions and not to English conditions, the method of procedure is one worthy of adoption. For the convenience of readers outside the United States, convenient conversion tables are given on the inside back cover. The book is compactly printed, the type being good and the margins purposely made small in order to reduce the book to one of convenient size. Mr. Taylor, in his general introduction, says: "It is our firm conviction that the introduction of the principles of Scientific Management into this field will produce the same beneficial results that have been secured elsewhere; that high wages earned by the workman and a low labour cost secured by the employer will convince both sides that it is for the interests of each to have the welfare of the other at heart; that friendly co-operation is better [illegible] open antagonism; that peace is better than war. And if this book helps in bringing about this result, it will have fulfilled its most important object."

SIMPLE CALCULATIONS FOR SANITARY OFFICIALS AND STUDENTS. Price 1s. nett. London: The Sanitary Publishing Company, Limited.

This little book of thirty-four pages has been prepared to meet the demand for a work dealing with calculations such as have frequently to be made by sanitary inspectors and officials. It thus deals only with elementary matters of every-day occurrence, such as the mensuration of simple rectilineal figures, the ellipse and simple curvilinear figures, the cubic contents of the cylinder, pyramid and cone. Rules are also given for finding the quantity of water in a pipe, the velocity of flow in pipes, the discharge from pumps, and for making calculations in regard to ventilation. The book concludes with twenty-four typical worked examples. It is an unpretentious volume, and contains nothing very novel. At the same time it will doubtless be found useful by many inspectors and others as a collection for ready reference of just those mathematical problems which are apt to crop up for solution at any time.

Owing to the numerous important and interesting ferro-concrete works awaiting description and illustration, for which the ordinary issues do not provide adequate space, [illegible] The issue will constitute a complete epitome of ferro-concrete construction in various branches of engineering and architectural practice.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

## CORRESPONDENCE.

*"Men are not apt to settle a question rightly as soon as they discuss it freely."* Macaulay's "Critical and Historical Essays."

### THE SOUTHPORT APPOINTMENTS AND IMPROMPTU EXAMINATIONS.

*To the Editor of* The Surveyor.

Sir,—Although I was one of the unsuccessful candidates for the recent appointments in Southport, my sense of fairness prompts me to express my disagreement with the views expressed in "Anti-Humbug's" letter.

The test we were put to took place in a large hall in which a couple of joiners were working. We were asked if their work disturbed us in any way, and told that if so they would be removed.

It seems to me that the questions were put to obtain, in addition to the theoretical qualifications, some idea of the draughtsmanship of the candidates.

This is a subject which is not included in the examination for associates of the Institution of Civil Engineers, but it is, in my opinion, a very necessary qualification for a post in a borough engineer's office.

The questions named in "Anti-Humbug's" letter were, roughly, those put to candidates for the junior position, as far as my recollection goes.

There are, unfortunately, a few men who are not above placing before a Selection Committee plans which are not entirely their own work; such a test shows them in their true colours, and therefore I welcome it.

The suggestion in "Anti-Humbug's" letter that the questions might be conveyed to favoured candidates is beneath contempt. As far as I could judge, the two best men got the posts, and with that I was satisfied.

Let us have more of these tests, let the best man win, and let us have less favouritism and humbug in these appointments.—Yours, &c.,

"Fair Play."

June 11, 1912.

*To the Editor of* The Surveyor.

Sir,—I was surprised by the letter which appeared under the above heading in your last issue.

"Anti-Humbug" appears to be somewhat disappointed at the result of the "impromptu examination," and has the audacity to suggest that some of the other candidates may have been supplied with copies of the questions previous to the date of the examination. At the same time he is surprised that the capabilities of an "engineer," especially associates of the Institution of Civil Engineers, should be further tested; surely, if one is so highly thorough, why be over-anxious about obtaining the questions beforehand?

In regard to the questions, personally I consider them very reasonable, and if more such tests were applied in making appointments, we should be a step forward in having the right man in the right place.

Why exclude the question of printing and tracing? I know of many "engineers" who cannot do either so as to be presentable.

In conclusion I may say that I consider it presumption on the part of "Anti-Humbug," a candidate for the post of an engineer's assistant, to depreciate the value of "nine out of every ten" of those holding chief positions in this country. Speaking in regard to the surveyor of the town in question, I guess "Anti-Humbug" would pass a first class examination on both theoretical and practical work in addition to that and finish up with a sound knowledge of himself.

"Oh! wad some power the giftie gie us
To see oursels as ithers see us!"

—Yours, &c.,

"Talentonian."

June 10, 1912.

### CEMENT AS A ROAD BINDER.

*To the Editor of* The Surveyor.

Sir,—In reply to the invitation contained in your recent article, I should like first to explain that the piece of road is one having no considerable traffic, but very apt to become muddy owing to a strong clay subsoil. The repair of such a road with soil or scrapings has always appeared to me objectionable. Some time ago I attempted to repair a piece of road in this neighbourhood with no binding except slag dumpings. Next winter cartloads coming out of the adjoining land completely covered the road, and took portions of the metalling along with them.

I appeared to me that a foreign binder was necessary, and I considered that no better material than Portland cement. The road was first coated with stone and dry-rolled. A layer of slag screenings was then spread, watered and rolled. The cement was then sprinkled over the top, the road again watered and rolled. A second coat of screenings was afterwards spread over the road.

The reason why the cement was not mixed with the screenings was that I considered it would be washed to the bottom of the stones, where, with the small amount I felt justified in using, it could have practically no effect. To give cement a fair trial, I am now engaged in making up a more important piece of road, using a sub-binder of cement and sand, as well as a surface binder.

The chief objection raised to cement is that it will not reset if the bond is once broken. But to reset, a substance must first reliquefy, as tar does in hot weather and ordinary soil in wet weather. Can this be said to be an advantage in either case?—Yours, &c.,

Ralph Oakden, Junr.

Newark.
June 11, 1912.

### MUNICIPAL AND COUNTY ENGINEERS: MUTUAL AID AND PROTECTION: SECURITY OF TENURE.

*To the Editor of* The Surveyor.

Sir,—I gather from your issue of the 7th inst. that since you were kind enough to insert my letters on the above subject the council of the Institution of Municipal and County Engineers have had the question under discussion. I am glad this is so, and to see that some action is to be taken by that body direct. It will be my privilege to be again associated with the council in July next, when I shall be pleased to give my whole-hearted support to the movement.

In the meantime I am returning the many donations I have received from members and others (yours among the number) who have already been good enough substantially to support and to express sympathy with the scheme I had in mind.

To the letter on the subject signed "Frank Harris," which appeared in your issue of the 7th inst (in which letter a poor attempt at raillery was exhibited), the old proverb "Where ignorance is bliss 'tis folly to be wise" appears applicable. Yours, &c.,

H. T. Wakelam.

63 Victoria-street,
Westminster, S.W.
June 8, 1912.

*To the Editor of* The Surveyor.

Sir,—There is something peculiarly squalid in the small-minded endeavours which are being made in certain quarters to belittle Mr. Wakelam's scheme for forming a "Mutual Aid Protection Society."

It is impossible to misinterpret either the intention or the spirit of the vapid communication which appeared in last week's issue of The Surveyor, and drew from you a well-merited rebuke. Once again, be it observed, the wreckers' little game is to be tried.

Mr. Wakelam is to be warmly congratulated in recognising that the most pressing need is to raise a "special fund" for the protection of municipal engineers, and having for its object the assurance of powerful aid against those who unjustifiably oppress public officers in the performance of their public duties.

For years feeble and unconvincing efforts have been made to get both security of tenure and superannuation, but the results have been disappointing. I am sanguine enough now to believe that we shall ultimately succeed.

If security of tenure and superannuation cannot be obtained, then by all means let us have the "Mutual Aid Protection Society," which my friend Mr. Wakelam has originated.

The call for protection is the most natural demand that members can make on the council of the Institution of Municipal and County Engineers, and when Mr. Wakelam's scheme is laid before it the members cannot refuse to direct the movement. If they do, they will incur, and rightly so, a load of popular odium which will quickly force them to reconsider their policy.

Mr. Wakelam and myself will shortly take office on the new council as representatives of the Eastern district, and this is a point we shall undoubtedly support to the end.—Yours, &c.,

W. H. Prescott, M.Inst.C.E.

Engineering Department,
Town Hall,
Tottenham.
June 11, 1912.

## MUNICIPAL AND COUNTY ENGINEERS IN PARIS.

### THE WATER SUPPLY OF THE CITY.

Not a little of the time of those who took part in the recent visit of the Institution of Municipal and County Engineers to Paris was occupied with inspections of the city's water supply system, the members, as we have already stated, being afforded the opportunity of seeing not only the interesting types of reservoirs at Montmartre and Montsouris, but the extensive filtration works at St. Maur, where apparatus for treatment by ozone is in course of installation, and at Ivry, in which place a demonstration of the process of purification by ultra-violet rays was given.

The water supply of Paris comprises two entirely distinct systems of distribution, the first providing potable or private service water, furnished from spring water or filtered river water, and the second distributing crude river water for public use (washing and watering streets, urinals, fishponds, sewers, monumental fountains, &c.), and for industrial requirements.

#### SPRING WATER.

The spring water is conveyed by four aqueducts—viz., the Dhuis aqueduct, brought into use in 1865, and of a length of 81¼ miles; the Vanne aqueduct, completed in 1874, and of a length of 107½ miles; the Avre aqueduct, constructed in 1893, and of a length of 63¼ miles; and the Loing and Lunain aqueduct, laid in 1900, and of a length of 45¼ miles. The total daily supply which the four aqueducts in working are capable of furnishing is from 46,220,302 gallons to 68,229,969 gallons, according to the year and the season.

Works are now being carried out to increase by about 4,401,933 gallons the delivery from the Loing and Lunain aqueduct, and a new aqueduct is projected to convey into the former an addition of 14,306,283 gallons of spring water coming from the neighbourhood of Provins.

#### FILTERED WATER.

When the outflow from the springs is insufficient, or when the water from some of them becomes turbid in consequence of rain, or suspect owing to cases of epidemic notified within the area of feed, or, lastly, in case of accidental damage to an aqueduct, filtered river water is used to supply the deficiency in the private service.

There are two filtering establishments, one being situated on the Marne at St. Maur, constructed in 1896, and capable of supplying 3,301,450 gallons daily. Important works of transformation and enlargement are proceeding; ozone sterilisation works are also being constructed. When these works are completed, the St. Maur establishment will be able to supply 17,607,734 gallons of filtered and sterilised water daily.

The second filtering establishment, situated on the Seine at Ivry, was constructed in 1896, and afterwards enlarged in 1900. It produces 13,205,800 gallons daily, and is shortly to be completed by a sterilisation plant which will double the productive capacity of this establishment.

#### CRUDE RIVER WATER.

Crude river water is pumped either from the basin of the Villette, where it is met by the Ourcq canal, which serves both as an aqueduct and as a navigable waterway (Ourcq and Villette works), or from the Marne (St. Maur works), or from the Seine (Ivry works, Nos. 1 and 2, Bercy, Austerlitz, Auteuil and Javel works). Altogether, these works can raise 154,067,663 gallons daily. It is proposed to enlarge two of them—Austerlitz and Auteuil—in order to meet the increasing consumption.

#### RELIEF WORKS.

There are also several relief works, intended to raise spring or filtered water and crude river water to higher levels in order to supply the high-lying districts of the capital. These are the Ourcq, Charonne, Montsouris, Gentilly, Ménilmontant and Montmartre. The power of the last two is shortly to be reinforced, in order to render it possible to supply the upper stories of private houses on elevated sites.

#### RESERVOIRS.

The reservoirs devoted exclusively to potable water are the one at St. Cloud, which receives the water from the Avre, and the one at Montsouris, which receives the waters of the Vanne, of the Loing and of the Lunain. Certain reservoirs comprise special basins for potable water and others for crude water; such are the one at Ménilmontant, which receives the waters of the Dhuis into its two upper divisions and water from the Marne in its lower divisions; the reservoirs at Passy, at Charonne, at Belleville, and at Montmartre (this last is in three floors). Lastly, other reservoirs receive crude water only. These are the ones at Villejuif, at Buttes Chaumont, and at Glentilly. The total storage capacities of these reservoirs are: 132,278,102 gallons of potable water and 44,679,625 gallons of water for public and industrial use.

#### DISTRIBUTION.

The private service and the public and industrial service are supplied by two entirely independent systems, of which the conduits are generally laid in the interior of the sewers, but sometimes in the ground. Every street is thus supplied by two parallel conduits, one for potable water, the other for river water.

The systems are so arranged as to permit a compensation supply to be furnished in case of interrupted service by one conduit. For both kinds of water the distribution is effected by storied zones corresponding to the levels of the regulating reservoirs. But the supply of a zone can always be maintained from the one above by simple overflow, or from the one below by means of the relief pumping stations.

Important pipe-laying works are now being carried out, and others are projected, with the object of improving the pressure in various quarters of Paris and of enabling the river water to reach the upper stories of all private estate buildings.

The conduits are generally constructed as pipes of cast-iron—ordinary or hooped—or of reinforced concrete. The diameters vary approximately between 4 in. and 67 in., and their total length is about 1,706 miles.

#### QUALITY OF POTABLE WATERS.

Examination of the potable waters, from the point of view of their quality, is guaranteed by a special supervision service which takes samples from the springs, from the filtering works, and from various portions of the pipe systems in Paris, makes chemical and bacteriological analyses, inquires into causes of contamination, and notifies waters that are suspected.

Another department keeps itself well informed, from the medical point of view, of all cases of epidemic disease which may occur within the area of feed from springs, and takes all necessary prophylactic measures to avoid, as far as possible, contamination of the underground water.

#### DAILY CONSUMPTION.

This reached in 1911 an average of 66,909,389 gallons of drinking water and 121,493,365 gallons of crude river water, or a total of 188,402,754 gallons, which, for a population of 2,850,000 inhabitants, corresponds to 66 gallons per head daily. The maximum attained during last summer reached 93,542,537 gallons of drinking water and 153,627,480 gallons of crude water.

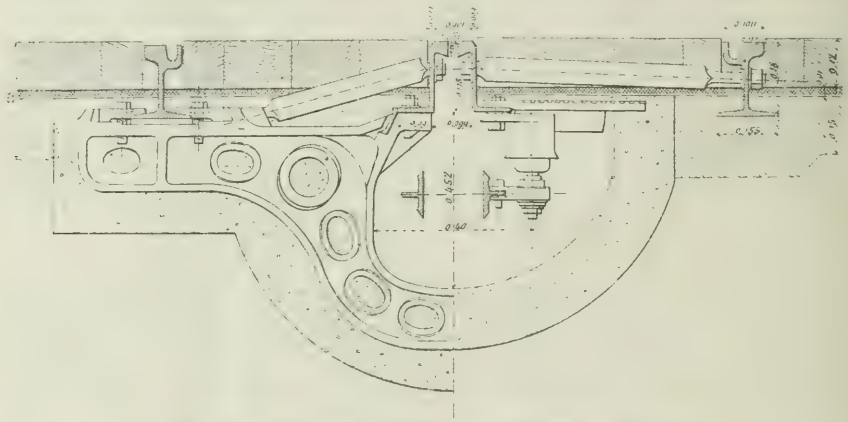
*Montmartre Reservoir.*—The reservoir of Montmartre, constructed in 1888-89, on the summit of the hill of that name, is used for supplying this elevated district with spring water and river water, these waters being pumped by the small relief works at Place Saint-Pierre. The reservoir, which is no less than 59 ft. in depth, is by the side of the basilica church, and is visible from several quarters of Paris. In consideration of this position it has been given a monumental character, which has been effected by means of arcades, balustrades and turrets in free-stone. It is divided into three superposed stories or decks, having a total capacity of 2,421,063 gallons, and rests on a floor drained by culverts that are large enough to admit of their being visited for inspection, and in which is arranged the pipe system that serves the three stories. The lower storey, devoted exclusively to river water, has a depth of 16 ft. of water; the middle storey, fed by spring water and capable of receiving a section of water of 11 ft. 7 in., entirely covers the preceding one, and both are divided into two basins by a transverse wall. They provide for the public service and the private service on the sides of the hill, and over the whole of its circumference. The upper storey, which supplies the summit, is in one single compartment, placed over the larger of the two basins of the middle storey, and it is provided with a covering formed by pillars and fish-bone vaults of bricks laid flatwise, with a layer of earth a little more than 1 ft. 7½ in. in thickness. The third storey receives spring water only, which is used for all purposes on the higher part of the hill. The hollowed-out floor is based on a thick platform of concrete, divided into two layers (which are separated by a conduit in cement with drains), and protected in front by a retaining wall.

The masonry work which has been constructed of millstone, with Portland cement mortar, is strengthened by iron girders on each storey. The construction of the reservoir involved an expenditure of £48,000.

*The Montsouris Reservoir.*—The Montsouris reservoir was constructed between 1871 and 1874, at the same time as the Vanne aqueduct, whose water it receives. Since 1900 it has also, as stated, received the spring water conveyed by the Loing and Lunain aqueduct. In plan takes the form of a vast rectangle of 869 ft. in length by 446 ft. in width. It is composed of two superposed stories, each divided into two compartments by a transverse wall. The depth of the water is 9 ft. 10 in. in the upper compartments and 18 ft. in the lower ones. The capacity of the former is 17,607,734 gallons, that of the lower 27,732,181 gallons, or 45,427,954 gallons in all. The waters of both aqueducts arrive in separate tanks, and thence are run off into the upper compartments. A small gallery runs all round the lower basins, and enables the work to be inspected. The upper compartments are covered in by means of vaults of bricks laid flatwise, supported by pillars, also of brick. A layer of earth 1 ft. 4 in. in thickness covers these vaults, and maintains the spring water at an approximate temperature of 10 deg. With the exception of this covering, the work is constructed entirely in millstone and Portland cement mortar. It is built on a site excavated by underground quarries opened in the rough limestone, which has necessitated some important consolidations. The establishment cost of the work amounted to £280,000. By the side of the Montsouris reservoir there is a small pumping station, which is provided with two Worthington pumping engines of 105-horse power each, and which is now being reinforced by the installation of two dynamo-pumps of 126 kilowatts. This pumping station serves to raise, when the needs of the distribution require it, Vanne water taken from the lower basins of the Avre system, the level of which is higher by 82 ft. than the height of the water in the Montsouris reservoir.

*St. Maur Pumping and Filtering Plant.* In order to increase the available capacity of filtered water, these works, which were visited on the second day of the meeting, are at present undergoing transformation, and new ferro-concrete tanks are being constructed, wherein several improvements, the utility of which has been proved by experience, will be carried out. On the completion of the works, the St. Maur plant will comprise nine tanks, with a total filtering area of 172,228 sq. ft., preceded by rough cleansers and preliminary filters presenting a surface of 68,891 sq. ft. There is also, as previously stated, being constructed at St. Maur a plant for sterilisation by means of ozone, which will enable a volume of 17,607,734 gallons of filtered water to be sterilised daily. The building containing this plant and covering surface of 9,149 sq. ft., is of ferro-concrete. The installation of the various apparatus is being carried out by the Compagnie Generale de l'Ozone. Lastly, a new pumping station is also being erected, this being intended to raise the above-mentioned volume of filtered water, and an additional volume of 6,602,900 gallons of crude Marne water, into the Ménilmontant reservoir. This pumping station, the buildings for which, having a total area of 29,069 sq. ft., are also constructed of ferro-concrete, will comprise seven gas engines of 400 h.p. each, with Rateau pumps, and four pumping engines of the same type, of 60 h.p., these latter being intended to raise crude water above the filtering tanks.

*Ivry Filtering Plant.*—This establishment, situated on the bank of the Seine, was constructed in 1899, and subsequently enlarged in 1906. In its present state it comprises thirty-five filters, with a total surface of 17,940 sq. yds., preceded by Puech gravel beds, with a surface of about 6,996 sq. yds. It is capable of furnishing a normal daily supply of 13,205,800 gallons of filtered water. The floors of the old filters rest directly on the soil, but the new ones have been laid on vaults, thus facilitating the discovery of fissures. In the former, the bed of fine sand, 17½ in. thick, was supported by beds of flint and gravel. For this preparation a floor of porous flagstones, of thin ferro-concrete has been substituted, enabling the thickness of the fine sand to be increased to 30½ in. The filtration speed is kept constant by means of Chabal regulating apparatus. After its passage across the filtering bed, the water passes into subterranean chambers (one per group of four filters), where it can be run off, either into the drinking water pipe system or into the pipes for non-potable water, according to the results given by the analysis of samples taken every day. Each of these pipe systems terminates in a special reservoir. The former is in communication with the suction pump gallery of the pumping station, the pumps being four in number, which force the filtered water either to the Charonne reservoir or to that of Montsouris. In times of flood, when the Seine water is turbid, the water is submitted to a double filtration. After a certain period of working, the level of the upper part of the sand bed is raised by mud deposits. The film which covers it is then removed. The soiled sand, thus extracted, is submitted to washing in a special apparatus, and is then used again. In addition to steam engines for the filtered water service, the Ivry works also contain four other engines which force crude Seine water into the Charonne or Villejuif reservoirs for public or industrial use. The Ivry establishment, as stated in our issue of May 31st, has at the present time in operation an experimental installation for sterilisation by means of ultra-violet rays.



Transverse Sections of New Conduit Tramways, Paris.

## THE PARIS TRAMWAYS.

The accompanying section will serve to indicate the method of construction adopted in connection with the new conduit tramways which are now being laid down in the city. In certain of the ogliances the lateral or side conduit is being installed, but the company to whom the municipal lines have been leased have adhered to the centre-slot system illustrated.

## CASWORKS.

Landy gasworks, St. Denis, over which the members of the institution were conducted during their stay in Paris, came into operation in 1889, being re-

# The Surveyor

And Municipal and County Engineer.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modelled and completed in the years 1908-11. The works occupy a site of 117 acres, and their daily capacity is 26,500,000 cub. ft. An interesting feature of the works is the comparative absence of manual labour, practically the whole of the operations being effected by electric power supplied from a station furnishing a continuous current of 220 volts.

## THE INSTITUTION OF MUNICIPAL ENGINEERS AND SECURITY OF TENURE.

A meeting of the members of the Southern District of the Institution of Municipal Engineers was held at the Institution Offices, 39 Victoria-street, on Wednesday, the 5th inst. The matter before the meeting was to consider the advisability of forming a local association for the purpose of becoming federated (so far as the local association went) with the N.A.L.G.O., and the chair was occupied by Mr. A. Winter Gray. Mr. Hill, secretary of the National Association of Local Government Officers, was present.

Mr. Winter Gray pointed out how the success of the association depended upon the co-operation of every member of the local government service. The Institution of Municipal Engineers was, he believed, the only body representative of municipal engineering officials which had as one of their defined "objects" the obtaining of security of tenure and superannuation. Members of the institution, and municipal engineers in general, had no idea of the time that the council had devoted, and were devoting, to this question. No professional association acting alone could, he felt, ever obtain these concessions from the Government. They could only be obtained by united action on the part of all local government officers. There was much talk now of mutual aid and protection, a legal defence fund, and so forth. These now formed part of the active work of the association, and no scheme run by a small proportion of one section of local government officers could hope for success. The association had already given both advice and aid in innumerable cases, and every officer of a local authority should either become a direct member of the association or join a local branch. Only by unity could the ends they desired be attained.

Mr. Hill gave some particulars of the objects and work of the association, and after a full discussion it was resolved that "The council of the Institution be asked to forward to all members of the Institution a short statement of the work and objects of the N.A.L.G.O., with a request that members either join the association direct or form themselves into local associations in their respective districts."

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Burry Port U.D.C.** (May 6th. Mr. M. K. North).—£850 for works of water supply.—Evidence was given by Mr. Wm. Howell (clerk), Dr. Owen Williams (medical officer of health), and Mr. A. J. Oborn (surveyor), after which the inspector visited the district where the work is intended to be carried out.

**Cardiff T.C.** (June 7th. Mr. M. K. North).—£2,500 for carrying out improvements in Queen-street, with the object of widening the thoroughfare.—The town clerk, Mr. J. L. Wheatley, said this was part of a larger scheme of improvement. A further application was made to borrow £2,200 for the provision of roads and footpaths and fencing, improved water service at Tyclyd and elsewhere in connection with the Mental Hospital, Whitchurch.

**Congleton T.C.** (May 30th. Major J. Stewart).—£1,700 for the extension of the gaswork. The gas manager said the public lighting was provided at cost price, and any profits from the gasworks were devoted to the borough fund. At the conclusion of the inquiry the inspector said he thought the board would grant the council's application.

**Darfield (Yorks) U.D.C.** (May 30th. Mr. F. H. Tulloch).—£1,860 for the purpose of providing a cemetery.—Considerable opposition was offered to the proposal, it being argued that there was ample room in the existing churchyard for burials.

**Hendon U.D.C.** (May 31st. Mr. F. H. Tulloch).—£2,562 for works of improvement at Lawrence-street and Daws-lane, Mill Hill.—The clerk, Mr. H. Humphris, stated that the loan was made up as follows: Kerbing works in Lawrence-street, £1,033; kerbing works in Daws-lane, from Lawrence-street to Birkbeck-road, £692; surface-water drain in Daws-lane, from Lawrence-street to junction with Birkbeck-road, £837. The whole of the works were rendered necessary on account of building developments. The scheme was then explained in detail by the surveyor, Mr. S. S. Grimley, who, in reply to questions, said that land had been given up for widening purposes by Mr. William Hollis, and the works would be carried out by contract. The proposed widening in Daws-lane was on the north side. Artificial stone would be laid.

**Kingston-on-Thames (Surrey) T.C.** (May 11th. Mr. T. C. Ekin).—£13,500, for the purposes of the municipal electricity undertaking.—The town clerk, Mr. H. A. Winser, said the area of the borough was 1,114 acres, assessable value £231,290, and the total outstanding loans £186,665. The capital outlay on the electricity undertaking to date was £109,333. Profits were shown in three years only amounting to £1,682, and the nett deficit to date was £15,286. The loan was for the horizontal type of Diesel oil engines, constructed by the M.A.N. Company, of Germany, the contract with that company being for £8,328, which included £2,358 for alternators manufactured by Messrs. Siemens, of Stafford. The extension of buildings and foundations would cost £1,870, the switchboard £2,221, and the balance was for sub-stations, kiosks, and other details. Mr. J. E. Edgecome, the electrical engineer, furnished the inspector with technical details, and the inquiry concluded without opposition having been offered to the application.

**Liverpool T.C.** (June 5th. Mr. Shelford Bidwell).—£8,500 for the purpose of laying out the Necropolis as a public garden, and £1,645 for the provision of a public recreation ground in Donaldson-street and Oakfield-road, Liverpool.—Mr. Thomas Shelmerdine, city surveyor, gave the details of the scheme. He said what they proposed to do was to take down the existing wall and, after the street improvements were carried out, to enclose the garden with a stone plinth and railing. The scheme provided for ornamental walks, two shelters, and a fountain. He believed what the corporation contemplated would be a great success, and the improvement would be much appreciated by the community.

**Penrith U.D.C.** (May 24th. Mr. M. K. North).—£2,000 for the purchase of the ruins of Penrith Castle and 7 acres of adjoining grounds for the purposes of a public park.—The question has been the subject of acute controversy in the town for nearly two years. The case for the council was put by the clerk, Mr.

G. Wainwright, and a considerable number of witnesses were called by the respective parties, the proceedings lasting five hours.

**Portsmouth T.C.** (May 23rd. Mr. W. O. E. Meade-King.—£20,000 for the purposes of surface-water drainage for the relief of the high-level and low-level sewers.—The town clerk, Mr. G. Hammond Etherton, explained that it was desired to provide a surface-water drainage scheme for Milton, where at present the surface water was carried through the existing sewers. The population of the district had increased very rapidly of recent years, and even in the last [illegible] The population of the borough itself had increased by over 6,000 since the last census [illegible] a large proportion of these additional [illegible] by the Local Government Board in connection with the Admiralty [illegible] the Admiralty [illegible] had not yet been given, and they had asked for further information. He was not in a position to say whether any objections would be raised to the scheme. The town clerk remarked that the corporation did not anticipate any difficulty of this sort. The borough engineer, Mr. A. W. Ward, informed Mr. Russell that the only discharge would be into the creek at the back of the pumping station.

**St. Helens T.C.** (May 31st. Major J. Stewart).—For £18,000 and £9,000 for the conversion of the sanitary arrangements of the town to the water-carriage system. —The town clerk presented a statement as to the amounts necessary for the work, and asked that the loans should be spread over twenty years. In reply to the inspector as to the reasons for such wholesale conversions, the medical officer said that St. Helens had always been subject to a great deal of typhoid fever, and was the worst town in England in that respect. It had been found that the typhoid [illegible] most prevalent in houses where the old system of dry removal had ruled, and although the tub and pail system had reduced the amount of typhoid, the water-carriage system would do more. Not only would it be beneficial from a health point of view, but financially it would be cheaper than the old method of dry removal. He was of opinion that the whole of the work of conversion could be completed in five years.

**Sandown (Isle of Wight) U.D.C.** (May 24th. Mr. W. O. E. Meade-King).—£885 for the purchase of a plot of land opposite the Sandown Hotel.—The clerk, Mr. [illegible], stated that the area of the land was 1,270 sq. yds., with a frontage to the shore of 15½ ft. Mr. L. G. Duthoit, surveyor, stated that the adjoining land was sold for £750. Taking that as a basis, they could value the piece the council proposed to purchase at £964. The Sandown Cottage, facing the Pier Hotel, on which the present lavatories were erected, was bought with the house upon it for £1,200.

**Tiverton T.C.** (May 30th. Mr. F. O. Stanford).—£3,350 for the purpose of widening Gold-street and Lowman Bridge.—The town clerk, Mr. C. M. Hole, explained that Gold-street was the main thoroughfare to the railway station, and that owing to the [illegible] at the point of issue accidents had been numerous. The borough surveyor, Mr. J. Sidwell, stated that the cost of the proposed improvement was £3,550, towards which the county council contributed in respect of the bridge widening £200, and would contribute a further sum towards the street widening of £1,250. The [illegible] would be £2,100.

### APPLICATIONS FOR LOANS.

**Bacup T.C.**—£14,598 for paving purposes.

**Beckenham U.D.C.**—£265 for a new sewer.

**Birkenhead T.C.**—£46,850 for electricity plant extensions.

**Bournemouth T.C.**—£700 [illegible] Electricity Undertaking.

**Brierley Hill U.D.C.**—£7,400 for a sewerage [illegible].

**Buckingham R.D.C.**—£1,200 for the provision of [illegible] Tattord.

**Chelmsford T.C.**—£450 for surface-water drainage and £1,750 for a pumping plant.

**Chippenham R.D.C.**—£1,500 for a water supply scheme.

**Diss U.D.C.**—£[illegible] at the Waterworks.

**Felixstowe U.D.C.**—£[illegible] for additions to the [illegible].

**Hereford T.C.**—£1,000 for alterations to the butter market and £300 for extensions to the art school.

**Leyton U.D.C.**—£1,600 for relaying sewers in the Cann Hall district.

**Pontefract T.C.**—£22,000 for a housing scheme.

**St. Annes U.D.C.**—£2,234 for street improvement works.

**St. Austell U.D.C.**—£385 for a street improvement scheme.

**Spalding U.D.C.**—£5,646 for a housing scheme.

**Stoke-on-Trent T.C.**—£1,700 for the extension of the Penkhull School.

**Wellington U.D.C.**—£2,350 for sewerage works.

**Whitefield U.D.C.**—£1,625 for sewerage scheme.

**Wolstanton U.D.C.**—£596, further loan for the Wattstalls School.

**Yeovil R.D.C.**—£2,806 for a housing scheme.

**York T.C.**—£800 for electricity requirements.

### LOANS SANCTIONED.

**Beckenham U.D.C.**—£5,100 for the purchase of part of Kelsey Park.

**Bournemouth T.C.**—£1,600 and £1,400 for the purchase, for purposes of public walks and pleasure grounds, of a house and land in King's Park-drive, and £390 for underground conveniences.

**Chelmsford T.C.**—£7,521 for the erection of thirty-eight workmen's dwellings.

**Lymm U.D.C.**—£9,692 for sewerage works.

**Newburn U.D.C.**—£1,200 for the purchase of land for a housing scheme.

**Newcastle-upon-Tyne T.C.**—£1,300 for the provision of a bowling green.

**Paddington T.C.**—£2,200 for the erection of a public laundry.

**Portrush U.D.C.**—£1,500 for laying of water main.

**Sutton Coldfield T.C.**—£2,000 for electricity plant.

**Torquay T.C.**—£2,105 for furnishing and equipping the pavilion, repayable within fifteen years.

**Wakefield T.C.**—£5,950 for street widening purposes.

### FORTHCOMING INQUIRIES.

| JUNE. | £ |
|---|---|
| 18.—**Aberdare.** For burial ground and electricity purposes (Mr. A. A. G. Malet) ... | 7,260 |
| 18.—**Altrincham.** For the provision of a refuse destructor and the purchase of land (Mr. Edgar Dudley) ... ... ... ... ... | 2,060 |
| 18.—**Birmingham.** For road improvement and bridge construction purposes (Mr. F. O. Stanford) ... ... ... ... ... | 33,619 |
| 18.—**Kirkby-in-Ashfield.** For sewage disposal purposes (Mr. R. G. Hetherington) ... | 12,000 |
| 18.—**Penybont.** For private street improvement purposes (Major J. Stewart) ... | 1,700 |
| 18.—**Rawtenstall.** For street widening, electricity, and market hall extension purposes (Mr. T. C. Ekins) ... | 10,523 |
| 18.—**Southend-on-Sea.** For street improvement works (Mr. R. H. Beckett) ... | 2,244 |
| 18.—**Winchester.** For the provision of a cemetery (Mr. W. O. E. Meade-King) ... ... | 4,361 |
| 19.—**Ashton-under-Lyne.** For the purchase of land for a secondary school (Mr. Edgar Dudley) ... | 5,200 |
| 19.—**Balby.** For sewerage and surface drainage works (Mr. R. G. Hetherington) ... ... | 1,673 |
| 19.—**Bolton.** For water and electricity purposes (Mr. T. C. Ekins) ... | 45,000 |
| 19.—**Llanelly.** For laying out a park (Major J. Stewart) ... | 5,100 |
| 19. **Llantrisant.** For the completion of a new road (Mr. A. A. G. Malet) ... | 24,500 |
| 20.—**Alfreton.** For the provision of a women's convenience (Mr. Edgar Dudley) ... ... | 500 |
| 20.—**Grinstead.** For sewage disposal purposes (Mr. F. O. Stanford) ... ... ... ... | 4,694 |
| 20.—**Luton.** For works of sewerage (Mr. F. H. Tulloch) ... ... ... ... ... ... | 1,700 |
| 20. **Mynyddislwyn.** For the provision of new [illegible] offices (Major J. Stewart) ... | 3,500 |
| 21.—**Hastings.** For sewerage, [illegible] and other purposes (Mr. F. H. Tulloch) ... | 2,556 |
| 21.—**Slough.** For the [illegible] Electricity Undertaking (Mr. T. C. Ekins) ... | 2,500 |

# Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 21 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the to left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

## QUESTIONS.

This week answers are invited to the following questions:—

**249. Applied Mechanics.**—What is meant by the reciprocal of a point, and a pair of reciprocal figures?

**250. Pier Pavilion Roof.**—Show by sketches how you would roof a pier concert room 60 ft. by 10 ft. If desired, there may be two columns 20 ft. apart below each truss.

**251. Disinfection.**—Distinguish between disinfectants, antiseptics, and deodorants, and name some examples of each. ("Sanitary.")

**252. Girder Bridge.**—Design a girder bridge to carry a 24-ft. road over a river and railway (at an angle of 60°) of two spans, 70 ft. and 42 ft. respectively. The mean height of road surface above bed of river is 21 ft. 6 in., and 17 ft. above rails, and the foundation is clay. Please show calculations and give an estimate of the cost. ("Nomad.")

**253. Hospitals.**—Give a typical cross-section of an infectious hospital ward. Specify for finishing the internal surfaces. Give detail sketches of a window. ("M. and C.E.")

## REPLIES TO QUESTIONS.

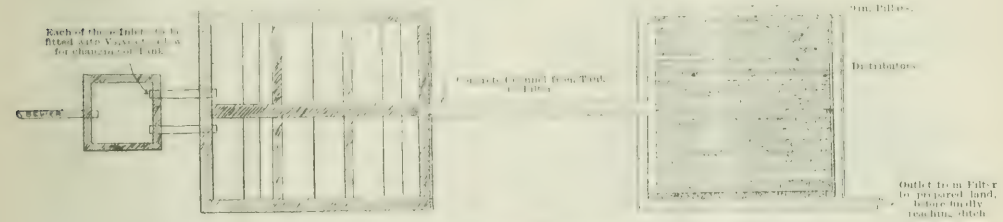
**238. Small Sewage Disposal Installation.**—Sketch and describe an installation consisting of a septic tank and filters for dealing with the soil sewage of about 750 persons, showing all the calculations for size of filters, &c. The filters are to be arranged so as to be capable of being enlarged if required. It is possible to have land treatment afterwards on about ½ acre to ¾ acre of land. The effluent is to discharge into a ditch, and must be kept to a high standard. The scheme is not meant to be permanent, and is only required for a period of about six years, until sufficient assessable value is created to apply for a sewer loan to connect to a now existing sewerage system. ("Somerset.")

The accompanying sketch shows the plan and section of a detritus tank, two sets of septic tanks, and continuous filter, suitable for the successful treatment of the sewage from 750 persons, after which the effluent may advantageously be discharged over the land available, before finally discharging into the ditch.

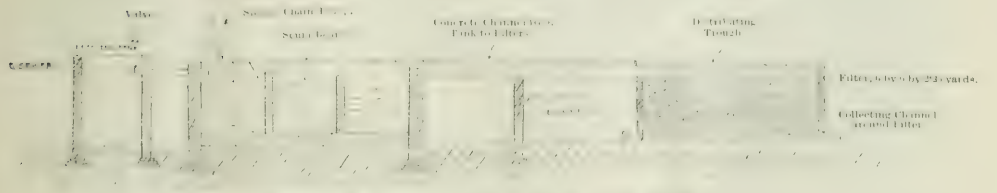
The detritus tank is an extra precaution for preventing the first chamber of the tanks being loaded with mineral matters, which would lower the value of the sludge. The tank shown is 6 ft. × 6 ft. × 8 ft. 6 in., rather large for the size of plant, but in the writer's experience it is better to err on the larger than the smaller side.

In calculating the size of tanks, 24 gallons per head of population has been allowed, which equals 18,000 gallons per day; and allowing for the tanks to empty three times per twenty-four hours, it is necessary to make them capable of holding 6,000 gallons approximately. The tanks in sketch are 20 ft. × 6 ft. × 6 ft. (internal measurement) = 960 cub. ft., or 6,000 gallons. It will be noticed that the tanks are equally divided by submerged walls, and scum boards are placed midway in each compartment, thus causing an undulating flow and assisting it to reach every part of the tank. The first compartment forms an ante-chamber in which the greater part of the solids is allowed to deposit, and from which they can be removed without interfering with the rest of the tank. For this purpose a chain pump can be utilised as shown in sketch. It will be noticed that the inlet is just submerged, which prevents the contents being disturbed, but this is immaterial. The outlet is simply a sill protected by an inclined scum board, the liquid flowing along this sill and down the central channel to the filter. It is a good plan to fix in this channel a diaphragm, the size of which allows, under a head of 3 in., the maximum rate of flow of dry weather sewage permissible on the filter. The head of 3 in. also allows abundant storage for extra flushes due to baths, &c. It is a wise plan to construct two sets of tanks as shown, in case of any breakdown, and also for the effectual cleaning of the separate chambers, although it is possible to construct the floors to drain towards the first chamber and fit a valve in each wall, so they may be washed through. The latter, however, is not a good plan.

In the sketch the filter is about 18 ft. from the tank, the object being to allow for an easy extension of the tanks if necessary, in addition to the possibility of enlarging the filter. The filter consists of 75 yds. of filtrant, thus allowing 1 yd. of filtrant for every ten persons. The filter is constructed as follows: The


Each of these Inlets to be fitted with Valve and Chain for cleaning out Tank.
Concrete Channel from Tank to Filter
9-in. Pillars.
Distributors
Outlet from Filter to prepared land, before finally reaching ditch

PLAN OF DETRITUS TANK, TWO SETS OF TANKS AND CONTINUOUS FILTERS.




SECTION OF SEPTIC TANKS AND CONTINUOUS FILTER.

site is covered with concrete, the highest point being the centre, thus causing the effluent to drain to the sides into a collecting channel, from which it is discharged over the prepared land. Upon this floor four or more 9-in. pillars are built to carry the distributing trough, which, as seen in the sketch, consists of a large one and a series of smaller ones fixed dead level and having small notches cut in the sides over which the effluent trickles and drips on to the filter. The small

troughs are fixed about 1 ft. apart, and (in my experience for a population of 2,000) may be made with two pieces of wood V shaped and subjected first to two or three coatings of thin tar. Of course a first-class iron distributor can be bought if desired. The filtrant consists of good hard burnt furnace clinker about 3-in. gauge well washed before being placed in the filter. This type of plant I know to be very successful, efficient, economical and requires but very little attention. The effluent may be advantageously distributed over prepared land, the preparation consisting of small agricultural pipes laid about 18-in. deep and discharging into a ditch. If the soil is unsuitable as a filtrant, which is generally the case, it is best to place about 18-in. of small clinker, coarse sand, or fine gravel over the pipes in the place of the soil, and make allowance for aerating. This will form a secondary and final filter bed.—(C. F. B.)

**248. Pumping.**—What power engine is required to pump 160,000 gallons per day of ten hours through $\frac{3}{4}$ mile of 5 in. diameter main against 8 ft. head suction and 90 ft. head delivery? Also state size and kind of pump. There are three right-angle bends in the main, in addition to those in the pump-house at connections. If a 4-horse power turbine and 6½-horse power engine, which will be used as a lay-by, be provided, and the figure given (160 000 gallons) is twice a day's supply, is this a reasonable margin when the storage capacity is 60,000 (fire contingency being considered)? (Hack.)

The resistance to flow round a right-angle bend (radius = 5 diameter) is generally expressed in terms of equivalent length of straight pipe.

$$L = 50 \text{ diameter} = 20 \text{ ft.}$$

Taking total 5 bends = 100 ft. equivalent extra length,

$$\text{total length} = \tfrac{3}{4} \text{ mile} + 100 \text{ ft.} = 4{,}060 \text{ ft.}$$

The velocity required to deliver 160,000 gallons through 5-inch pipe (area 0·136 sq. ft.) in 10 hours is given by

$$\text{velocity} \quad \frac{160{,}000}{6{\cdot}25 \times 10 \times 60 \times 60 \times 0{\cdot}136} = 5 \text{ ft. per sec.}$$

For a pipe of length L the head lost by friction due to velocity $v$ is given by the formula

$$H = f \frac{4L}{d} \frac{v^2}{2g}$$

$f$ = 0·001 coefficient of friction

$\frac{d}{4}$ = hydraulic mean depth

$\frac{v^2}{2g}$ = kinetic energy per lb. of water

$$H = \frac{0{\cdot}001 \cdot 4 \times 4060 \times 5^2}{\frac{5}{12} \cdot 64} = 15 \text{ ft.}$$

∴ total head 15 8 + 90 = 113 ft.,

and brake horse power of pump $= \frac{113 \times 160{,}000 \times 10}{33{,}000 \times 60 \times 10}$

= 9-horse power.

Taking the efficiency of a centrifugal pump to be 60 per cent, the break horse power of the engine, or indicated horse power of the pump = 15-horse power, and this is required to throw 266 gallons per minute. A high-pressure 4-in. centrifugal pump will throw 200 to 300 gallons per minute at about 800 revolutions per minute.

Taking 4 as meaning the indicated horse power of the stand-by pump, it is about one quarter the horse power calculated above to give twice the daily supply. A 4-h.p. pump would therefore take 20 hours to deliver one day's supply. So by working approximately all day and night it could meet the ordinary requirements. Three-quarter day storage seems a reasonable margin, but this depends, of course, on the number of fire hydrants to be supplied, and also upon whether a longer storage is necessary for the purification of the water for drinking purposes. (G. W. H., *Kingston-on-Thames.*)

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Notes.

Thanks are due to "F. B." for his letter of 1st inst. We cannot undertake to return or correct wrong solutions or other matter which is submitted but not used. If a stamped addressed envelope be enclosed, however, every effort will be made to return unused MS. and drawings. Ed. Assistants' and Students' Section.

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**Torquay Medical Baths.** Torquay Town Council have resolved [illegible] to provide medical baths, at an estimated cost of £15,000.

## ST. PETERSBURG INTERNATIONAL FIRE CONGRESS.

The International Fire Congress, which opened at St. Petersburg on June 2nd, and was continued at Moscow and Warsaw, saw its conclusion on Sunday last. It was held at the invitation of the Imperial Russian Fire Service Society, and conducted under the auspices of the International Fire Service Council. There were some 1,200 members of congress, of whom about 200 were non-Russians, including six British delegates, among whom the Earl of Londesborough K.C.V.O., was a conspicuous figure.

The congress was divided into four sections—(1) Fire Prevention; (2) Fire Service; (3) Ambulance; (4) Fire Insurance. Some eighty papers were put forward for discussion, including one on "Fire Protection at Exhibitions," by Mr. Edwin O. Sachs, F.R.S.ED. (chairman of the British Fire Prevention Committee); one on "Fire Testing Stations and Research Work," by Mr. Horace S. Folker, F.A.I. (treasurer of the British Fire Prevention Committee); and one on "The Importance of Fire Brigade Associations," by Mr. T. G. Dyson (vice-president of the National Fire Brigades' Union).

Notable Continental papers were presented by Chief Officer Reichel (Berlin), on "Motor Fire Appliances;" Chief Officer Westphalen (Hamburg), on "The Storage of Petroleum;" by M. Guesnet (Paris), on "Fire Prevention;" by Mr. Czermack (Austria), on "Fire Service Museums;" by Dr. Prange (Berlin), on "Industrial Fire Prevention." Some twenty of the more important papers will be published in three languages by the International Fire Service Council in their next Bulletin. A number of useful resolutions were passed, and these will also be issued in due course to the various Government departments concerned.

The occasion of the congress was taken for the arrangement of a fire brigade display on the Champs de Mars, St. Petersburg, in which both the professional and the volunteer service participated, and similar displays were given at Moscow and Warsaw. During the course of the congress several executive meetings were held by the International Fire Service Council, as also the biennial general meeting, at which Mr. Edwin O. Sachs was re-elected a vice-president, Mr. Horace Folker an executive member, and Mr. Ellis Marsland joint honorary secretary.

The next executive meeting of the International Council will be held in 1913 at Leipsic, and the next International Fire Congress under its auspices will probably take place at Copenhagen in 1915.

The Special Commission formed by the British Fire Prevention Committee to study the fire preventive and fire service arrangements of Russia returned to London on Monday after visiting St. Petersburg, Moscow and Warsaw and attending the International Fire Congress in the first-named city. The commission comprised six members, including Mr. Edwin O. Sachs, F.R.S.ED., chairman of the British Fire Prevention Committee, the Earl of Londesborough, K.C.V.O., a member of its council, Mr. H. S. Folker, F.A.I., its hon. treasurer, Mr. J. Herbert Dyer, a member of the executive, with Chief Officer Marshallsay, of Aldershot, and Chief Officer Hockin, of Truro. A very cordial reception was met with in Russia, all facilities for obtaining technical information being freely put at the Commission's disposal by the Russian Government, municipal authorities and the various technical societies and officials concerned. Many works, warehouses and large buildings were visited, as also the principal fire stations, waterworks and other municipal institutions, and an illustrated report will be issued by the British Fire Prevention Committee embodying the results of the commission's investigations.

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**Pull Up the Roads.**—An enormous amount of attention has been paid of late to the development of road engineering, with a view to obtaining the ideal highway, but hitherto no special attention has been devoted to the science of road destruction. It may have to be studied, judging from a proposal for which on Tuesday, at the meeting of the West Ham Town Council, urgency was moved by Alderman W. Thorne, M.P. He submitted that "in consequence of the refusal of the London Port Authority and other employers to accept the terms of the settlement suggested by the Government, this council instructs the borough engineer immediately to pull up those parts of the roads in West Ham that have direct communication with the docks in the borough." The mayor (Alderman J. R. Hurry) declined to put the proposition.

# Municipal Work in Progress and Projected.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Anglesey £3,668, Bromley £12,000, Staffs £12,850, Wallasey £80,000; housing and town planning—Chelmsford, Pontefract £19,707; roads and materials—Burnley £13,350; sewerage and sewage disposal—Auckland £4,800, Brighton £17,183, Glastonbury £8,305, Teddington; water, gas and electricity—Ossett, Ryde, Southmolton.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

## ADMINISTRATION.

**Waterford C.C.**—The following report, prepared by the county surveyor, Mr. W. E. L. Duffin, has been referred to the Finance and Law Committee: "Your Finance Committee appear to be of opinion that more frequent inspections of the quarrying and steam rolling works are necessary, and have directed me to report to you on the matter. None of your assistant county surveyors are whole-time officers, and it does not appear to me that you can call on them to give much more time to your work than they do, or to incur greater outlay in travelling. Certainly this is so in the case of transferred officers. Some of the councillors may remember that at the commencement of the Local Government Act I advised the council that it would be better for them to arrange with the assistant surveyors that they should give their whole time to the duties, and to give them an adequate salary. If this arrangement were now made it might meet the case. With your present staff such an arrangement must be voluntary. For future appointments you could make your own conditions. Another solution would be to appoint a special assistant whose duties would be primarily to attend to the steam rolling, quarrying, and machinery, and to give an adequate salary and travelling allowance or expenses. The latter has been tried in a few counties, and with, I understand, good results."

## BUILDINGS.

**Anglesey C.C.**—New county offices are to be provided at a cost of £3,668.

**Bourne R.D.C.**—The council have secured from the Kesteven County Council 4 acres of land on Southroad, Bourne, at a cost of £269, for the erection of an isolation hospital.

**Bromley T.C.**—A proposal is receiving consideration to erect a public swimming bath upon the municipal buildings site at a cost not exceeding £12,000.

**Edinburgh T.C.**—The masonry work in connection with the raising of the parapets of the Dean Bridge to a uniform height of 4 ft. 9 in. has been completed. There is still, however, to be added to the parapets a surmounting iron crest, about 2 in. in height. The work has been carried out for the corporation from plans by the borough engineer, approved by Sir Rowland Anderson and Prof. S. Brown.

**Falkirk T.C.**—Extensions are to be made to the corporation electricity works at an estimated cost of £1,300.

**Hackney B.C.**—It has been decided to replace an old iron convenience opposite the Metropolitan Hospital in Kingsland-road with a lavatory on modern lines, at a cost of £1,385.

**Hampstead B.C.**—The extension of the town hall is to be formally opened on the 29th inst.

**Hereford T.C.**—A new roof, concrete floor, and messroom are to be provided at the Butter Market, at an estimated cost of £1,000.

**Portland (Dorset) U.D.C.**—Of eighty-seven designs submitted for proposed council offices, Mr. A. Needham Wilson, the adjudicator, has awarded the premium of £50 for the best design to Messrs. Spiers & Bevan, of Wharton-street, Cardiff. The work is to be started forthwith.

**Ryde T.C.**—A tender has been accepted for building a pumping station to cost £2,720.

**Shepton Mallet U.D.C.**—The new swimming bath has been opened. The bath is 104 ft. 6 in. long by 39 ft. 2 in. wide, and 8 ft. 6 in. deep at its greatest depth, and at the shallow end 2 ft. 6 in. deep. The building has been constructed under the direction of the surveyor, Mr. D. Hinchcliffe.

**Staffs C.C.**—Plans and estimates have been passed for a new nurses' block at Stafford Asylum to cost £5,500; also plans and estimate for a new nurses' home to cost £6,730; for eight attendants' houses at Burntwood Asylum; and for a cycle-shed and a greenhouse and covered way at Cheddleton Asylum to cost £332.

**Wallasey T.C.**—The Local Government Board have been asked to sanction the use of the North Meade site for the purpose of a town hall, for the erection of which authority to borrow £80,000 is to be sought.

**Willesden U.D.C.**—It has been decided to provide slipper baths for the district.

## HOUSING AND TOWN PLANNING.

**Buckingham R.D.C.**—The Local Government Board have sanctioned the provision of six cottages for Twyford, at an estimated cost of £1,200.

**Chelmsford T.C.**—In addition to the thirty-eight dwellings sanctioned by the Local Government Board, it has been decided to carry into effect a scheme for the erection of another fifty houses.

**Cainsborough U.D.C.**—An intimation has been received from the Local Government Board that the application for a loan for the purpose of erecting artisans' dwellings has been sanctioned, the loan in regard to the site to be repaid in eighty years, and that for the buildings in sixty years. The board state that they are satisfied as to the need for further working-class accommodation in Gainsborough, and they do not, on the information before them, consider the proposal to erect eighteen dwellings, to let at rents varying from 5s. to 6s. a week, sufficient to meet the needs of the district, and consequently they must regard the present scheme as an instalment only.

**Hayes (Middlesex) U.D.C.**—The question of the desirability of a town planning scheme has been referred to the Housing and Town Planning Committee.

**Listowel R.D.C.**—Notice has been given by the council of their intention to promote a scheme under the Labourers' (Ireland) Act, for the provision of dwellings, at an estimated cost of £55,722.

**Liverpool T.C.**—An important block of dwellings has been almost completed in the Bevington-street area.

**Pontefract T.C.**—It has been decided provisionally to accept a tender for the erection of 102 workmen's dwellings, at a cost of £19,707.

**Surbiton U.D.C.**—A plan prepared by the surveyor, Mr. H. T. Mather, showing the land he considers most suitable for inclusion in the first town-planning scheme, has been adopted after certain slight amendments.

## PARKS AND OPEN SPACES.

**Glasgow T.C.**—Captain Archibald Stirling, of Keir, has offered to throw open 100 acres of Cadder Wood as a public recreation ground.

**Hexham U.D.C.**—Railings are to be placed on the east and south sides of Abbey grounds, at a cost of £279.

## REFUSE COLLECTION AND DISPOSAL.

**Ashington U.D.C.** In the contracts for cleansing the ashpits it has been decided to stipulate that the scavengers must be paid not less than 5s. a day.

**Cardiff T.C.**—The city engineer, Mr. W. Harpur, has prepared a report for the Health Committee dealing with the cleansing and watering of streets, including incidentally, the question of tar-paving.

## ROADS AND MATERIALS.

**Battersea B.C.** Clapham Common-road is to be repaired, at a cost of £4,514, subject to the London County Council sanctioning a loan for £1,980.—It has been agreed to contribute £1,000 towards the improvement of the Clapham Junction passageway, to be carried out by the London County Council.

**Bradford T.C.**—It has been agreed to proceed with the construction of a new road at Thackley. Part

of the work has been offered to the Docks Committee, £435 being the cost estimated by the city engineer and surveyor, Mr. W. H. S. Dawson.

**Burnley T.C.**—The borough surveyor, Mr. G. H. Pickles, has submitted to the Highways and Sewage Committee the annual estimates for the repaving, reflagging, or repairing of the roads, streets and back streets in the borough which had been inspected by the committee. The committee have decided to recommend the council to authorise the repaving, reflagging, or repairing as the case may require, of a large number of thoroughfares, at a total estimated cost of £13,250.

**Chippenham R.D.C.**—It has been agreed to extend the water mains to Kington Langley, at an estimated cost of £1,500.

**Hampstead B.C.**—The Works Committee have made an inspection of the main road between New Eltham and Sidcup, where trials of various road materials are being made by the Kent County Council under arrangement with the Road Board. In the report which they have submitted to the council they state that the chief methods adopted by the various contractors carrying out the works were based on the use of asphalt, bitumen and tar as a binder for the road aggregate. In the opinion of the committee the most satisfactory pavings at the present time appeared to be those in which tar was incorporated with the macadam before it was laid, and the best specimen appeared to be the length of tarred slag-macadam, such as had been used in various roads in Hampstead during the past six years. The section of Durax armoured paving, such as was proposed to be used in a portion of South End-road and Pond-street, was inspected. The paving consisted of Leicester granite cubes of about 3½ in., which were laid on a prepared foundation, in intersecting segmental courses, and grouted in with pitch and creosote oil. The paving was in good condition, and the committee were of opinion that it would prove a very suitable paving for the portion of South End-road and Pond-street in question, especially having regard to the gradient there. The council have agreed to the proposition to adopt Durax paving grouted with pitch in the streets named.

**Hampton U.D.C.**—The Middlesex County Council have been asked to wood-pave a section of the main road through the district and to bear the expense of the work.

**Shoreditch B.C.**—With respect to the repaving of Shrubland-road, for which £1,000 has been provided in the estimates, it has been decided to accept an estimate from the Northern Quarries Company to lay a 4-in. bed of quarrite paving, with a waterproof surface of strong bitumen, strewn with a coat of granite chippings, upon foundations to be prepared by the borough council, at an inclusive price of 4s. 2d. per square yard, the work being guaranteed for a period of twelve months.

**Thornaby T.C.** It is proposed to spend £1,700 on the [illegible] private street improvement.

**Wellington (Somerset) U.D.C.**—A much-appreciated public improvement has been effected by the widening of the lower part of Alma-road for a distance of nearly 200 yards, at an estimated cost of £700, and the purchase of property.

## SEWERAGE AND SEWAGE DISPOSAL.

**Auckland R.D.C.** The tender of Mr. Jacob Robson, of Newcastle, at £1,802 has been accepted for the construction of the Coundon Valley sewage disposal works.

**Bracebridge U.D.C.** Subject to the approval of the present existing sewage disposal works being abandoned, the Corporation of Lincoln have agreed to receive and treat the sewage from the whole of the urban district, and to pay for the same at the rate of [illegible] per annum, the Lincoln Corporation entering the Lincoln sewers on the daily average quantity as entering throughout the year, and the daily average to be calculated each year at 20 gallons per head of the population.

**Brighton T.C.**—The council have agreed to the application of the Council of Messrs. Pearson, Limited, of Margate, for the construction and maintenance of a sewer in the Lewes-road district for 17 years, and that of Mr. Edward Hewitt, of Croydon, for the construction and maintenance of a main sewer in Ditchling-road for £1,997. In each case the sewers are to become the property of the council further authorised the borough surveyor, Mr. H. Tillstone, to engage two clerks of works to supervise the works. Councillor Teasdale said the number of tenders was small in comparison with the large amount of the contract, but he felt the committee were justified in rejecting all the tenders received on the last occasion and asking for fresh ones in their place. They were now within the borough surveyor's estimate by about £300, and it was a credit to him that the tenders had come in so near. They had now a tender £2,800 below the lowest tender received last time.

**Chelmsford T.C.**—The plans of the surveyor, Mr. P. T. Harrison, have been approved for surface-water drains in New-street and Rectory-lane, at a cost of £450.

**Glastonbury T.C.**—The tender of Messrs. Wright & Sons, of Glastonbury, at £8,300, has been accepted for the construction of new sewage disposal works.

**Hampton U.D.C.**—The General Purposes Committee on Tuesday asked that the sewage manager be requested to submit suggestions as to how he would provide for the proposed extension of the disposal works, to which an amendment was moved that the paragraph be deleted on the ground that it was placing the council in a ridiculous position by asking a subordinate official to make suggestions upon a scheme which had twice been reported upon by the surveyor, Mr. S. H. Chambers. "They might go on indefinitely," it was urged, "the surveyor being asked to give his opinion upon the sewage manager's suggestions." The amendment, however, was lost by one vote, and the committee's proposal was approved.

**Keady U.D.C.**—The Local Government Board have written emphasising the unsanitary condition of the town, as mentioned in Dr. O'Brien's reports, both regarding sewerage and water, and intimating that these matters could not rest any longer.

**Kidderminster T.C.**—It has been agreed to purchase from the Earl of Dudley the Dropping Wells and Birchen Coppice farms for the extension of the sewage farm. Alderman Ray said the council were committed to an expenditure of something like £13,000.

**Larne U.D.C.**—The provision of a sewerage scheme has been referred to the Public Health Committee.

**Laurencekirk T.C.**—A scheme of sewage disposal, to cost £1,505, has been adopted. The engineers are Messrs. Bruce & Proudfoot, of Cupar and Kirkcaldy.

**Loughborough R.D.C.**—Mr. F. W. Hodson, who was appointed engineer to report upon the need of a sewerage and sewage disposal scheme for Hathern, states that there is no land, either flooded or unflooded, to which the sewage can be taken by gravitation, and, secondly, that there is not sufficient fall for tanks and filters, and even if land was available it would be unsuitable for sewage treatment. The sewage from the Hathern Turn presented the greatest difficulty. The matter is still under consideration.

**Tavistock U.D.C.**—It has been decided to support the petition promoted by the Barnstaple Town Council urging an amendment of the law with regard to the [illegible] tonnage question.

**Teddington U.D.C.** There was considerable discussion at the last meeting as to the proposal to spend £35,000 on the extension of the sewage disposal works, the council having before it a protest against the proposal passed at a recent public meeting. The Sanitary Committee proposed that of the twelve tenders received three should be referred for report to the surveyor (Mr. M. Hainsworth) and the consulting engineer (Mr. W. Fairley), to which it was moved as an amendment that the subject be referred back to the committee. On a division the votes were equally divided, and the chairman's concluding words were: "I suppose we must have a new scheme then."

**Thornaby T.C.**—It is intended to repair a public sewer at an estimated cost of £836.

## WATER, GAS, AND ELECTRICITY.

**Alnwick U.D.C.** It is stated that the Local Government Board have approved the scheme for augmenting the water supply of Alnwick. Copious springs in Alnwick Park, near Hulne Abbey, will be tapped, and the water conveyed to Canongate, where it will be pumped into a high-level reservoir near Swansfield Park. The supply into the town will be divided into upper and lower services. In this scheme the Duke of Northumberland has given the council every possible assistance and agreed to the water being taken free of charge. The estimated cost of the scheme in round figures is about £7,500. The engineers are Messrs. Taylor & Wallin (Mr. Harry W.

Taylor, ASSOC.M.INST.C.E.), of Newcastle and Birmingham. Tenders for the works are to be invited at once.

**Barrow T.C.**—The nett profits of the electricity undertaking during last year were £967.

**Belfast T.C.**—An electric Telpher coke-handling plant by Messrs. R. Dempster & Sons, of Eland, is to be installed at the gasworks at a cost of £5,500.

**Bridlington T.C.**—A nett profit of £1,876 was earned by the electricity undertaking last year, an increase of £369 on last year.

**Chippenham R.D.C.**—The tender of Messrs. Downing & Rudman, at £1,467, has been accepted for works in connection with a water supply scheme for Empton Langley.

**Hastings T.C.**—The accounts of the electricity undertaking for the year ended March 31st show a nett profit of £90, as compared with a deficit of over £1,600 last year.

**Ossett T.C.**—A scheme of filtration for the water used at the public baths, in order to remove the discolouration caused by peat on the gathering grounds, is under the consideration of the corporation.

**Petersfield U.D.C.**—New water mains are to be laid, at a cost of £297.

**Rawtenstall T.C.**—Certain thoroughfares in the west end of the town are to be experimentally lighted with electricity.

**Ryde T.C.**—The tender of Mr. J. Rousell, at £2,720, has been accepted for the erection of a pumping station at the Knighton waterworks.

**Southmolton (Devon) R.D.C.**—The engineer and surveyor's scheme for the Northmolton water supply is to be proceeded with.

**West Bromwich T.C.**—The nett profit of the electricity undertaking for the past year was £2,853, an increase of £1,071 over the previous year.

## MISCELLANEOUS.

**Bournemouth T.C.** It has been agreed to make application to the Local Government Board for sanction to borrow the sum of £1,000, made up as follows:—Aiax (John Mort & Sons, Leamed) turbine fire engine with hose tender combined, £840; first aid pump with cistern, reel and hose, £50; two electric head lamps and one tail lamp, £10; 50-ft. lattice girder telescopic escape, £95; contingencies, £5; total, £1,000.

**Thornaby T.C.**—£4,300 is to be spent on the purchase of land near Thornaby-road for a depot and other purposes.

**Turbine Pumps.** A fine variety of turbine pumps are shown in the latest catalogue of Messrs. Mather & Platt, of Park Works, Manchester, and Queen Anne's Chambers, Westminster, S.W. The experience gained by the firm during a period extending over thirty years of the application of turbine pumps to all classes of work has enabled them to effect radical improvements in design to obtain the highest efficiency and to ensure thorough reliability of action. Mather & Platt turbine pumps have actually been built to quantities up to 15,000 gallons per minute, for heads up to 1,600 ft., and for speeds up to 3,000 revolutions per minute, and they have been successfully applied in such widely diverse directions as mine, waterworks and sewage pumping, as well as in connection with fire services and various industrial undertakings.

**Third International Road Congress Programme.**—The programme has been issued of the Third International Road Congress, which will meet in London from Monday, June 23rd, to Saturday, June 28th, 1913. The opening address will be delivered by the Chancellor of the Exchequer, and on June 23rd there will also be receptions by the First Commissioner of Works and by the City Corporation at the Guildhall. Sectional meetings will be held on June 24th and June 25th, the evening of the latter day being devoted to a reception by the Institution of Civil Engineers at the Albert Hall or the new premises of the institution, if completed. On Thursday, June 26th, a group of members of the congress will inspect roads in the Home Counties; another will visit Windsor Castle, on the invitation of the King, and a third will proceed up the river. There will be a reception in the evening at the Royal Automobile Club. On Friday, June 27th, the final meetings will be held and a garden party given by the Surveyors' Institution attended. The chief event of Saturday, June 28th, is a banquet at the Hotel Cecil.


## FOR OTHER ADVERTISEMENTS

See End of Paper.

BOROUGH OF KINGSTON-UPON-THAMES.

TO BUILDERS AND CONTRACTORS.

The Corporation invite Tenders for an Addition to the Electricity Works Building and for Engine Foundations.

Plans and Specification of the Building can be seen at the office of the Borough Surveyor, Mr. R. Hampton Clucas, Municipal Offices, and the Plans and Specification for the Foundations at the office of the Borough Electrical Engineer, Mr. J. E. Edgcome, Electricity Works in this Borough.

Sealed Tenders, endorsed "Electricity Works," to be delivered at my office on or before Wednesday, the 26th instant.

The lowest or any Tender will not necessarily be accepted.

HAROLD A. WINSER,
Town Clerk.

Town Clerk's Office,
Kingston-upon-Thames.
June 12, 1912.

ESHER AND THE DITTONS URBAN DISTRICT COUNCIL.

SURVEYOR'S CHIEF ASSISTANT.

An Assistant is required in the Engineer and Surveyor's Department of the above Council, who must have had experience in the office of a Municipal Surveyor.

He must be a good Surveyor and Draughtsman, competent to take levels, and have had experience in the inspection of new buildings.

Commencing salary £120 per annum (payable monthly), and, subject to approved service, rising by annual increments of £10 to £150.

Applications are to be made on a form which can be obtained by sending a stamped addressed foolscap envelope to Mr. H. C. Fread, Surveyor to the Council.

The forms to be returned, addressed to the undersigned, endorsed "Surveyor's Assistant," not later than noon on the 26th inst., accompanied by copies of three testimonials.

Canvassing, directly or indirectly, will be a disqualification.

E. A. EVERETT,
Clerk.

Council Offices,
Thames Ditton.

BOROUGH OF LUTON.

SURVEYOR'S ASSISTANT.

The above Council require the services of an Assistant in the Surveyor's Department.

Salary £80 per annum.

Candidates must possess a thorough knowledge of surveying and levelling, and be neat and accurate draughtsmen.

Applications, stating age and experience, together with copies of not more than three testimonials, to be forwarded to the undersigned not later than Monday, 24th June, 1912.

BRUCE PENNY,
Town Clerk.

Town Hall, Luton.
June 12, 1912.

BROMLEY RURAL DISTRICT COUNCIL.

Wanted, Clerk of Works for Private Street Works, &c., at Orpington, Kent. Salary £2 10s. weekly. Period of engagement three months at least.

Apply by letter (endorsing the envelope "Clerk of Works") to the undersigned, with copies of not more than three testimonials of recent date, not later than 12 noon on Tuesday, the 18th June, 1912.

(By order)
EDWARD HASLEHURST,
Clerk to the Council.

Park House,
Bromley, Kent.
June 12, 1912.

## PERSONAL.

Mr. James Andrew, burgh surveyor of Helensburgh, has been appointed assistant surveyor for Dumbartonshire.

Mr. D. Higgins, of Farnborough, has been appointed assistant and clerk to Mr. J. Stevenson, surveyor to the East Molesey Urban District Council.

Mr. W. T. Douglas, of London, has been appointed, at a fee of 50 guineas, to advise the Torquay Corporation on the matter of the proposed retention of sand at Torre Abbey.

Mr. Larman Luck, second and architectural assistant to the borough engineer of Folkestone, has been appointed (out of 170 candidates) as architectural assistant to the borough surveyor of Walsall.

Mr. Walter Busbee Griffin, architect and landscape artist, has been selected as the designer of the new capitol of the Commonwealth of Australia, after being awarded the first premium for the competitive designs submitted.

Mr. Clive H. Kilminster, chief assistant works engineer, Colombo Municipality, has arrived in England on nine months' furlough, and all communications intended for him should be addressed c/o The Crown Agents for the Colonies, Whitehall, S.W.

Mr. Charles H. Roper, one of the assistants in the Chiswick surveyor's office, was recently the recipient of a parting gift upon his leaving to take up a position in Canada. The gift consisted of a leather case of drawing instruments, bearing a suitable inscription.

Mr. Vincent John Grose, F.R.I.B.A., F.S.I., district surveyor for Bermondsey, has resigned his appointment owing to failing health. The London County Council have appointed Mr. C. A. Daubney, A.R.I.B.A., F.S.I., the district surveyor of Rotherhithe, to attend to the business in Bermondsey.

Mr. H. Percy Boulnois, M.INST.C.E., and Mr. H. Howard Humphreys, M.I.MECH.E., have been appointed to represent the Roads Improvement Association at the Conference on the Standardisation of Road Materials to be held under the chairmanship of Sir John Wolfe Barry, and convened by the Engineering Standards Committee for Friday, June 21st.

Mr. G. Henry, surveyor to the Carmarthen Rural District Council, has been appointed surveyor to the eastern division of Carmarthenshire, at a salary of £250 a year. There were sixty-one applicants, and at the council meeting it was decided to exclude those who could not speak Welsh. Only nineteen stated in their applications that they could converse in the vernacular.

Mr. E. J. Fort, chief engineer of sewers in Brooklyn, New York, and Mr. G. T. Hammond, engineer in designing under Mr. Fort, have left for a two months' trip of investigation of sewage disposal systems in the larger cities of Great Britain and the Continent. They will visit London, Manchester and Birmingham, Rotterdam, and the Emscher district of Germany, and will also study the sprinkling-filter system recently installed in Paris.

Mr. T. P. Frank, city engineer and sanitary inspector to the Ripon Corporation, has been appointed borough surveyor and waterworks engineer at Newark-on-Trent, at a salary of £250. In connection with this appointment, it may be noted that Mr. J. C. Haller, engineer and surveyor of Carlton (Notts), was one of the 180 candidates, being one of the six recommended by the Selection Committee for final interview. He withdrew his application, however, as his council offered him an increase (by two instalments) of £50 per annum, and an agreement for five years, this being accompanied by very kind remarks of appreciation.

Mr. T. W. Stainthorpe, ASSOC.M.INST.C.E., M.R.S.I., the honorary secretary of the Institution of Municipal and County Engineers for the African District, will arrive at Southampton on the "Balmoral Castle" on the 22nd inst. Since 1903 Mr. Stainthorpe has been engaged on numerous water and drainage schemes in Cape Colony and the Union Governments of South Africa. Mr. Stainthorpe's address in England will be c/o Secretary, Institution of Municipal and County Engineers, 11 Victoria-street, Westminster, S.W., where any information or recent catalogues relating to water supply, sewerage or municipal engineering will be welcomed from manufacturers or others.

Mr. R. O. Wynne-Roberts, M.INST.C.E., of Regina, contributes to the *Contract Record* (Toronto) of May 29th an article on the "Progress of Good Roads in Saskatchewan." He notes that there is not a supply of suitable stone in the province, and consequently, pending the development of financial resources, the local materials—clay, sand and gravel—must be employed. There are now 2,095 motor cars in Saskatchewan, and about 170 municipalities, each having the entire control of roads in its district. Mr. Wynne-Roberts concludes by pointing out the great saving that would accrue to the province's 90,000 farmers if the roads were improved so as to give increased haulage facilities.

Mr. J. A. Brodie, the city engineer of Liverpool, went to India recently at the request of the Government to assist with his advice in the laying out of the new capital, Delhi, and it was understood that he would be away for five months. It now transpires that the five months will not be a continuous period. As a matter of fact, says the *Liverpool Post*, Mr. Brodie will return to England this month, and leave for India again in time to give his services there in December and January next. The Health Committee have confirmed the permission provisionally granted by Alderman Menlove, the chairman, and Mr. E. R. Pickmere, the town clerk, authorising the alteration of the original arrangement, in so far as it concerns the city engineer. The chairman, in explaining the matter to the committee, said they were very glad to know that their official was so much thought of as to be specially invited to continue the important work at Delhi.

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**Benfieldside Sewage Disposal Scheme.**—In a recent competition promoted by the Benfieldside (Durham) U.D.C. for a sewage disposal scheme, the council have awarded the following prizes: first premium, Messrs. Wallin & Taylor, Newcastle; second premium, Mr. G. H. Shipley, Park-road, Leeds. The scheme when completed will cost between £9,000 and £10,000.

**India's New Capital: Durbar Site Rejected.**—The town planning experts consulted with regard to the new capital at Delhi have now officially decided against the Durbar site for the permanent capital. They have selected a position in the south-western suburbs of the city, which offers good drainage and a fine prospect. The only objection to it is its distance from the recently selected site of the temporary capital. The cost of constructing the new capital is provisionally estimated at £4 000,000.

**Jarrah Wood Paving in New Zealand.**—Auckland, New Zealand, is contemplating the expenditure of £224,000 for permanent street improvement. The mayor recently went to Australia to investigate paving methods there, and upon his return he visited Wellington. He gave it as his opinion that the business streets of the latter city are the best in Australasia, considering the period of time they have been down and the wear to which they have been subjected. He referred especially to the 4 miles of Jarrah wood paving constructed eight years ago, which show no signs of wear (largely attributable to the coating of tar and sand which they receive every year or two), and mentioned particularly one street that has been down nearly three years, and still possesses a perfectly even surface, although nothing has been done to it in the meantime. The only renewals of these pavements have been in a few spots where the ground was soft, causing the underlying concrete to sink. The method of laying wood-block pavements in Wellington is stated by the city engineer to be as follows: The roadway is excavated to a depth of 11½ in. below the finished surface level of pavement. Six inches of concrete (composed of six parts of ballast to one of Portland cement) are laid over the whole width of the roadway and floated to a smooth surface. Blocks, 5 in. deep, cut from planks measuring 6 in. by 3 in., 7 in. by 3 in. or 8 in. by 3 in., are dipped in hot tar, and then laid in courses 3 in. wide across the street, the blocks in each course and the several courses being placed as close together as possible. Expansion joints, 1 in. wide, of well-worked clay, are laid alongside each kerb. The whole surface is coated with boiled tar, well brushed in, and then sprinkled with coarse sand. This tarring and sanding are repeated as found necessary. The sand used is taken from the sea beach, the particles being about the size of rice.

# Institution of Water Engineers.

## SUMMER GENERAL MEETING AT CHELTENHAM.

The seventeenth summer general meeting of the Institution of Water Engineers opened at Cheltenham on Thursday of last week. [illegible] as we have already reported, Mr. J. S. Pickering, M.INST.C.E., the borough surveyor and water engineer, was formally installed as president in succession to Mr. Edward Sandeman, M.INST.C.E., engineer to the Derwent Valley Water Board. The business proceedings, which took place at the town hall, were attended by the following, among others: Messrs. C. H. H. Adams (Newmarket), R. Askwith (Wilton-le-Wear), G. H. Baglay (Cheltenham), F. J. Bancroft (New Barnet), J. C. Barrowclough (Batley), J. F. Bedford (Colne), C. H. Bird (Cardiff), W. T. Bird (Midsomer Norton), A. B. E. Blackburn (Sunderland), E. Blackburn (Brighouse), H. T. Blake (Ross, Herefordshire), R. Blakiston (Liverpool), H. Bloor (Birkenhead), F. W. Booth (Stamford), T. Booth (Stamford), E. Brooks (London), F. H. Brunt (Rochdale), W. T. Burgess (London), T. Caink (Worcester), J. Cartwright (Loughborough), J. Chisholm (Airdrie), A. J. Clark (Manchester), F. C. Cook (Nuneaton), J. H. Crowther (Wallasey), E. H. Crump (Hinckley), J. Davidson (Coatbridge), J. Dewhirst (Chelmsford), E. W. Dixon (Leeds), F. J. Dixon (Ashton-under-Lyne), R. E. Doewra (London), W. Eastwood (Wallasey), G. T. Edwards (Bamford), G. Foster (Wakefield), R. H. Fox (Chile), H. Francis (Plymouth), J. H. Garrett (Cheltenham), C. F. Gettings (Worcester), G. Greenslade (Southampton), F. Griffith (Leicester), H. L. Groves (Windermere), F. Hammond (Chepstow), J. E. Hawkins (Paignton), H. C. Head (Winchester), H. Ashton Hill (Birmingham), L. M. Hill (Cheltenham), F. W. Hodson (Loughborough), F. E. Howard (London), W. Jones (Pontypridd), D. Kitchingman (Southampton), F. Oscar Kirby (Doncaster), G. O. H. Klopp (London), J. J. Lackland (St. Helens), H. Lapworth (Westminster), J. Lees (Tonbridge), F. W. Lillicrap (Devonport), W. Matthews (London), W. Millhouse (Scarborough), F. W. McCullough (Belfast), J. T. Mason [illegible] W. J. Mercer (Cheltenham), T. Molyneux (Stockport), J. H. Montgomery (Llanelly), A. Murray-Smith (Cheltenham), H. Nicholson (Manchester), W. Paterson (London), W. J. Peirce (Richmond, Surrey), F. R. Phipps (Basingstoke), J. S. Pickering (Cheltenham), A. C. Potter (London), H. Preston (Grantham), C. H. Priestley (Cardiff), R. Read (Gloucester), L. Richards (Cheltenham), S. Rideal (London), R. B. Rigby (Bury), C. H. Roberts (Aberdeen), R. F. Rogers (Newton Abbot), E. Sandeman (Hathersage), C. Sanity (Windsor and Eton), E. J. Silcock (Westminster), S. Simmelkjer (London), C. Clemesha Smith (Wakefield), T. R. Smith (Kettering), J. Stewart (Cheltenham), W. A. Stewart (Aberdeen), W. J. Tait (Sudbury), W. Osborne Thorp (Malvern), J. C. Thresh (Chelmsford), A. Towler (Ilkley), A. Valon (Westminster), A. H. Walker (Loughborough), L. C. Walker (Reading), G. Watson (Westminster), A. S. West (Harrogate), W. Whitaker (Croydon), H. J. White (Cheltenham), S. Whitehead (Nelson), H. W. Woodall (Bournemouth), and G. N. Yourdi (Westminster).

The MAYOR (Councillor C. H. Margett, J.P.) said it afforded him much pleasure to be present that morning and extend to them a very hearty welcome to Cheltenham. The corporation [illegible] greatly honoured that such an important body as the Institution of Water Engineers should pay a visit to their town for their annual [illegible] meeting. They recognised that the members of the institution had great responsibilities, for they were in control of practically all the water supplies of the kingdom, and it was on the purity of those supplies that the health of the community at large depended. They felt it an additional honour that they should [illegible] the year in which [illegible] had elected as their president Mr. Pickering, the borough surveyor and water engineer. In doing so he felt that they had recognised his merits, abilities and high standing in the engineering world. They recognised his merits in Cheltenham—not only on the council, but outside—and appreciated the valuable services he had rendered to the town. He congratulated Mr. Pickering on the honour he had had conferred upon him and the institution on the possession of such a president. He [illegible] that they would find many points of interest in the Cheltenham water supply. They obtained it from five different sources, with three reservoirs at different parts of the town fed from natural springs. They had a never-failing well at Sandfields and an emergency supply from the Severn. They would see that the water engineer had some difficulties to contend with. At Tewkesbury, in which interesting and picturesque town were situate their Severn waterworks, they had installed Paterson rapid filters, and they hoped the result of that would be that, whatever the state of the weather might be, they would be the means of providing them with a never-failing supply of pure water. It was his hope that the weather would be fine during their stay, but even if it rained he assumed they would not be nonplussed, because they would only be coping with their natural element, and he trusted when they returned to their various districts that they would retain nothing but pleasant memories of the garden town of England.

The RETIRING PRESIDENT (Mr. Sandeman) said the welcome which the institution received, wherever it went, was one of the things which materially assisted in making their yearly visits pleasant. There was no doubt they were exceptionally fortunate in being able to hold their meeting in such a beautiful place as Cheltenham. The mayor had received them with great kindness and much courtesy, and on behalf of every member he wished to return most sincere and hearty thanks.

The minutes of the winter meeting held on December 8th and 9th last were read by the SECRETARY (Mr. Percy Griffith) and confirmed.

### DELEGATES FROM WATER AUTHORITIES.

Mr. SANDEMAN said he wished now to extend a very hearty welcome to those delegates of water authorities who were present for the first time, and to express the hope that in the future they would see many more of them.

### PRESENTATION OF PREMIUMS.

Premiums awarded by the council for papers read during 1911 were afterwards presented by the president, as follows: Dr. Herbert Lapworth for paper on "The Geology of Dam Trenches;" Mr. Edwards (Bamford) for paper on "Portland Cement for Public Works;" and Dr. Recklinghausen (Paris) and Mr. Wilbur Clemence (London) for a joint paper on "Filtration and Sterilisation."

### INSTALLATION OF NEW PRESIDENT.

Mr. SANDEMAN said he had now to perform the pleasant duty of introducing to them as his successor in the presidential chair Mr. Pickering, who, by virtue of his position, experience and labour in connection with water supply and kindred subjects, had every qualification for the office. He was convinced that in Mr. Pickering they would have a president who would uphold the dignity of the chair not only with credit to himself, but also to the advantage of all concerned. He wished him a happy and prosperous year of office, and he had great pleasure in asking him to take the chair and accept the certificate of his office.

Mr. PICKERING, taking the chair amid cheers, said he had to thank Mr. Sandeman for the kind and generous remarks he had made as to himself, and the meeting for the cordial way they had received him. He felt that he lacked many of the qualifications for the office possessed by his predecessors, but it was his greatest wish to do all he could in the interests of the institution. The certificate presented to him would be treasured by his family in years to come, and would help to remind them, if such a thing were necessary, of the honourable position which by their kindness he was now occupying. So far as he was personally concerned, nothing was necessary to remind him of it, because the occasion was one which would always be green in his memory. He was particularly pleased to be in that position if only to be able to add his welcome to that already extended to them by the mayor. It was his hope that their visit to Cheltenham would be an enjoyable one, and that the papers, discussions, and visits to works would be productive of knowledge, useful not only to the members of the institution, but to the authorities they represented. He had now the pleasurable duty to perform of asking them to accord a hearty vote of thanks to the retiring president. Mr. Sandeman had made an ideal president. The very eminent position he occupied as a water engineer had in itself enabled him to add a

[illegible] he had held which would be of lasting benefit to the institution. His courtesy and the grace he had shown in presiding over their meetings had won for him the esteem and regard of every one of his colleagues on the council, and, he [illegible] member of the institution who had had the privilege of taking part in the proceedings. He had had perhaps the most onerous task of any president, because during his term of office they had become an incorporated body—a change which had thrown a great deal of work on his shoulders.

Mr. Sandeman said he felt somewhat overwhelmed at the encomiums which had been showered on him, but he was obliged to tell them that a great deal of the work connected with the incorporation of the institution had been performed by others who were more able than he was to undertake it—one being Mr. Easton Devonshire, who was unfortunately absent owing to illness, and another Mr. Wm. Matthews. His own share of the work was extremely small, but he thoroughly appreciated the kindness of the president in referring to anything he had done. His hope was that Mr. Pickering's year of office would be of increased progress. Concluding, Mr. Sandeman said that it was with a sense of some little relief that he handed over the reins of office; it had been a very pleasant year to him, but with one's own work to attend to, the duties which fell to the president became at times somewhat onerous.

It was announced that Messrs. R. B. Rigby and W. Ironside Tait had been appointed scrutineers of the ballot.

THE PRESIDENTIAL ADDRESS.

Mr. Pickering afterwards rose to deliver his presidential address—reproduced in last week's Surveyor.

Mr. Wm. Matthews, in proposing a vote of thanks to the president, said the address, although not so highly technical as some delivered in previous years, had brought to their notice a number of points which were greatly exercising them at the present time, while he had also furnished an interesting *résumé* of the matters which had been engaging the attention of the council during the past year.

Mr. C. H. Priestley (Cardiff) seconded, and the vote of thanks was carried with acclamation.

The President, in acknowledgment, said he could assure those present that he was deeply thankful to them. It had been a great pleasure to him to prepare the address, and if he had been able to bring before them something of interest he had been amply repaid.

NEW MEMBERS.

The following elections were announced: Members: Messrs. C. W. Bennett (Cheshire), W. J. E. Binnie (Westminster), F. G. Fairbank (York), and T. Moulding (city and waterworks engineer, Exeter); associate members: Messrs. S. Hall (Aberdeen), J. A. Hutchinson (Torquay), J. H. Montgomery (Llanelly), and W. Young (Epsom); associate: Mr. W. T. Burgess (London).

The meeting next proceeded to the consideration of a paper by Mr. Percy Griffith, M.INST.C.E., descriptive of the new waterworks for Skegness. The contribution in question, which was submitted at the last winter meeting of the institution, but, owing to lack of time, not discussed, will be found in our issue of December 22, 1911.

## SKEGNESS NEW WATERWORKS.

Mr. A. Towler (Ilkley), alluding to the description of the trial pumping operations, asked [illegible] nominally was 37 revolutions per minute; at the [illegible] It was stated, of course, that the valves were not [illegible] members, if a drawing of the valves were given. They were told of the heavy loss incurred through "banking" during the time the plant was not working. It had often been claimed by the makers of suction plant that the banking losses were quite nominal. He thought the conclusion would be that this was a very economical installation. It would probably use less than half the weight of fuel a good steam plant would use. Of course, the steam plant might use fuel one-half the value, but the cost of the steam plant to do that and the cost of the buildings, he thought, would be greater than the cost of the plant put in. The author, in the course of his paper, had spoken of "strokes"; he thought that ought to be revolutions. He should like to ask what was done with the overflow from the purifiers. It was said to be exceedingly poisonous to cattle, and there was always a danger if care was not exercised of the effluent contaminating the source of supply.

Mr. C. H. Priestley (Cardiff) said there was one point upon which he should like some information. Mr. Griffith had had exceptional opportunities, probably, in this particular installation, which, however, he understood, was an entirely new one. Few of those who practised as water engineers in provincial towns had to deal with new installations, and it would be interesting to know the cost of the water per 1,000 gallons as it was supplied to the district—capital cost taken into consideration. Mr. Griffith considered the installation to be an economical one, and no doubt it was so. He had given him (the speaker) some information recently in connection with some new machinery he was installing, the question being between steam and gas-producer plant, and from what he had heard that morning the plant described was a very economical one, and might be taken as a standard one for small towns such as Skegness. He thought, however, Mr. Griffith had made rather too much of the rendering. His (Mr. Griffith's) contention was that the structure did not matter if the rendering were all right. That was going too far. He thought the structure ought to be a sound one in the first instance, and with good rendering on that a perfect job would be obtained. The pumping into the reservoir and the town at the same time was a matter in which he had experienced difficulty, and some little time ago he put a duplicate main in so that they would not have to pump into the town mains.

Mr. C. H. Roberts (Aberdeen) said the water from the lower greensand was of a chalky nature, and not suitable for storage in a reservoir for any length of time, as it was found by experience to become stale and to depreciate in quality if it were left stagnant in the reservoir. He therefore thought that the suggestion adopted in the case of pumping into the reservoir and the town mains at the same time was not to be recommended owing to the absence of circulation in the reservoir. He should also like to refer to the position of the reservoir. The author of the paper stated that it was some 7 miles distant from Skegness. He could not see any reference in the paper to a reservoir for storing water in the town with the exception of a small tank holding less than an hour's supply. In the case of a fracture of the 10-in. main, or it being found necessary to repair any of the valves, Skegness would be left without water unless the repairs could be done while the town was being supplied from the small tank, which he did not think was possible. With regard to the main, it appeared to him to be desirable to have automatic shut-down flaps along the whole length of the main, so that in case of accident the surrounding property would not be flooded with water causing considerable damage and liability. Referring to the boreholes, he was interested to hear of the difficulties encountered, and it seemed to him that there was no need to put down a trial borehole when there was so much information available in the neighbourhood. It would have been better, he thought, to have put down a larger borehole at once, and take the slight [illegible] filters, but also of putting down a second borehole. With regard to the sand difficulty, as the author explained, it was probably due to the breaking down of a stratum of argillaceous material passed by the 8-in. tubes. The breaking down of this stratum was presumably due to heavy pumping through the small [illegible]

esting to the institution if a section through the borehole could be shown, indicating the thickness of the gravel and the formation of the overlying strata. He did not know whether the author had considered the question of settling the water first with a coagulant instead of settling the wash water returned to the river. He presumed that the sand difficulty having now been removed, owing to a larger borehole having been put down, the filters were not required, and he should be glad if the author would tell them whether they were now in use.

Mr. WM. PATERSON (London) said he would like to have an analysis of the water, because a point of peculiar interest in the paper was the manner in which the silt from the turbid water choked up the filters. Mr. Griffith was fortunate in avoiding this by putting down another borehole. But he would like to hear what he would have proposed if he could not have got rid of it in that way. Alumina had been suggested. He had had experience of a similar thing, and the simplest method of treatment seemed to be the addition of lime; that formed a very heavy precipitant, and the water, after standing a few hours, became practically clear. The difficulty, of course, with added alumina was that some reaction might occur. The whole thing depended on the analysis of the water. Another point was the pumping direct from the well through the filters to the reservoirs. He admitted that was a thoroughly satisfactory arrangement in many cases, but when dealing with a doubtful water it was a great advantage to be able to get the water up to the ground level, this facilitating the arrangement of the plant. Where they had to pump from a deep well direct into the town mains they were more or less handicapped. He suggested a low-lift pump lifting to the ground level, and they could then put in large precipitating tanks, although that only held good in the case of doubtful water. The rendering of the concrete tanks was undoubtedly a very important matter indeed, and he would be much indebted to Mr. Griffith if he would say whether there was a special method of rendering in this case. If there were a special preparation of concrete it would be useful to them to know what it was.

Mr. J. DEWHIRST (Chelmsford) stated that he had had to deal with a similar water in his own district. In the Eastern Counties they got a vast amount of sand in suspension. When his council first contemplated making their waterworks, it was the usual practice to put down a rather small trial boring. The result was that after pumping some little time in almost every case, and in one in particular, they got fine sand and clay in suspension to such an extent that they could not use the water. Sand filters were put down in the first instance, and proved a failure, and after considerable inquiry it was decided to put in a mechanical filter. The makers guaranteed the duty after a careful analysis of the water, and they put in a filter which was capable of dealing with six times the quantity when the water was at its worst. But, in his opinion, it was facing the wrong position. The water was first turned into the subsidence tank and the coagulant then added. He might say that with the average filter of ample size they had no trouble except for a very short time. He was at a loss how to account for it. The engineer assured him that he (the engineer) never exceeded the proper rate of pumping, but on one occasion he found a double quantity was being put through. He merely mentioned that because with a mechanical filter he thought they could get over the difficulty. The first borehole he put down was 11½ in., and from that source he had been able to get a larger quantity of water with less sand than from any other. The next one would put down would be a 14-in. He would have liked to have some more details in the paper, but that was perhaps too much to ask for. He agreed that it was in the main point of the rendering that the great secret of watertightness lay.

Mr. F. W. HODSON (Loughborough) said he should like to ask Mr. Griffith if he could give them any information on what he considered was an important point with respect to the effect of the change of the water supply upon the general health of the inhabitants of Skegness, particularly as a health resort. The town had for many years enjoyed a high reputation all over the Midland counties as a suitable place to which to send convalescents. The atmosphere was always considered to be a bracing one, and supposed to have a most remarkable effect, but he did not think himself when he visited the town that it had anything to do with the air, but the strength of the water. Mr. Griffith had said that the proportion of chloride of sodium in the Skegness water reached 73 grains per gallon, and that was the only information they had had about the analysis of the old water. He was under the impression that it took from 75 grains to make any appreciable taste in the water, but when he drank the water he noticed a very distinct taste in it—more than in the Cheltenham water. The beauty of it was that the Skegness water was supplied by the local authority to everyone, and they were not asked to pay 2d. per glass for it. One tasted it through the medium of one's coffee, tea and whisky, and they were thus provided with a very cheap and effective health resort. The effect on the first day was perhaps rather inconvenient, but on the second, third and fourth days it began to give one an appetite, and he supposed the water contained an iron tonic in some form or another. He thought that the change in the water supply brought about by Mr. Griffith, although it would probably give the consumers water of better quality, might be prejudicial to Skegness as a health resort. It would have been interesting to have had an analysis of the original water, so that they could have seen the precise nature of the difference between the old and new water. He should also like to know whether any statistics of the general health of the inhabitants of the town were available, though probably sufficient time had not elapsed since the installation of the new supply to enable them to get any reliable data. The question, however, was of some importance, because Skegness was not the only place the reputation of which as a health resort depended not on the air but on some mineral given by the public water supply which people had to take without paying.

Mr. GRIFFITH said he very much appreciated the interest and value of the discussion on his paper. He had hoped the contribution would lend itself to a useful discussion, and he was much obliged to all those who had contributed to their information. Dealing with Mr. Towler's remarks, that gentleman had, he thought, referred to the dimensions given as regards the level of the water in the well. The figures were quoted from the official report of the test, and for the sake of convenience they were taken from the bottom of the well. He admitted that was not always a good way of doing it, measurement from the surface being better. For the particular purpose of the test, however, the fluctuation in the level of the well was sufficient. Another question was that of the slip in the pumps. That was admittedly high during the test; owing to sand passing through, the pump had naturally been scored. The slip, he could assure them, was then larger than at any other time. He had not with him any definite test of the slip, but he could state confidently that when other tests were made the results were extremely satisfactory. With regard to Mr. Towler's remarks generally, he thought they all appreciated the fact that he (Mr. Towler) had had a very large experience with steam as a motive power. Mr. Towler suggested that if the comparative cost of the fuel used were taken into account, the result was about the same as if a steam plant had been employed. He was bound to suggest that that was not altogether the position with regard to the Skegness plant. As a matter of fact, the cost of the fuel used would be approximately about 31s.; that of ordinary steam coal, delivered at the works, would be 22s., so that, admitting the consumption of fuel was one half that of the steam plant, he thought it would be admitted that the suction gas plant "had it." The scrubber waste, also mentioned by Mr. Towler, was a real difficulty in these plants, and in this particular case they had a bit of a struggle to get over it. The waste was objectionable, and though he had never heard of cattle being actually poisoned, they had received complaints from neighbouring riparian owners that cattle were affected. That he thought was imagination, because the parties were not aware of the nature of the material they were putting into the water; they merely complained of the sand discolouring the water, but he did not think it really injured live stock. At the same time he would be glad to hear that some ingenious person had been able to eliminate the objectionable qualities of the waste. In regard to the cost of pumping per 1 000 gallons, including capital charges, in the present case he had a good reason for not complicating his results with such figures. The works were carried out by a company, and being afterwards transferred to the local authority, the initial position as regarded capital was very different in the two cases. In this case the amount paid by agreement under the purchase clause of the Urban District Councils Act included an addi-

tional 10 per cent for compulsory purchase, and an additional 4 per cent on money advanced to carry on works during an interval. All these were additions to the capital charges not represented in material, although the subsequent working of the undertaking by the urban district council showed that they had not paid excessively for the undertaking. But an important point arose in connection with these capital charges. It should always be borne in mind that in the case of a company what were called capital charges were mostly optional, and depended on the profits made; in the case of a new company they would amount to nothing. With a local authority the capital charges were fixed by the Local Government Board, and were permanent and fixed. In comparing company working with a local authority's undertaking that was an essential point to remember if they wanted to get a fair basis of comparison. The rendering of the reservoir had been referred to by Mr. Priestley. Possibly in reading his paper he had rather emphasised the importance of the rendering, but he thought the paper represented his views clearly; but as regarded structural stability, he preferred reinforced concrete to anything, though, in order to secure watertightness, he preferred to have a good rendering put on afterwards. The small amount of storage, referred to by Mr. Roberts, was an interesting point. The amount of 10,800 gallons provided near the town was intended only as a safeguard against the fracture of the 7 miles of main. It was quite a practical point, and one which deserved consideration, but the position here was that there were a few cases where there were mains which could not have an insurance at the end of them; that was to say, risks had to be taken in all works for fractured mains, and he did not think the risks in this case were more than normal, or that they were likely to cause any trouble. There had been defects discovered in the past, but they had been dealt with without delay. He believed he had stated in the paper that they had automatic alarms, by which means bells were rung at two points on fractures of the mains taking place. The filters were still in use, and they had been found very useful as a safeguard against an occasional inflow of sand not sufficient in quantity to discolour the water. But sand had found its way into the filters, where, however, it was better than in the town supply. A geological section of the boring would be added to the paper. The question as to why, in dealing with the sand difficulty, settling was not attempted had been raised. The point was considered most carefully, and the process was not adopted because it would have taken a long time to provide suitable storage for sedimentation, and would have cost a large amount of money. He was glad to be reminded that he had not given an analysis of the water. Mr. Hodson had asked for an analysis of the old water, and he would be pleased to supply that information in the "Transactions." They were grateful to Mr. Paterson for his suggestion as to the use of lime in connection with sedimentation. It would, he thought, have assisted sedimentation to have added lime in that case. The question of pumping direct through the filters, as compared with the use of gravity filters, of course, involved double pumping, and they required to judge as to the circumstances of each case. There were objections to pumping twice, but these did not apply in all cases, and he appreciated that the double pumping would be a disadvantage under certain conditions. He was grateful to Mr. Dewhurst for his remarks; it was always interesting to hear of difficulties such as he had described, and particularly when they were provided with details of the methods adopted to overcome them. He had no figures such as were asked for by Mr. Hodson, but his own view was that it would be likely rather to enhance the popularity of Skegness to have got rid of the taste in the water. He thanked the meeting for the attention given to his paper.

*(To be continued.)*

## ANNUAL DINNER.

On Friday evening the annual dinner of the institution took place at the town hall, Mr. J. S. Pickering, the president, occupying the chair, and the company, which numbered over 100, including the Mayor (Councillor C. H. Margrett) and several members of the town council.

In proposing "The Mayor and Corporation of Cheltenham," Dr. Rideal said the corporation and town were to be congratulated upon their efforts to secure an absolutely satisfactory water supply, a thing so essential to the value of any town, and especially a place like Cheltenham with a reputation to maintain.

The Mayor, in acknowledgment, paid a tribute to the work which Mr. Pickering had carried out in his capacity as water engineer.

Alderman Norman, J.P., in proposing the toast of "The Institution of Water Engineers," remarked that Cheltenham had reason to be grateful to water engineers. To men so well acquainted with the subject as those present, he need hardly tell them that Cheltenham was placed in a peculiar position with regard to water supply, for although the town was surrounded by hills, the water that ought to come from them broke away in another direction. They had attempted to make incursions into the Thames Valley, but on every occasion had been turned back by Parliament. What they had accomplished during the past fifty years had been due to the skill of the engineers they had consulted, the first of whom being the late Thomas Hawksley, a name which still lived among engineers. He could only hope that under the difficult circumstances which had presented themselves the institution had enjoyed its visit to Cheltenham. It must not complain, for it seemed to have brought its own weather with it, but he could assure the members that they did get good weather in Cheltenham, and perhaps at some future time some of them would visit the town under more auspicious conditions. In concluding, Alderman Norman offered his congratulations to Mr. Pickering on the honour the institution had done him in electing him their president, and to the institution on the president they had secured.

The President, in the course of his response, remarked that the institution had brought about among its members a friendship of unspeakable value. This friendship had done much to advance the science of water engineering throughout the country. It had enabled them to keep in touch with all the latest developments, and the value of the papers, and even more so of the informal conferences, was of immense educational advantage. He very deeply appreciated the honour which had been conferred upon him by his election to the presidency. He had been connected with the institution since its establishment seventeen years ago, had had the honour of serving upon its council for the last seven years, and it had been his privilege to take part in a good deal of the work which the institution had carried out. He need not assure them nothing would be wanting on his part to maintain the dignity and usefulness of the institution.

The concluding toasts were "The Visitors," proposed by Mr. C. Clemesha Smith, and responded to by Mr. T. E. Rickerby, and "The Chairman," submitted by Alderman Colonel Rogers.

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**Cremation in Great Britain.**—A growth in the membership of the Cremation Society of England is recorded in the report of the council of that body for 1911. During the twelve months under review 114 cremations took place at Woking, as compared with 106 during the previous year; but at Golder's Green there was an increase of nearly 33 per cent, the figure for the year being 542, as against 415 for 1910. From crematoria in other parts of the country increases were also reported.

**Law of Private Street Works.**—It is surely a commentary on our system of legislation relating to what may be termed domestic matters that the owner of house property (to say nothing of the occupiers of his houses) has to thread his way through a maze of statutes and decisions to ascertain his rights and his liabilities in connection with questions which may arise every day. Such, however, being the case, text-books dealing with what on the face of them might be deemed to be simple matters have become an actual necessity, although the owner of property is lucky if the text-book suffices and he is not driven to consult a specialist. The work before us* deals with one of such subjects, private street works under the Public Health Acts and the Private Street Works Act, 1882, but not with the Metropolitan Management Acts; the statements in the text are supported by decided cases, with references printed in the text; there is also a table of cases and an index, and it should prove a useful hand-book. We find the recent decisions included, and the work seems to have been carefully prepared. *The Builder.*

* "Notes on the Law of Private Street Works under the Public Health Acts." By J. B. Rentoul, Conveyancing School of the Supreme Court. 4s. 6d. nett. London: St. Bride's Press, Limited, 24 Bride-lane, E.C.

# The Gloucester Waterworks—Witcombe Reservoirs.

By R. READ, ASSOC.M.INST.C.E., City Engineer.

**[An inspection of the works described in this paper was made on Saturday last by the Institution of Water Engineers, on the conclusion of the Summer General Meeting of that body at Cheltenham.]**

In 1855 an Act for the better water supply of the city of Gloucester authorised the purchase of the Robinswood Hill works of the Gloucester Water Company and the construction of the reservoirs at Witcombe. The corporation purchased the works at Robinswood Hill for £18,000, and Mr. Bateman, C.E., having recommended the Witcombe scheme as the best one available, the works were proceeded with and opened in 1863. The gathering ground at Witcombe which he selected is 1500 acres in extent, forming an escarpment of the Cotswold Hills, about 5 miles eastward of the city. The top of the escarpment is about 950 ft. above sea level, and comprises an ascending series of small beds of the great oolite, fuller's earth, inferior oolite, Midford sands, upper lias clay, marlstone, and lower lias clay.

Unfortunately, the dip of the strata is at an angle of from 7 deg. to 9 deg., away from the face of the escarpment towards the Thames Valley in a south-easterly direction; therefore the amount of spring water (which passes down through the inferior oolite and is thrown out by the upper lias clay on the face of the escarpment, at about 600 ft. above sea level) is very limited, varying from 120,000 to 150,000 gallons per day. The escarpment is, however, very steep, in some places near the top being at a slope of 1 in 3, and therefore a large quantity of water (averaging about one-third of the rainfall, and even in the very driest years one-sixth of the rainfall) runs off the surface. At Robinswood Hill (an outlier of the Cotswolds) the strata are similar, but at a lower level, the top being about 650 ft. above sea level. They consist of a small capping of inferior oolite, below that at about 600 ft. ordnance datum is upper lias clay, then marlstone, and below that again lower lias clay. The surface of the hill being convex, instead of escarped as it is at Witcombe, the water has to be collected and brought round the contours of the hill in pipes and conduits into the reservoirs, whereas at Witcombe the natural trend of the ground from all points except two small portions on the east and west is towards the reservoirs.

The capacities of the Robinswood Hill reservoirs are as follows: No. 1, 9,000,000, and No. 2, 1,000,000—total, 10,000,000; and at Witcombe, No. 1 contains 60,000,000, No. 2, 30,000,000, and No. 3, 30,090,000—total, 120,000,000 gallons. The first and second reservoirs at Witcombe were made in 1863, but the second one was enlarged and the No. 3 constructed in 1870, giving the above totals.

Fig. 1 shows a plan of the three Witcombe reservoirs, with the position of the original stream which ran down the valley, shewn by a dotted line. All the water is collected in the No. 1 or upper reservoir, and is decanted from that into the other two. The areas of water surface and the depths of water are as follows: No. 1 reservoir (greatest depth 37ft.), 14a. 1r. 9p.; No. 2 reservoir (greatest depth 39ft), 6a. 3r. 25p.; No. 3 reservoir (greatest depth 19 ft.) 7a. 3r. 5p.

The works, when opened in 1863, consisted of the No. 1, as shown, but No. 2 only extended so far as and below the water tower.

The works at Witcombe were carried out under Mr. John Hanvey, then city surveyor of Gloucester, to plans prepared by Mr. Bateman. It will be seen from the plan (Fig. 1) that, owing to the open character of the valley, the embankments are very long.

Fig. 2 shows a cross-section of the lower embankment, the water face of which is sloped at the usual angle of 3 to 1, the outer slopes being 2 to 1 at the top and 3 to 1 at the bottom. The treacherous nature of the lower lias clay was revealed by the fact that No. 1 embankment showed signs of slipping directly the reservoir was filled. This may possibly have arisen from not giving sufficient height of bank to allow for settlement due to consolidation. When the lower embankment was constructed in 1870, the same thing happened immediately the old bank which was across No. 2 was cut through, and the greater part of that bank is still in the reservoir, being, of course, submerged. On the advice of Mr. W. B. Clegram, the engineer to the Gloucester Severn and Canal Company, about 2000 tons of Budlip stone were placed on the outer face of the embankment, and this stopped the sliding movement. The overflow or by-wash is carried round the outside of No. 2 reservoir, and is built in brickwork, the bricks having been made from the clay found on the ground. Part of the water from the stream was, however, sent down to Gloucester as soon as the 12-in. main was laid, without waiting for the reservoirs to be completed.

In 1874-5 the city was extended, the whole of the Barton district being taken in, thus increasing the population by about 15,000, making a total of about 32,000, and on the author's appointment in March, 1878, he had to face the prospect of an early deficiency in the water supply. The meters on the 12-in. main at Hucclecote, being out of order, were first repaired, after which a house-to-house inspection throughout the city was organised, and was carried out during the following year by the late Mr. Warne. This inspection revealed the fact that, although about 1,600 houses in the recently added district had not had the water laid on, a great number of those which had the water laid on had no flushing cisterns to the water-closets, and the consumption worked out at something like 32 gallons per head per day. In the following year (1880), as it was impossible to give a constant supply, a Deacon meter was installed, but as this was worked by a pendulum clock, the results were not very satisfactory. The makers, however, substituted a watch movement for the pendulum clock, and very much improved the meter generally, so that in 1883 the author adopted the system throughout the city, which was mapped out into twenty districts. The installation was completed in October, 1883, at a cost of £2000, and by June, 1884, the consumption had been reduced to 16 gallons per head per day. It now averages about 20 gallons per head per day.

In 1880 Mr. J. F. Bateman was called in to report upon the best means of obtaining an additional water supply, and he recommended tunnelling in the upper lias clay above the Witcombe reservoirs for a length of about half a mile with a view of tapping the Midford sands below the inferior oolite, and so intercepting the water flowing down the dip of the strata towards the Thames Valley. The yield of water which would be obtained being unknown and depending upon the sand beds being of considerable thickness, trial borings were put down, as shown in the section (Fig. 3). Although some water was found in them, it was doubtful whether a sufficient quantity could have been obtained from that source, and as the result could not have been proved until the tunnel had been completed, and as, moreover, the Local Government Board ruled that the scheme was beyond the scope of a Provisional Order, and would necessitate an Act of Parliament, it was abandoned.

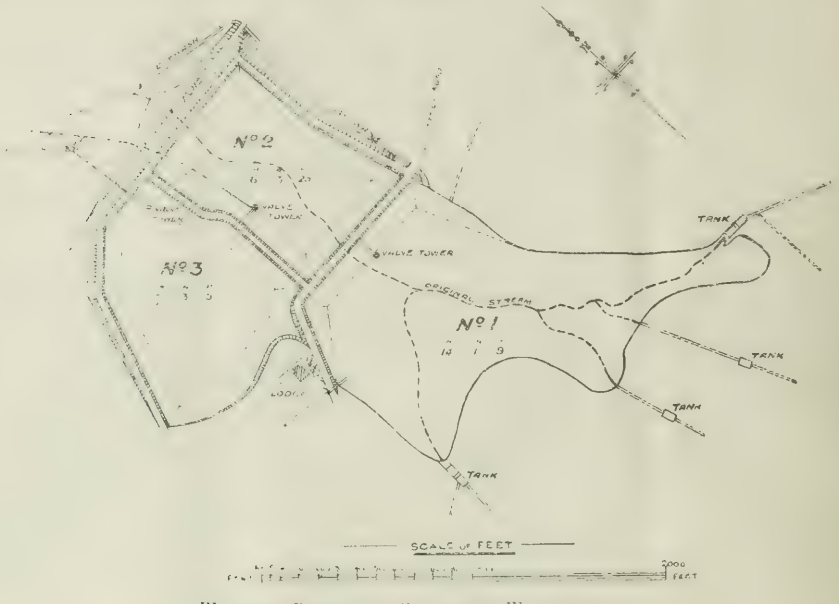
Happily, the reduction of waste resulting from the system of night inspection was so great that the supply was maintained without additional works until 1890. At Christmas time of that year, however, a very severe frost set in, during which the Witcombe reservoirs were covered with ice 12 in. thick, and the supply had to be supplemented by water from the Severn at Walham and from the canal. Early in 1891 Mr. William Fox was called in to advise, and he investigated nine different schemes for an additional water supply, including the Newent pumping scheme, which was finally decided upon and has since been carried out.

Previously to 1901 great trouble was experienced during the summer months from weeds growing in the Witcombe reservoirs, which imparted a fishy taste and smell to the water. These were the "Cara Vulgaris" and the "Nitella," which grow rapidly in waters collected from the limestone formations, where the light can penetrate the water to a depth of 15 ft., especially when the temperature of the air is above 55 deg. The "Cara" has the appearance of seaweed, and has a similar taste and smell at certain stages of its growth, leading people to suppose that there are too many fish in the reservoirs.

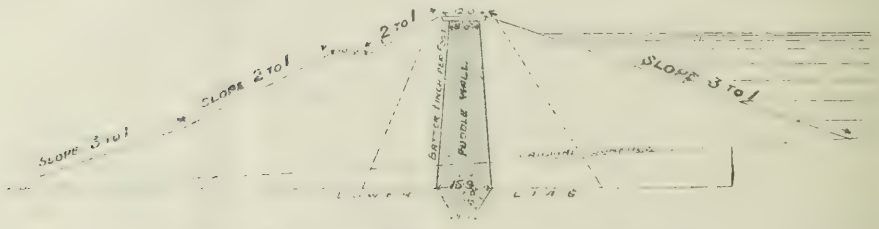
On the recommendation of the author, supported by Mr. Embrey, the city analyst, and the medical officer of health, Dr. Campbell, ten mechanical filters made by Messrs. Bell Bros., of Manchester, were installed in 1901 to deal with this difficulty. Each

filter consists of a wrought-iron cylinder 8 ft. diameter and 8 ft. high, filled with about 7 tons of fine silver sand from Leighton Buzzard, and is capable of filtering at the rate of 150,000 gallons in twenty-four hours. The capacity of the ten filters is therefore 1,500 000 gallons per day, thus giving an ample margin over the average rate of filtration, which does not exceed

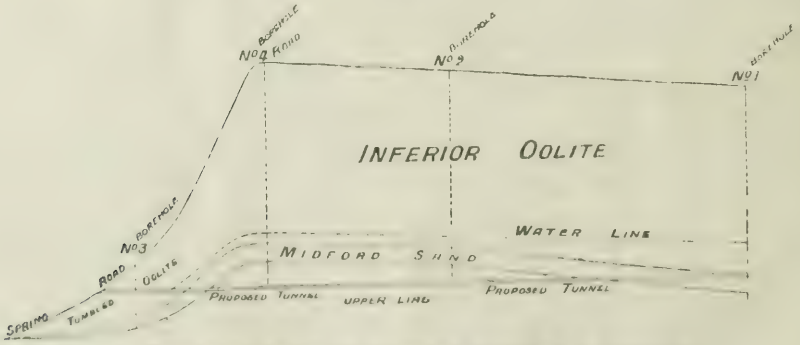
The filters are cleaned by reversing the direction of the current for about fifteen or twenty minutes, during which revolving arms stir up the sand so that the whole is thoroughly washed; indeed, it was this system of washing the sand which decided the author to select the Bell filter, as no other filter at that time was provided with this. In order to completely




Witcombe Reservoirs, Gloucester Waterworks.
(Fig. 1.)




Witcombe Reservoirs. Section of Northern Embankment.
(Fig. 2.)




Witcombe Reservoirs. Section of Escarpment South-East of Reservoirs.
(Fig. 4.)

750,000 gallons in twenty-four hours. The bottom of each cylinder consists of 144 cones filled with coarser sand and gravel, each cone being 6 in. diameter with a large number of ¼ in. holes drilled in the surface, by which the filtered water is discharged over the whole area of the filter, and the fine sand is prevented from being washed down into the outlet pipes.

arrest the suspended matter, about one-third of a grain of sulphate of alumina per gallon of water is used. The filters have acted admirably since their installation, and have always removed all taste and smell from the water, although at times they have been severely taxed.

In the year 1905 the author obtained from the

Bureau of Agriculture, Massachusetts, U.S.A., some very favourable reports on the use of sulphate of copper, and after consulting the city analyst, Mr. George Embrey, he decided to make an experiment with this, with a view to reduce the work of the filters when the growth of weeds in the reservoirs was exceptionally prolific. About the same time the late Mr. Haynes, of Newport (Mon.), made a trial of this in his reservoirs, but found that, probably owing to using too strong a solution (1 in 500,000), he had killed some of the fish. The American experiments had been made with proportions varying from 1 in 500,000 to 1 in 1,000,000, and as the author wanted to be on the safe side, he used a proportion of 1 in 3,000,000. The sulphate of copper, in the form of powder, was put up in 7 lb. bags, and thrown out with a trowel from a punt which was propelled up and down the reservoir in regular lines. In doing this it is important to avoid the powder being blown into the eyes by the wind.

The city analyst is of opinion that the smell and taste do not arise from the weed itself, but from small seed pods on the back of the weed, containing a kind of essential oil, which, on the bursting of the pods, imparts the taste and smell to the water. The result of treatment with sulphate of copper was that in a few hours the surface of the water was covered with bubbles of gas caused by the action of the sulphate on the seed pods, in about two days the water became much clearer than it had previously been, and in about a week after treatment the water was fit for use, without any trace of copper.

The reservoirs have been treated three times since 1905, the best time of year being in the spring before the weeds begin their rapid growth. On the second and third occasions the sulphate was used in the proportion of 1 in 1,000,000, but on neither occasion were any fish killed by the sulphate. However, on the last occasion, in one reservoir, where large numbers of roach were usually found, many of these were practically starved for want of food owing to the destruction of the weeds, and it was necessary to empty the reservoir in order to get them out; fortunately this occurred at the end of the drought of last summer. On the first occasion it was found that the weeds grew rather quicker the following year, but whether this was due to the treatment or to other circumstances is uncertain. Undoubtedly the treatment is beneficial to the water, and relieves the filters very considerably; moreover, as the weeds grow on the bottom of the reservoirs, it is most difficult to get them out by any mechanical means without emptying the reservoirs.

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**Fraserburgh Waterworks.**—New waterworks for Fraserburgh were formerly inaugurated by Provost The contract involved the expenditure of £32,000. The source of supply is at Fedderate, New Deer, where at a height of 900 ft. above the sea level, the waters of the Upper Ythsie Burn have been dammed into a huge reservoir containing 65,000,000 gallons of water. The contractors for the work were Messrs. H. M. Murray & Co., Glasgow; Messrs. Casey & Darragh, Stirling; and Messrs. Mather & Platt, Limited, Manchester.

**Motor Fire Engines.**—Considerable time has recently been given by Edinburgh Town Council to the question of equipping the fire brigade with motor fire engines, and a report based on a study of the progress made in other cities with motor fire appliances and on inquiries made in regard to the various types of pumps and engines has been submitted by the firemaster, who states that, in his opinion, the best type of pump for work in the city is the plunger pump, driven by a 55 h.p. four-cylinder engine. The efficiency of the turbine pump depends, he adds, on an engine speed which averages from 1,500 to 2,000 revolutions per minute, whereas the piston pump attains a maximum efficiency at 200 revolutions per minute conveniently, the wear and tear on engine and frame would be greater on the quicker-running engine. The road speed of the two types is about equal, but extra power is absorbed by the additional 25 to 30 cwt. of the turbine pump. The substitution of motor engines for horses would cost about £1,050, but there would be an annual saving of £150, and at the end of ten years the engines would be free of debt. The committee who have been considering the question have recommended that estimates should be obtained for three motor fire engines fitted with the plunger pump, and for two motor hose-tenders.

## THE DISPOSAL OF REFUSE.

### CLEANSING SUPERINTENDENTS' DISCUSSION.

At a meeting of the Institute of Cleansing Superintendents held recently in Middlesbrough, Mr. Geo. H. Anderson, chief sanitary inspector of Middlesbrough, read a paper on the advantages and disadvantages of barging house refuse to sea, and explained the method of collection and disposal of house refuse in vogue in Middlesbrough, both before and after the purchase of a barge to carry the refuse to sea. The barging process had worked admirably, the outstanding advantage being that the nightsoil was taken direct to the barge without any sorting; but serious disadvantages arose at times owing to stress of weather preventing the barge going to sea. In Middlesbrough the house refuse contained not less than 25 per cent of moisture, which rendered the possibility of a destructor effectually and economically dealing with it very remote, while it must not be lost sight of that the manurial value of their nightsoil was greatly in advance of that of most towns.

ADVANTAGES OF DESTRUCTORS.

Mr. Arthur May, M.INST.C.E., superintendent of the Cleansing and Destructor Department of the Finsbury Borough Council, London, read a paper on the disposal of refuse by means of a destructor, which he described as the most scientific and only hygienic and complete method of dealing with it. It was absolutely reliable in all its operations, and could be erected in the most densely populated portion of any town, and need not cause any nuisance, while by using a destructor the refuse need not be handled at all from the time it left the house to the time it left the furnace as clinker, and the workpeople were adequately protected throughout. The clinker and the heat generated, too, could be used for many useful purposes. As to its disadvantages, they were very few. It would be a little more costly, but that was more than adequately compensated for, and there was nothing to prevent the successful working of a destructor in Middlesbrough.

Mr. Jackson, Sheffield, said in his twenty years' experience he had never seen refuse so wet as that of Middlesbrough, and it would be very undesirable and unwise on the part of Middlesbrough to erect a destructor. At any rate, they should wait until they had the water-carriage system well on the way.

Mr. J. Terry, Nottingham, criticised the use of a destructor, and said it was not correct to say it did away with the handling of the refuse, for it must be carted from the houses, laid down to drain, and then carted to the destructor. While Middlesbrough could dispose of its refuse by sea at 10d. per ton, it would be unwise to erect a destructor at a cost of 3s. a ton.

Mr. Eccles, Stockport, described burning as the most sanitary way of dealing with refuse, but Mr. Hamblet, Salford, said the present system of barging was by far the most economic principle Middlesbrough could adopt at present.

Mr. Storer, North Shields, also spoke against the use of a destructor, and a vote of thanks was accorded Messrs. Anderson and May, who responded, the latter remarking that wherever barging took place complaints were received.

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**Municipal Engineering** (Edited by Sydney G. Turner, ASSOC.M.INST.C.E. Price 3s. 6d. nett. London: St. Bride's Press, Limited, 24 Bride-lane, E.C.).—This volume consists of model answers to questions set at recent examinations of the Institution of Municipal and County Engineers, and is the second edition. It is practically identical with the first issued. It is not suggested that it should take the place of recognised text-books, but it provides useful summaries of various subjects, as well as indications as to how different types of questions may be answered. Every effort has been made to render the answers as accurate and comprehensive as possible, though they contain more than a candidate would be expected to supply. The answers are founded upon examinations held in Birmingham, London and Manchester. The appendix contains examples of questions on sewerage, sewage disposal, tramway construction, bridges, water supply, road construction, buildings, sanitary science as applied to towns and buildings, drainage, and other matters. It will be seen, therefore, that the book is comprehensive, practical and exhaustive. *Local Government Journal.*

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President*—Mr. Albert D. Greatorex, M.Inst.C.E., Borough Engineer and Surveyor of West Bromwich.

### EASTERN DISTRICT MEETING AT EAST HAM.

The following is the programme of the meeting of the Institution of Municipal and County Engineers which is to be held to-morrow (Saturday) at the Town Hall, East Ham:—

11 a.m.—Meet at Town Hall. Reception by his Worship the Mayor (Councillor J. Murrell Oakes, J.P.).

11.10 a.m.—District business.

11.30 a.m.—Inspect town hall, public baths, library, mortuary, school clinic. Visit electric power station and car sheds.

1 p.m.—Light refreshments.
Discussion on paper (which will be taken as read) entitled "Public Works of East Ham," by J. E. W. Birch, borough engineer.

2.30 p.m.—Inspect Barking-road sectional wood-block paving.

2.45 p.m.—Drive to Manor Park library.

3.25 p.m.—Drive *viâ* Wanstead Flats to Plashet Park and library, and on to Central Park and open-air swimming bath and En-Tout-Cas tennis courts.

3.35 p.m.—Drive to isolation hospital.

4.10 p.m.—Drive to sewage works.

5 p.m.—Tea at town hall, kindly provided by J. E. W. Birch.

Trains at intervals of about 15 minutes on District Railway, and Tube connections from all parts of London.

E. J. Elford,
Southend. *Hon. District Secretary.*

### PRELIMINARY PROGRAMME OF ANNUAL MEETING.

*Thursday, July 11th.*

General meeting of the subscribers to the Orphan Fund.
Council meeting.
Annual general meeting.
Annual report of council.
Presentation of premiums.
Presidential address.
Adjournment for lunch.
Papers on municipal engineering work generally.
Evening. Dinner at the Hotel Cecil (ladies are especially invited to be present).

*Friday, July 12th.*

Papers on roads, &c.
Adjournment for lunch.
Alternative visits:
Sidcup roads tests.
Hampstead Garden City,
The works of the London County Hall.

*Saturday, July 13th.*

Reception by Buckinghamshire County Council at County Hall, Aylesbury.
Local papers on roads.
Proceed by motor cars to Wendover and Halton to inspect the Chiltern Hills waterworks.
On return journey
Visit the Hon. W. Rothschild's museum at Tring.

### FORTHCOMING MEETINGS.

The following meetings have been arranged:
June 22nd. Lowestoft.
June 29th.—Bridlington.
July 6th.—Stourbridge.

Thomas Cole,
11 Victoria-street, S.W. *Secretary.*

**Fraserburgh New Water Supply.** The Fraserburgh water-works scheme has been completed at a cost of £72,000. The new supply has been laid from Fedderate to Fraserburgh, a distance of eighteen miles, and the whole contract has been accomplished in fifteen months, including a huge reservoir at New Deer covering an area of 25 acres, and containing 65,000,000 gallons of water. Mr. Allan Carter, Edinburgh sea engineer.

## INSTITUTION OF MUNICIPAL ENGINEERS.

*President*—Mr. E. A. Stickland, Assoc.M.Inst.C.E., Borough Surveyor, Windsor.

### WESTERN DISTRICT MEETING AT CINDERFORD (GLOS.).

A meeting of the Institution of Municipal Engineers will take place at Cinderford on Thursday, June 20th.

Programme.

12.30 p.m.—Meet at the "Speech House," in the centre of the Forest of Dean. The "Speech House" is about a mile from Speech House-road Station, for which train leaves Lydney Junction at 11.45. Brakes will be in waiting at Russpidge Station, which is reached by motor rail from Newnham-on-Severn. Train from Gloucester arrives at Newnham at 11.25.

12.45 p.m.—Luncheon.

1.45 p.m.—Meeting, when a paper, "Some Notes on the Use, Misuse and Waste of Public Water Supplies: Can Misuse and Waste be Remedied?" will be presented by Mr. William Whitehouse, member.

3 p.m.—Drive by brakes, and visit the stone cutting and sawing works of the Dean Forest Stone Firms, Cannop Colliery (time permitting), and the cement making works of the South Wales Portland Cement Company. Arrive at Mitcheldean, where tea will be provided.

Members intending to be present are requested to notify me as early as possible, and to state if they will partake of luncheon and tea. The cost of the drive will be about 2s. 6d. each. Copy of the paper will be sent to members making application to me.

John Brook,
*Hon. District Secretary.*

6 College-street,
Stratford-on-Avon.
June 4, 1912.

### COUNCIL MEETING.

The next meeting will be held on Saturday, June 22nd, at 3 o'clock.

B. Wyand,
39 Victoria-street, S.W. *Secretary.*

## ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

### VISIT TO WAKEFIELD SEWAGE DISPOSAL WORKS.

By kind permission of the corporation and the city surveyor (Mr. J. P. Wakeford, Assoc.M.Inst.C.E.), a visit will be paid to Wakefield to-morrow (Saturday).

Programme.

2.30 p.m.—Assemble at the town hall.

2.45 p.m.—Proceed to the sewage works, over which the visitors will be conducted by the city surveyor, Mr. J. P. Wakeford, assisted by the manager, Mr. A. Rookby Ward. Mr. Wakeford has promised to prepare a brief description of the method of treatment, &c., and the alterations involved in the remodelling of the works, copies of which will be supplied to visitors.

5 p.m.—Tea will be provided by kind permission of the chairman and members of the Works Committee.

### JOINT MEETING AT SOUTHALL-NORWOOD AND HANWELL.

By kind permission of the Southall-Norwood and Hanwell Urban District Councils the members will have the privilege of visiting and inspecting the local sewage disposal works on June 22nd. Mr. S. W. Barnes, Assoc.M.Inst.C.E., will give a description of the Hanwell works, and Mr. Reginald Brown, Assoc.M.Inst.C.E., F.S.I., &c., will give a description of the Southall-Norwood works.

Programme.

2.30 p.m.—Meet at Boston-road entrance to sewage works, Hanwell, where the party will be met by Mr. Barnes and Mr. Brown, and proceed to visit works. After inspection

of the works the party will adjourn to the town hall, Southall, where tea and light refreshments will be provided, and a paper will be given by Mr. Reginald Brown, ASSOC.M.INST.C.E., F.S.I., &c., engineer to the Southall-Norwood Urban District Council, on "Fixed Sprays *versus* Revolving and Travelling Sprinklers."

Members intending to be present must notify the hon. district secretary on or before Wednesday, June 19th.

## ROYAL SANITARY INSTITUTE.

### ANNUAL CONGRESS AND EXHIBITION AT YORK.

The annual congress of the Royal Sanitary Institute, which is to take place this year at York, will open on July 29th. The proceedings will commence with a reception of the members and delegates in the Mansion House by the Lord Mayor, a public luncheon following, and in the evening the inaugural address to the congress will be delivered by the Archbishop of York.

On Tuesday, July 30th, a conference of municipal representatives and of engineers and surveyors will be held in the Exhibition Buildings, and on Friday, August 2nd, and the following day, the Engineering and Architecture Section will meet in the Museum. Mr. A. D. Greatorex, M.INST.C.E., borough engineer and surveyor of West Bromwich, will preside at the conference of engineers and surveyors, and the section devoted to engineering and architecture will have as its chairman Mr. J. Walker Smith, M.INST.C.E., chief engineering inspector to the Local Government Board for Scotland.

At the conference of engineers and surveyors discussions will take place on, among others, the subjects of Housing and Town Planning Progress, to be opened by Mr. H. Gilbert Whyatt, ASSOC.M.INST.C.E., borough engineer and surveyor, Grimsby, and Sewage Disposal in Rural Districts, to be opened by Mr. Ascough Rodwell, surveyor to the Skipton Rural District Council. The question of the modification of the Model Building By-laws from the rural point of view will be considered in the Engineering and Architecture Section.

The opening of the Health Exhibition arranged in connection with the congress has been fixed for Saturday, July 27th.

## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

ROAD FOREMAN.—June 15th.—Westhampnett Rural District Council. 30s. per week.—Mr. W. D. Rasell, acting clerk, 5 South-street, Chichester.

SURVEYOR.—June 15th.—Helensburgh Town Council. £200 per annum.—Mr. J. B. Maclachlan, town clerk.

ASSISTANT WATER ENGINEER.—June 15th.—Corporation of Merthyr Tydfil. £110—£150 per annum. Mr. T. Aneuryn Rees, town clerk.

SURVEYOR'S TEMPORARY ASSISTANT.—June 17th.—Porthcawl Urban District Council.—Mr. W. Chorley, clerk.

WORKING FOREMAN.—June 17th.—Worcestershire County Council. 35s. per week.—Mr. C. F. Gettings, county road surveyor.

INSPECTOR OF NUISANCES.—June 17th.—Berwick Urban Sanitary Authority. £115 per annum.—Mr. W. Weatherhead, clerk.

ASSISTANT INSPECTOR OF NUISANCES.—June 17th.—Gloucester Urban and Port Sanitary Authorities. £100—£120 per annum.—Mr. G. Sheffield Blakeway, town clerk.

STEAM TRACTOR DRIVER.—June 22nd.—Cornwall County Council. 27s.—30s. per week.—Mr. Albert E. Brookes, county surveyor.

WORKING ROAD FOREMAN.—June 22nd.—Cornwall County Council. 26s.—30s. per week.—Mr. Albert E. Brookes, county surveyor.

ARCHITECTURAL ASSISTANT.—June 24th.—West Riding County Council. £120 per annum.—Mr. J. Stuart, education architect, County Hall, Wakefield.

GENERAL FOREMAN.—June 25th.—Bethnal Green Borough Council. £200—£250 per annum.—Mr. C. G. E. Fletcher, town clerk.

ARCHITECTURAL ASSISTANT.—June 25th.—Corporation of St. Helens. £120—£150 per annum.—Mr. W. H. Andrew, town clerk.

ENGINEERING ASSISTANT.—June 25th.—Corporation of St. Helens. £2 per week.—Mr. W. H. Andrew, town clerk.

ASSISTANT TO COUNTY SURVEYOR.—June 29th.—Essex County Council. £180 per annum.—Mr. F. J. Wood, county surveyor.

## MUNICIPAL COMPETITIONS OPEN.

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LLANELLY.—June 18th.—Designs for school buildings, comprising boys', girls' and infants' departments, for the urban district council. Premium 50 guineas.—Mr. I. W. Watkins, clerk, Education Office, Coleshill-terrace, Llanelly.

HALE.—June 28th.—Designs for a town planning scheme for the urban district council. Premiums of £50 and £25 are offered.—The Clerk.

REIGATE.—June 29th.—Plans and schemes for laying out and developing part of the Reigate Lodge estate, belonging to the town council. Premiums of 30 and 10 guineas.—Mr. Alfred Smith, town clerk.

PADIHAM.—June 30th.—Designs for town hall and baths. Premiums £40 and £20.—Mr. J. Gregson, surveyor.

DUSSELDORF.—July 1st.—Plan for the extension of the city. Premiums of £1,000 and £375 are offered.—The Chief Burgomaster.

CARDIFF.—August 6th.—Designs and estimates for fire station.—The Town Clerk.

GOOLE.—September 1st.—Competitive designs and estimates for municipal offices, for the urban district council. Two premiums (£30 and £15).—Mr. R. Tyson, clerk.

## MUNICIPAL CONTRACTS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1359 Holborn), subject to later confirmation by letter.*

### Buildings.

DEWSBURY.—June 15th.—For the construction of a concrete water tank and chalk-mixing house, for the Waterworks Board.—Mr. H. Ellis, clerk, Town Hall, Dewsbury.

CHESHIRE.—June 15th.—For the erection of a school at Haslington, for the Administrative Sub-Committee.—Mr. C. E. Speakman, clerk, Education Office, Crewe.

NORTHUMBERLAND.—June 17th—July 2nd.—For the erection of a secondary school, for the Education Committee.—Mr. C. Williams, secretary, The Moot Hall, Newcastle-upon-Tyne.

WORKSOP.—June 17th.—For building a battery room and condenser pit at electricity works, for the urban district council.—Mr. G. H. Featherstone, clerk.

SLEAFORD.—June 17th.—For the rebuilding of culverts, for the rural district council.—Mr. E. Clements, clerk.

REDRUTH.—June 17th.—For the erection of forty-eight cottages, for the urban district council.—Mr. G. P. Paige, clerk.

SOUTHEND-ON-SEA.—June 17th.—For the construction of administrative block at the Sanatorium, for the corporation.—Mr. H. J. Worwood, town clerk.

ABERDEEN.—June 17th.—For additions to city hospital, for the corporation.—Mr. J. Rust, city architect, 224 Union-street.

HASTINGS. — June 17th. — For the erection of twenty-five hard-wood screens upon the sea front, for the corporation.—Mr. P. H. Palmer, borough engineer.

MONMOUTH.—June 17th.—For the erection of a manual training workshop, for the Education Committee.—Mr. C. Dauncey, secretary, County Council Offices, Newport (Mon.).

GODSTONE.—June 18th.—For the construction of concrete embankments, weir chamber, concrete tube overflows, steel cofferdam, and water carrier, for the rural district council.—Mr. G. E. Crowter, engineer and surveyor.

MOUNTAIN ASH.—June 18th.—For repairs and additions to public schools, for the Education Committee.—Mr. W. H. Williams, Town Hall.

GRIMSBY.—June 18th.—For the construction of a school, for the education authority.—Mr. D. Chandler, clerk.

NORTH RIDING.—June 18th.—For the erection of a court-house, for the Standing Joint Committee.—Mr. W. H. Brierley, county architect, 13 Lendal, York.

WALLSEND.—June 18th.—For the erection of an underground convenience, for the corporation.—Mr. W. V. Mulcaster, town clerk, 28 Sandhill, Newcastle-upon-Tyne.

HALIFAX.—June 18th.—For the erection of a salt shed, for the Tramways Committee.—Mr. J. Lord, borough engineer.

KINSALE.—June 19th.—For the erection of cottages, for the rural district council.—Mr. J. Murphy, clerk.

GLOUCESTER.—June 19th.—For repairs to council schools, for the Education Committee. — Mr. R. S. Phillips, architect, Shire Hall.

HULL.—June 19th.—For the construction of workshops and stables, for the corporation.—Mr. A. E. White, city engineer.

BRISTOL.—June 19th.—For the erection of engineers' and workmen's mess-rooms, for the Electrical Committee.—The Engineer.

ESSEX.—June 20th.—For the erection of manual instruction and cookery rooms, for the Education Committee.—Mr. H. J. Goodwin, clerk, Education Offices, Loughton.

REDRUTH.—June 20th.—For additions to the fire brigade station, for the urban district council.—Mr. G. P. Paige, clerk.

BRECON.—June 20th.—For repairs to bridge and construction of a culvert, for the rural district council. —The Clerk.

HULL.—June 20th.—For the construction of partitions at public schools, for the Education Committee. —Secretary of Education.

WEST RIDING.—June 21st.—For the erection of a new school at Bracewell, for the county council.—The Clerk, County Hall, Wakefield.

WILLESDEN.—June 21st.—For the construction of an engine-house, for the Metropolitan Water Board.—Accountant, Savoy-street, Strand, W.C.

WEST RIDING.—June 21st.—For the erection of a head teacher's house, for the county council. — Mr. Francis Alvey Darwin, clerk, County Hall, Wakefield.

FINCHLEY.—June 21st.—For the construction of an engine-house, formation of roads, and drainage works, for the Metropolitan Water Board.—The Clerk, Savoy-street, Strand, W.C.

COLCHESTER.—June 22nd.—For the erection of a coal store, for the corporation.—Water Supply Committee.

HYDE.—June 22nd.—For the erection of public hall, police courts and offices, for the corporation.—Mr. Thos. Brownson, town clerk.

COVENTRY.—June 24th.—For the erection of a public mortuary, for the corporation. — Mr. J. E. Swindlehurst, city engineer and surveyor.

KEIGHLEY.—June 24th.—For alteration at public baths, for the corporation.—Town Clerk.

ESSEX.—June 24th.—For repairs and alterations to schools, for the Education Committee.—Mr. D. T. Williams, clerk.

WATFORD.—June 25th.—For the construction of a public convenience, for the urban district council. Mr. W. Hudson, clerk.

LONGFORD (Leinster).—June 28th.—For the erection of forty dwellings, for the urban district council. —Town Clerk.

HENDON.—July 1st.—For the erection of a public mortuary and other buildings, for the urban district council.—Mr. S. S. Grimley, engineer and surveyor.

EAST RIDING.—July 5th.—For the removal of existing bridge across the river Hull, near Beverley, and the construction of a new bridge, for the county council.—Mr. John Bickersteth, clerk.

ELLESMERE.—July 6th.—For the erection of cemetery chapel and convenience, and laying pipe sewer, for the urban district council.—Mr. T. W. Francis, clerk. Ellesmere Park.

## Iron and Steel.

HOWRAH (India).—June 18th.—For the supply of steel pipes, cast-iron specials, sluice valves and air valves, for the municipality.—The Chairman, Howrah Municipality, India.

BRAY.—June 18th.—For the supply of cast-iron pipes, for the urban district council.—Mr. P. McDonnell, town clerk.

BELFAST.—June 18th.—For the supply of cast-iron pipes and special castings, for the corporation.—City Surveyor.

HULL.—June 19th.—For the steel roof work required for workshops, stables and cart sheds, for the corporation.—Mr. A. E. White, city engineer.

HULL.—June 21st.—For the supply of tramway rails, for the corporation.—Town Clerk.

BECKENHAM.—June 24th.—For the supply of wrought-iron railings and gates, for the urban district council.—Mr. F. Stevens, clerk.

## Roads.

LEIGH.—June 15th.—For the supply of granite setts, for the corporation.—Mr. W. H. Cowburn, town clerk.

HADLEIGH.—June 15th.—For the supply of granite, for the urban district council.—Mr. C. J. Grimwade, clerk.

WEST SUSSEX.—June 15th.—For the hire of steam rollers, for the county council.—Mr. H. W. Bowen, county surveyor, North-street, Horsham.

EARBY.—June 15th.—For works of kerbing, channelling, flagging and paving, for the urban district council.—Mr. J. E. Aldersley, surveyor.

ALTON.—June 15th.—For the supply of road materials, for the urban district council.—Mr. J. B. Trimmer, clerk.

HAM. — June 17th. — For the supply of granite, granite chippings, flints, haulage and steam rolling, for the urban district council.—Mr. R. W. Hindhaugh, surveyor.

SKIPTON.—June 17th.—For works of making up, for the urban district council.—Mr. A. E. W. Aldridge, engineer and surveyor.

WIMBLEDON.—June 17th.—For laying creosoted wood paving, for the corporation.—Borough Surveyor.

EPSOM.—June 17th.—For making up a road, for the rural district council.—Mr. T. R. Ware, surveyor of highways, Waterloo-road, Epsom.

BRISTOL.—June 17th.—For relaying and refacing tar paving in certain school grounds, for the Education Committee.—Mr. W. A. Adams, secretary.

TENDRING.—June 17th.—For the supply of Kentish flints, for the rural district council.—The Clerk.

EAST SUSSEX.—June 17th.—For the hire of steam rollers and scarifiers, for the county council.—Mr. Fred. J. Wood, county surveyor.

DOVER.—June 17th.—For the supply of Guernsey or Welsh granite and granite chippings, for the corporation.—Town Clerk.

WEMBLEY.—June 18th.—For private and public street improvement works, for the urban district council.—Mr. F. W. Rodd, clerk.

ORSETT.—June 18th.—For the supply of broken granite or basalt and Kentish ragstone, for the rural district council.—Mr. J. Beck, clerk, 2 Orsett-road, Grays.

SOYLAND.—June 18th.—For the supply of broken and larvikited granite for the urban district council. Mr. W. Whitehead, surveyor.

BURY.—June 19th.—For making a road and finishing with Reemac, for the rural district council.—Mr. E. T. M. Johnson, Bank of England Chambers, Tib-lane, Cross-street, Manchester.

BEXLEY. June 19th. For the execution of tar paving, for the urban district council.—Mr. T. G. Baynes, clerk.

CHESTER-LE-STREET.—June 19th.—For making up a street, for the rural district council.—Mr. R. V. Dickinson, clerk.

HORNSEY.—June 19th.—For making good certain roads, for the corporation.—Town Clerk.

BIRKENHEAD.—June 19th.—For flagging, paving, channelling and sewering, for the corporation.—Mr. J. Fearnley, town clerk.

OLDHAM.—June 20th.—For making up several roads, for the corporation.—Chairman of the Surveyor's Committee.

READING.—June 20th.—For work of making up, for the corporation.—Mr. J. Bowen, borough engineer and surveyor.

CLECKHEATON.—June 22nd.—For making up a portion of Union-street, for the urban district council.—Mr. J. H. Linfield, clerk.

LEWES.—June 22nd.—For scarifying and steam rolling, for the corporation.—Mr. Montague S. Blaker, town clerk.

BIRMINGHAM.—June 22nd.—For the reconstruction of a road, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

EARSDON.—June 22nd.—For carrying out street work, for the urban district council.—Mr. J. R. MacMillen, Council Offices, Shire Moor, Northumberland.

NORTH WALSHAM.—June 22nd.—For the supply of broken granite, granite chippings and granite setts, for the urban district council.—Mr. E. J. Simpson, surveyor.

BEXHILL.—June 22nd.—For making up a new road, for the corporation.—Mr. T. E. Rodgers, Town Hall.

BARNSLEY.—June 24th.—For paving works, for the corporation.—Mr. Jas. H. Rothwell, town clerk.

WEST SUFFOLK.—June 24th.—For the supply of broken material for the main roads, for the county council.—Mr. W. Lionel Jenkins, county surveyor.

BRIGHOUSE.—June 24th.—For work of paving, for the corporation.—Mr. S. S. Haywood, borough engineer and surveyor.

ROMFORD.—June 24th.—For the supply of Norwegian kerb, for the rural district council.—Mr. T. W. A. Greenhalgh, clerk.

LEWISHAM.—June 25th.—For paving with granite setts, for the borough council.—The Surveyor.

SCUNTHORPE.—June 27th.—For making up certain streets, for the urban district council.—Mr. Henry Metcalfe Hett, clerk.

HARROW.—June 29th.—For the supply of broken granite, granite chippings and gravel, for the urban district council.—Mr. P. Bennetts, surveyor.

HENDON.—July 1st.—For making up certain streets, for the urban district council.—Mr. S. S. Grimley, engineer.

HIPPERHOLME. July 1st.—For the supply of macadam, for the urban district council.—Mr. G. W. Thompson, engineer and surveyor.

## Sanitary.

TOWCESTER.—June 15th.—For constructing sewers and sewage disposal works, for the rural district council.—Mr. W. K. Higham, clerk.

EASINGWOLD.—June 17th.—For laying stoneware sewer and manholes, for the rural district council.—Mr. F. J. H. Robinson, clerk.

GRANTOWN-ON-SPEY.—June 17th.—For extension of sewer and water pipe, for the corporation.—Mr. W. Forsyth, town clerk.

NORTH WOOLWICH.—June 18th.—For the removal of refuse from the screens at main drainage works, for the London County Council.—Sir Maurice Fitzmaurice, chief engineer.

WALLSEND.—June 18th.—For the removal of privies and erection of water-closets, for the corporation.—Borough Surveyor.

PLYMOUTH.—June 19th.—For reconstructing a common drain, for the corporation.—Mr. J. Paton, borough engineer and surveyor.

CROYDON.—June 20th.—For laying iron sewer, for the rural district council.—Mr. R. M. Chart, surveyor.

STOCKPORT. June 20th. For work of sewering, for the corporation.—Mr. J. Atkinson, borough surveyor.

RISHWORTH.—June 20th.—For laying sewers with top water drains, for the urban district council.—Mr. J. Walshaw, clerk.

LAURENCEKIRK.—June 24th.—For the construction of sewage purification works, for the corporation.—Mr. J. Craig, town clerk.

SOUTH STONEHAM.—June 24th.—For the construction of main sewerage and sewage disposal works, for the rural district council.—Mr. E. T. Westlake, clerk.

WATFORD.—June 25th.—For the supply of sanitary fittings to a public convenience, for the urban district council.—Mr. D. Waterhouse, engineer.

NEWPORT PAGNELL.—June 25th.—For laying cast-iron and stoneware sewers, and the construction of sewage disposal works, for the rural district council.—Mr. Charles W. Powell, clerk.

ST. HELENS.—June 25th.—For the construction of semi-circular brick culvert and manholes, for the corporation.—Mr. A. W. Bradley, borough engineer.

ST. AUSTELL.—June 26th.—For the supply of glazed stoneware socket drain pipes, for the rural district council.—Mr. A. J. Blight, highway surveyor, Trelowth, St. Austell.

PETERBOROUGH. — June 29th—July 20th.—For the construction of sewerage works and pumping machinery, for the rural district council.—Mr. J. W. Buckle, clerk.

SOUTH MOLTON.—June 29th.—For laying 3,560 yds. of service mains, connection of house services, provision of valves and hydrants, and laying gas mains, for the corporation.—Mr. R. Louis Riccard, town clerk.

BLEAN.—July 2nd.—For the construction of about 12,689 yds. of stoneware and cast-iron pipe sewers, cast-iron rising and air mains, manholes and ejector chambers, for the rural district council.—Mr. J. E. Burch, clerk.

HOVE.—July 3rd.—For constructing new sewer, for the corporation.—Mr. H. Endacott, town clerk.

LYMM.—July 4th.—For the construction of outfall works and laying three miles of stoneware pipe sewers and manholes, for the urban district council.—Mr. W. Mullard, clerk.

DENTON.—July 6th.—For the erection of a gas engine, suction-gas plant, air compressor, ejectors, lime and sludge mixers, sludge presses, pipes and valves, for the urban district council.—Mr. W. Richards, clerk.

LONDON.—July 9th.—For the construction of egg-shaped sewer and cast-iron pipe sewer, for the county council.—Sir Maurice Fitzmaurice, chief engineer.

## Stores.

ATHERTON.—June 20th.—For the supply of articles for the surveyor's and gas and water departments.—Mr. William Garnett, Town Hall.

LEEDS.—June 22nd.—For the supply of iron, steel, gas and pipe hooks, bolts, nuts, tin plates, tin ingots, shovels, coke forks, and oils, for the Gas Committee.—Town Clerk.

BIRMINGHAM.—June 24th.—For the supply of general and engineering stores, for the electricity department.—Mr. R. A. Chattock, city electrical engineer and manager, 14 Dale-end.

ROTHERHAM.—July 8th.—For the supply of materials for the tramway department. — Tramways Manager.

## Miscellaneous.

MANCHESTER.—June 15th.—For the supply of materials, for the Gas Committee.—Mr. Thomas Hudson, town clerk.

CARDIFF.—June 17th.—For the supply of fodder, for the cleansing department.—Mr. J. L. Wheatley, town clerk.

OLDHAM.—June 18th.—For the purchase of tar and ammoniacal liquor produced at the corporation works.—Mr. J. H. Hallsworth, town clerk.

LEYTON.—June 19th—25th.—For repairs to tar-paved playgrounds, for the urban district council.—The Architect, Town Hall.

## TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of* Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

BRECON.—For constructing paving, kerbing and channelling, for the corporation.—H. L. Griffiths, surveyor:—

| | |
|---|---|
| Williams Brothers, Brecon | £467 |
| L. Meredith, Brecon | 443 |
| B. Jenkins, Brecon | 409 |
| I. R. Morgan, Brecon * | 403 |

GREENOCK.—For the construction of kerbs, water runs, and gravel footpaths, for the corporation:—

| | |
|---|---|
| G. Duncan & Sons, Glasgow | £427 |
| Thomson, Taylor & Co., Gourock | 359 |
| R. Aitkenhead & Sons, Greenock | 345 |
| R. & C. Murray, Paisley * | 317 |

HARWICH.—For the erection of a fire station and public convenience, for the corporation:—

| | |
|---|---|
| Fisher & Woods, Dovercourt | £1,247 |
| I. W. Trudgett, Colchester | 1,156 |
| Cubit & Gott, Ipswich | 1,150 |
| Greenwood & Sons, Sudbury | 1,140 |
| Blay & Co., Dartford | 1,079 |
| E. E. Newton, Harwich * | 1,041 |

HOVE.—For laying wood carriageway paving on the existing concrete foundations in Church-road, opposite the town hall, the Works Committee recommend the acceptance of that of the Improved Wood Pavement Company, Limited, London, at £760.

The tender of J. Parsons & Sons, New Church-road, for carrying out, for £863, new street works in Glebe-villas for a length of 550 ft. northwards from New Church-road.

The tender of W. Hillman, Portslade, for supplying about 1,500 cubic yards of Coombe rock flints during the period ending 31st March next.

LEEDS.—For the construction of public conveniences, for the corporation.—W. T. Lancashire, city engineer:—

W. Irwin & Co., Limited, Leeds, £1,432.

LEIGHTON BUZZARD.—For supply and fixing artesian-bored tube well, for the urban district council.—E. J. Saunders, surveyor:—

| | |
|---|---|
| A. C. Potter & Co., London | £293 |
| Artesian Well Boring Company, London | 272 |
| J. Henderson & Son, Limited, Glasgow | 263 |
| A. Williams & Co., London | 245 |
| C. Chapman & Sons, Salford | 225 |
| R. Richards & Co., London | 225 |
| Duke & Ockenden, Limited, Littlehampton | 217 |
| New England Boring Company, Limited, Walton | 211 |
| Cheeld & Co., Chesham | 210 |
| G. Y. Murray, London | 205 |
| Le Grand & Sutcliff, London | 186 |
| C. P. Martin, Harpenden | 184 |
| E. Timmins & Sons, Limited, Runcorn | 180 |
| C. Isler & Co., Limited, London* | 180 |
| J. Thom, Patricroft | 171 |
| F. Smith & Son, Grimsby | 142 |

OAKHAM.—For scavenging and removal of house refuse, for the rural district council:—

| | |
|---|---|
| L. Dalby, Oakham | £65 |
| A. Cross, Oakham* | 60 |

ST. MELLONS.—For the construction of a system of sewerage, for the rural district council:—

R. Pomeroy & Co., Cardiff, £4,106.

SCUNTHORPE AND CROSBY.—For the construction of cast-iron and stoneware pipe sewers, 24 in. and 21 in. diameter, timber trestles, pile driving and other works, for the Scunthorpe and Crosby Joint Sewerage Board.—H. Walker, engineer:—

| | |
|---|---|
| H. E. Buckley, Bradford | £4,503 |
| W. Gradwell & Co., Barrow-in-Furness | 3,805 |
| R. C. Brebner & Co., Edinburgh | 3,794 |
| T. H. Harper, Carlton | 3,429 |
| J. E. Nalin, Sheffield | 3,351 |
| A. H. Price & Co., Nottingham | 3,265 |
| Marshall, France, Limited, Redcar | 3,176 |
| Leggott & Speight, Hull | 2,917 |
| Lane, Brothers, Mansfield | 2,889 |
| C. Chamberlain, Leicester | 2,822 |
| Sangwin & Co., Hull * | 2,547 |

Engineer's estimate, £2,736.

SCUNTHORPE AND CROSBY.—For the manufacture and delivery of 24 in. and 21 in. cast-iron pipes and specials, for the Scunthorpe and Crosby Joint Sewerage Board.—H. Walker, engineer:—

| | |
|---|---|
| D. Y. Stewart & Co., Glasgow | £2,560 |
| Clay Cross Company, Clay Cross | 2,467 |
| Cochrane & Co., Middlesbrough | 2,444 |
| Holwell Iron Company, Asfordby | 2,397 |
| Cochrane & Co., Dudley | 2,360 |
| J. Oakes & Co., Riddings | 2,350 |
| Staveley Coal and Iron Company, Staveley | 2,225 |
| Stanton Ironworks Company, near Nottingham * | 2,210 |

Engineer's estimate, £2,286.

SEFTON.—For constructing a sewer, for the rural district council.—F. Pool, surveyor:—

| | |
|---|---|
| P. Barner, Aintree | £420 |
| W. Jowett, Prescott | 359 |
| T. Harris, Bootle * | 319 |

SOUTHGATE.—Accepted for the construction of stoneware pipes with patent watertight joints and concrete tubes, for the urban district council:—

Grovelands sewers.—A. Thompson, Whetstone.

SOUTHGATE.—For the erection of 36 workmen's dwellings, for the urban district council.—C. G. Lawson engineer:—

Newby, Brothers, Southgate*.
Watts & Co., Finchley.
A. W. Keats, Beckenham.
Fairhead, Enfield.

SOUTH SHIELDS.—For laying *in situ* concrete for footways, for the corporation. L. Rosevcare, engineer and surveyor:—

G. Thornton & Co., South Shields.

WILTS.—For the erection of a school at Idmiston, for the General Education Committee of the Wilts County Council.—J. G. Powell, surveyor:—

| | |
|---|---|
| F. Burton, Durrington | £1,674 |
| C. Grace & Sons, Ludgershall | 1,455 |
| Sturgess, Brothers, Andover | 1,156 |
| E. J. Drew & Sons, Calne | 1,100 |
| Bourne & Jenkinson, Andover | 1,065 |
| Hayward & Wooster, Bath | 1,025 |
| Parsons, Brothers, Westbury | 1,020 |
| W. Harris, Bulford | 1,002 |
| Wort & Way, Salisbury | 999 |
| W. S. Harris, Salisbury * | 975 |

WILTS.—For the erection of a school at Rodbourne Cheney, for the General Education Committee of the Wilts County Council.—J. G. Powell, surveyor:—

| | |
|---|---|
| R. James & Leighfield, Swindon | £4,760 |
| T. C. Gluyas, Bedminster | 4,050 |
| Saunders & Sons, Cirencester | 3,878 |
| P. Chick, Highworth | 3,767 |
| E. J. Drew & Sons, Calne | 3,700 |
| Tydeman, Brothers, Swindon | 3,572 |
| Pope, Brothers, Swindon | 3,522 |
| Hayward & Wooster, Bath | 3,503 |
| H. & C. Spackman, Swindon | 3,495 |
| A. J. Colbourne, Swindon | 3,459 |
| Cripps & Franklin, Marlborough * | 3,405 |

## MEETINGS.

*Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.*

JUNE.

15.—Association of Managers of Sewage Disposal Works: Visit to Wakefield Sewage Works.
15.—Institution of Municipal and County Engineers: Meeting at East Ham.
20.—Institution of Municipal Engineers: Western District Meeting at Cinderford, Glos. 12.30 p.m.
21-24.—Junior Institution of Engineers: Visit to Sheffield.
22.—Association of Managers of Sewage Disposal Works: Metropolitan District Meeting, Southall-Norwood and Hanwell.
22.—Institution of Municipal and County Engineers: Meeting at Lowestoft.
22.—Institution of Municipal Engineers: Council Meeting, 39 Victoria-street, S.W. 3 p.m.
24.—Royal Institute of British Architects: Presentation of Royal Gold Medal. 8.30 p.m.
29.—Institution of Municipal and County Engineers: Meeting at Bridlington.

JULY.

6.—Institution of Municipal and County Engineers: Meeting at Stourbridge.
11-13.—Institution of Municipal and County Engineers: Annual Meeting, London.
13.—Institution of Municipal Engineers: North-Western District Meeting at Clitheroe.
25-28.—Royal Institution of Public Health: Congress in Berlin.
29.—Royal Sanitary Institute: Congress at York opens.

## APPOINTMENTS OPEN.

METROPOLITAN BOROUGH OF BETHNAL GREEN.

GENERAL FOREMAN.

The Council invite applications for the appointment of General Foreman.

Applicants must be between 35 and 42 years of age.

The appointment will be subject to the provisions of the Bethnal Green Borough Council (Superannuation) Act, 1906, to the successful candidate satisfactorily passing a medical examination, and undertaking to reside in the Borough of Bethnal Green.

The salary will be at the rate of £200 per annum, rising by annual increments of £12 10s. to a maximum salary of £250 per annum (each increment being subject to a recommendation of the Works and Stores Committee).

Practical experience in the construction, maintenance and cleansing of roads and sewers is essential.

Applications, on forms to be obtained from the Borough Engineer and Surveyor, must be filled up and returned to the undersigned, with copies of not more than three recent testimonials, by 12 noon on Tuesday, the 25th June, 1912, endorsed "General Foreman."

Canvassing, directly or indirectly, any Member or Officer of the Council will be a disqualification.

C. G. E. FLETCHER,
Town Clerk

Town Hall,
Bethnal Green, E.
June, 1912.

TOWN SURVEYOR has opening for Pupil or young gentleman who wishes to enter the Municipal profession. Personal tuition, moderate premium. Old pupils now holding good positions.—"South Coast" office of The Surveyor, 21 Bride-lane, Fleet-street, E.C.

# The Surveyor

And Municipal and County Engineer.

Vol. XLI. JUNE 21, 1912. No. 1,066.

## Minutes of Proceedings.

**Sewage Disposal in the United States: A Notable Book.**

Although the literature of sewage disposal is already enormous, the present volume surpasses all previous works on the subject in its comprehensiveness and value to the engineer. This is to a great extent due to the fact that the author, Mr. George W. Fuller, has the advantage of possessing a deep technical knowledge of the scientific side of the subject, combined with long experience of its practical application. In addition to this he has the enviable faculty of extracting from the previously published reports and books of other engineers, chemists and biologists those facts and figures which are really important, comparing and criticising them, and summing up for his readers the position of the problem of sewage disposal at its present stage of development. Another feature of interest to the English engineer is that the volume deals essentially with American experience, although European practice, which the author generously admits is "richer and broader in many ways," has not been ignored entirely. We have to acknowledge our indebtedness to the work done in the early "nineties" by the Massachusetts State Board of Health in setting us upon the right road, and if we in this country did more than any other nation during the succeeding fifteen years, plodding along in our severely practical and cautious manner, our friends in America, taking advantage of our failures and successes, have gone ahead in directions which we either feared to follow or had no opportunities to take up, with the result that we are now profiting largely from American experience. This applies particularly to methods of disposal by dilution in large bodies of water, and to the treatment of sewage and effluents by electrolytical methods and their disinfection or sterilisation with hypochlorite. These sections of the subject are dealt with in great detail. Separate chapters are devoted to "Dilution in Inland Streams"; "Dilution in Large Lakes"; "Dilution in Oceans and Tidal Estuaries"; "Electrolytic Treatment"; "Hypochlorite Treatment," and "Ozonisation," all of which must undoubtedly be earnestly studied by every engineer dealing with sewage disposal who desires to keep abreast of the times and be in a position to utilise the latest knowledge available in connection with his work.

Another important and valuable chapter is that dealing with "Sewage as Related to Shellfish," a subject of special importance in this country, and one which is being actively considered by the various authorities in the United States of America, who differ from the oyster growers in their views on several points. To those engineers and surveyors in this country who are not satisfied merely to copy existing methods of disposal, but who wish to know something of the bacterial and biochemical processes in the decomposition of sewage in order to be able to study each separate problem with which they may have to deal in a scientific manner, the first three chapters of this book will prove interesting and useful. The importance of oxygen and deoxygenation, not only as a means of measuring the strength of sewage but in relation to proper conditions of the flow of sewage through collecting systems and various disposal devices, is discussed rather fully with the practical purpose of showing how to prevent or lessen putrefaction with its objectionable odours. Bearing in mind opinions which we have ventured to express in these pages at various times, it is satisfactory to note the statement that "so far as feasible decomposition should proceed on an aërobic and not an anaërobic basis. This applies in particular to stranded solids which may give off enzymes that affect the overlying sewage far more than hitherto supposed." The question of sewage bacteria as related to public water supplies is also discussed, and the various methods of preliminary treatment, filtration, final treatment, including sand filtration and aëration, together with the mechanical devices and methods of operation generally adopted in America, are all described and illustrated very clearly, and although we may not always agree with the conclusions arrived at, it is certainly useful to compare their methods and results with those which obtain in this country. We hope to return to some of the more interesting and important questions discussed in this volume on some future occasion. Meanwhile we congratulate the author upon the valuable matter contained in his book, and upon the very clear and practical manner in which it is arranged, and we strongly recommend it to all engineers, surveyors and others interested in the subject.

* * *

**The Stirling and East Ham Meetings.**

The meeting of the Institution of Municipal and County Engineers held recently at Stirling produced a record attendance for a Scottish meeting, and was a great success both from the social and professional points of view. The members received a very cordial official welcome from the authorities of the town, and the business proceedings, at which two papers were very fully discussed, were followed by several interesting visits to works. The annual dinner which took place in the evening was a very successful function, and was made the occasion of a presentation to Mr. Bryce, the founder of the Scottish Institution of Muni-

* "Sewage Disposal," by George W. Fuller, M.Am. Soc. C.E., &c., &c. Price 21s. nett. New York: McGraw-Hill Book Company.

cipal and County Engineers, which subsequently amalgamated with the English Institution.

The first of the papers was read by Mr. A. H. Goudie, the burgh engineer, who dealt in a comprehensive and interesting manner with "Stirling and its Municipal Works." The ancient and royal burgh of Stirling has an enviable reputation as regards both natural situation and historical associations. At the same time, its municipal administration is carried on according to modern and up-to-date principles. The water supply and drainage system are both excellent, and in other directions the comfort and health of the population are well looked after by the council. The passage from Mr. Goudie's paper which received most attention in the course of the discussion was that in which he said the town council had had under consideration for some time the advisability of erecting a destructor. The difficulty of finding a site where the steam could be properly utilised, and at the same time be free from objection by the surrounding householders, had so far been against it, the council apparently thinking that such a work would be a nuisance to the neighbourhood. This is a difficulty of course. The general opinion appeared to be that a destructor in a populous district need not create a nuisance provided that the householders burn as much garbage as possible in their own grates and that there is no extensive storage of uncremated refuse at the destructor works. The other paper submitted to the meeting was by Mr. Cox, who dealt with the roads of Stirlingshire. The discussion centred round the merits of Rocmac in consequence of the apparent inconsistency of the Road Board in having refused a contribution towards the cost of that material for the town of Stirling whereas they had contributed towards it on the main roads in Stirlingshire. Both papers were much appreciated, as will be gathered from the full report of the proceedings given in this and last weeks' issue.

In another column will be found a paper on the "Municipal Works of East Ham," which was read before the Institution last Saturday by Mr. J. E. W. Birch, the borough engineer. The growth of East Ham has indeed been phenomenal. In the last forty years the population has increased from 5,000 to 134,000, a rate which must surely be more rapid than that of any other town in Great Britain. The members received a civic welcome and carried away an excellent impression of the public spirit of the council and the large amount of good work which has been accomplished during the critical period of such rapid growth. A good illustration of the far-sighted policy which has been pursued is provided by the purchase, in 1899, of six acres of land in the centre of the borough upon which have been erected a town hall, technical college, free library, public baths and other buildings. The electric lighting and tramways undertakings are in a flourishing condition, while the various municipal services are well maintained in a state of efficiency. The sewage and refuse disposal works are worthy of special mention, inasmuch as they were originally designed (for a population of 20,000) by Mr. Charles Jones, M.INST.C.E., who was present at the meeting. A large extension was carried out in 1902, and the design is peculiarly interesting inasmuch as the power needed to pump the sewage and to do the other incidental duties of purification is provided by the crude refuse of the town, burned in the destructor, the resultant clinker being used for the subsequent purification of the effluent. All these matters and many others were dealt with by Mr. Birch in his paper, which was much appreciated by the meeting.

* * *

**Closing Orders under the Housing Acts.**

The administration of Sections 17 and 18 of the Housing, Town Planning, &c., Act, 1909, has raised many points of difficulty in practice, and although only one case has been decided in the High Court—*Rayner* v. *the Corporation of Stepney*—questions of such a nature as to cause the issue of a circular drawing attention to certain important matters have been submitted to the Local Government Board from time to time. The general principle to be borne in mind in acting under these sections is that, inasmuch as the object sought is an interference with private property, and ultimately in certain circumstances its total demolition, the statutory procedure must be adhered to with the utmost strictness. This is well illustrated by the case we have just referred to, in which a closing order was served on an owner of certain dwelling-houses. The notice was in the form prescribed by the Local Government Board, save that it omitted a note which appears at the end of the prescribed form. This note sets out the statutory provision in regard to the owner's right to appeal against the order to the Local Government Board within fourteen days of service; and it was held in that case that the note was a material part of the prescribed form, and the fact that the notice of the closing order had not got that note vitiated the whole proceedings. But it is to be remembered that in that case the owner deposed that he had not become aware of his right of appeal to the Local Government Board until it was too late for him to exercise it, and it is submitted that that fact must be taken to have had a material effect on the decision in that case. It does not appear that the decision in the *Rayner* v. *Stepney* case would apply in a case where the owner had in fact exercised his right of appeal to the Local Government Board. In such a case, when the Local Government Board came down to hold their inquiry, it would not lie in the mouth of the owner to say that "this note was omitted from my form; there was such and such a legal defect in my form." The answer would be, "You are not injured, because you have exercised your right of appeal, and here you are at the inquiry." The very fact that he had appealed to the Local Government Board would probably be held to be a waiver of any of those provisions in the Act which are put in distinctly for his own benefit.

The circular of the Local Government Board above referred to draws attention to one or two other matters. The names of all persons who are owners within the meaning of the definition are, if possible, to be included in the address at the head of the order, and the most diligent inquiries should be made to ascertain the facts as to ownerships; but as a matter of caution it is in every case advisable to add the words "or other the owner or owners of the dwelling-house," and, further, in addition to serving every known owner with a copy of the order and the notice, to serve a further copy addressed to the owner and to the occupier of the dwelling either by delivery to an occupier or by causing it to be stuck on the door where there is no occupier. These details are mentioned in order to emphasise the fact that in dealing with closing orders the utmost caution should be observed to carry out the whole of the procedure exactly and precisely as the Act provides. Another matter mentioned incidentally in the circular is that a closing order or a demolition order, as a general rule, should not extend to more than one dwelling-house. In connection with this, reference may be made to a Scottish case in which the Glasgow Sheriff quashed a closing order on the ground that it related, not to a dwelling-house, but to a block of tenement dwellings. He pointed out that the definition of a dwelling-house has been repealed, and the later Act contains no substituted definition, and said that the whole policy of the Act appeared to be based on a consideration of the character of the individual dwelling-house, and he thought a separate closing order should have been made in respect of each of the forty-three dwellings in question. This is a point which, so far as we are aware, has not been determined as far as England is concerned, and it is one of the many points which, no doubt, will arise in due time in connection with the administration of these sections.

**More about Portland Cement and Road Crusts.**

Our remarks of May 31st have led to the appearance of several interesting letters on the subject of Portland cement as a road binder. Mr. Malcolm Bennett is of the same opinion as ourselves as regards the quality of resetting and its importance, and the consequent failure of Portland cement to qualify as a true binder. As regards the use of the material in the sub-crust, Mr. Malcolm's suggestion is, we think, somewhat like our own in the first column of our "Minute" of May 31st, when we opened a door to those who might "find our arguments more convincing than they are to ourselves." We look with no favour on the use of Portland cement in the sub-crust. In making a definite crust of cement concrete to receive the carpet layer of a city street the surveyor provides a single homogeneous strength crust. If, however, we use Portland cement in the sub-crust of a country road, or a road of a non-city type, we lose the advantages of continuity of material; we provide, perhaps, a platform on which the upper layer will slide or be crushed, and we invite sudden rather than gradual settlement. More than this, we lose that valuable kind of resiliency by which the shocks of traffic are smoothly dissipated both directly downwards and slantwise.

As regards drainage, there may be a tendency to the holding up of water in the upper layers, as well as towards the retention of water under the cement-bound layer. If this layer be intended to prevent upward seepage into the crust we can only say that there are better ways, in almost any case, of using the same quantity of Portland cement, or other materials of the same cost. Having regard to the cost of Portland cement, and the drawbacks attending its use in the lower course of the crust, it would seem that the better practice in almost any case is to relay the foundation. A good deep foundation course of cheap and relatively weak material is worth more than a thin layer of grouted (not adequately *bound*) sub-crust.

As to the experience related by "Cretacious," the experiment was worth making, but the results are quite in accord with our own remarks, and we may say further that over a large part of the country, away from the chalk area, the climate does not permit of the treatment of the skidding strip by any hardening process. Indeed the best way in almost every case to treat such a strip on grades steeper than some ruling gradients, which in many districts is about 1 in 8 (or 1 in 10 for a long hill), is to make it and keep it as a strip of unrolled, unbound road-metal. The same plan works well in some roads with gradients much less steep. Generally nearly all the trouble with skid-pans arises from improper adjustment, though some of them are not quite as wide as they should be.

* * *

**Public Interest in Housing and Town Planning.**

The Scottish National Conference at Glasgow this week, on the administration of the Housing and Town Planning Act, is itself evidence, were any wanting, that interest in the subjects with which the Act deals continues to be well sustained. But there is plenty of evidence elsewhere that housing and town planning, especially the former, are commanding a goodly share of public attention. There are the proceedings in the Standing Committee on the Housing of the Working Classes Bill to testify to the fact; there is, moreover, the Memorandum which has been addressed to the Standing Committee by the National Housing and Town Planning Council advocating the formation of a Housing Department of the Local Government Board. A Housing Department at Whitehall might presumably be established with advantage if, say—and this would be a large order—it were invested with larger powers over municipal authorities than the Local Government Board itself already possesses, or, alternatively, if it had authority to order the expenditure of public money for housing purposes. Parliament will necessarily have to grant this authority, and there are not yet any signs that it is very anxious to do so. Needless to say that this particular part of the subject bristles with difficulties, political, social, and administrative. Another proof that town planning, and of course housing indirectly, is to the fore is the fact that there is to be held in London, during August, a summer school, at which opportunities will be provided for the study of the subject by professional men, including architects, surveyors and engineers, as well as councillors and others. The session has been arranged by the University of London Summer School of Town Planning, and the Hampstead Garden Suburb has been chosen as the rendezvous. Every morning of the session, which will last a fortnight, there will be given three lectures or demonstrations on the site, and visits will be arranged to various places having a special interest in connection with town planning or housing. The idea of the school is thus practical as well as artistic, and in its dual character it will doubtless serve a very excellent purpose.

* * *

**The Salary Question.**

The absurdly inadequate salaries that are frequently offered for municipal engineering appointments have often formed the subject of comment in these columns. It appears, however, that the local authorities in the Mother Country are not the sole offenders in this respect. Complaints are not infrequently heard as to the poor salaries paid by Canadian municipalities to their engineers, although in the Dominion, as here, the general tendency is towards a gradual if slow improvement in the conditions of employment. One curious result of this under-payment, especially in the larger towns, is that the engineer's department of the offending authority acquires a spurious reputation as a "training ground" for engineers, by reason of the number of assistants who leave to take up appointments in other places. It should always be borne in mind, however, that the continual loss of assistants by a department may be due, not to any merit attaching to training there, but rather to a desire on the part of those who hold appointments to remove themselves to other spheres as speedily as they can. These observations are not of course of universal application. There are both in this country and in Canada many authorities who give very fair remuneration to their officials of every grade, and there are also offices which very deservedly have the highest reputation as excellent training grounds for the younger members of the profession. We can only hope that those whom the cap fits will wear it. Of this, however, we are certain—that underpayment must in the long run tend to inefficiency, and that no public department can be properly administered if the officers are not satisfied that they are one and all being treated with justice and fairly remunerated for the work they have to do.

* * *

**Standardisation of Road Materials.**

The Engineering Standards Committee have convened a conference, which takes place to-day, on the standardisation of road materials. The question is a very large and important one, the full consideration of which is long overdue, and it is to be hoped that the outcome of to-day's proceedings, over which Sir John Wolfe Barry will preside, will be that the whole matter will be taken up by the Engineering Standards Committee and dealt with by them in a thoroughly comprehensive manner. To-day's meeting is of a private character, but we understand that an official *résumé* of the proceedings will be issued, and we hope to publish this in the next issue of THE SURVEYOR.

# Institution of Municipal and County Engineers.

## EASTERN DISTRICT MEETING AT EAST HAM.

A most successful meeting of the Eastern District of Municipal and County Engineers was held at East Ham on Saturday last. The municipal works of the district were described in a paper prepared by the borough engineer, Mr. J. E. W. Birch, who afterwards accompanied the members on an inspection of the various undertakings. A cordial welcome was extended to the institution at the commencement of the business proceedings—which took place in the council chamber of the town hall—those present including Mr. A. D. Greatorex (president, West Bromwich), Messrs. W. V. Anderson (Winchester), H. L. Baker (East Ham), S. W. Barnes (Hanwell), J. E. W. Birch (East Ham), W. Nisbet Blair (St. Pancras), W. Laurence Bradley (Tonbridge), A. T. Bridgewater (East Ham), J. W. Brook (East Ham), Reginald Brown (Southall-Norwood), E. R. Capon (Epsom), J. W. Cockrill (vice-president, Great Yarmouth), A. Coles (East Ham), H. Cubitt (London), E. J. Elford (hon. district secretary, Southend-on-Sea), E. H. Essex (Leyton), A. Flood (Gravesend), H. H. Foster (London), H. A. Giles (assistant secretary, Westminster), M. Hainsworth (Teddington), P. T. Harrison (Chelmsford), A. C. James (Grays), C. J. Jenkin (Finchley), W. Jennings (Leyton), Charles Jones (president, general hon. secretary, Ealing), C. G. Lawson (Southgate), J. W. Liversedge (Leigh-on-Sea), E. J. Messent (Southend-on-Sea), T. G. Newcomen (Finchley), J. H. Norris (Godalming), E. J. Reynolds (Friern Barnet), J. Robinson (Aylesbury), E. A. Rogers (East Ham), W. H. Savage (Chadwell Heath), Norman Scorgie (Hackney), George Smith (Luton), A. Stokes (East Ham), W. H. Taylor (Aylesbury), J. W. Trodd (Leyton), H. F. Wilkinson (Tottenham), E. Willis (Chiswick) and O. E. Winter (Hampstead).

The Mayor (Councillor J. Murrell Oakes) said it gave him great pleasure to welcome the members of the Institution of Municipal and County Engineers to East Ham. They were a very important part of the municipal machinery, a great deal was expected of them, and a great deal was given, more perhaps than councillors always acknowledged. If they advised them in something that was good the councillors generally took the credit; if it was bad they let the public know it was the engineer who had done it. Some short time ago the ground where that building stood was like the rest of East Ham—a village. They had grown very rapidly, and they must acknowledge that they had needed assistance from such gentlemen as themselves more than a good many other boroughs had. They had been extremely fortunate in getting good engineering advice, which had been so much needed in a neighbourhood such as that which had grown so rapidly. Although great alterations had been made from time to time in the roads, there was still some improvement needed, as places had grown, traffic had altered from the old broad wheel coach to the fast travelling vehicles of many descriptions, all of which needed some reformation in the make of their roads. In the towns the authorities had made some effort, on the advice of their engineers, to alter the construction of the roads, though they had not as yet got over all the difficulties; but certainly outside the towns there was still room for some definite scheme of improvement so that they might be as they used to be, green roads and free from dust. He knew that several schemes had been tried, and no doubt they had been more or less successful, but apparently no definite scheme had been laid down. He supposed the cost prevented it, though he admitted there had been an improvement. He had no doubt such meetings as that would help very largely to bring about a solution. He trusted that from their deliberations and visit themselves might gain knowledge and help each other, but that it might be a help to the various authorities that were represented there by their members. He trusted they would spend a pleasant and profitable day, and it was with the greatest pleasure he welcomed the institution in the name of the borough.

The President said he wished to thank his Worship for the very kind welcome he had given the institution that morning. In reading through an able paper on the municipal works of East Ham which had been prepared by the borough engineer and surveyor one was struck not only by the growth of the town in extent and population, but also by the public spirit of its governing body, and the amount of work accomplished by the town council and its predecessors during the past few years. East Ham was in possession of a handsome town hall, and the utmost care appeared to have been bestowed on the various municipal services—the streets in particular. He might say that the institution always received the greatest hospitality from the authorities of the towns they visited from time to time. The meetings were of considerable value to the members of the institution—who were the chief officials of public bodies—but must also prove of some advantage to the authorities they served, for he ventured to suggest that at all these gatherings they were able to gain some information, and gather fresh ideas which were of assistance to them in the carrying out of their duties. In again thanking the mayor for his welcome, the president said he felt he must congratulate East Ham on having had the advice of those members of the institution who had filled the position of borough engineer in the past, and on having at the present time the services of Mr. Birch.

The president then took the chair.

The minutes of the last Eastern District meeting—held at Gidea Park on September 23, 1911—were read and confirmed, and expressions of regret for non-attendance were reported by the hon. secretary to have been received from Messrs. Campbell, Fidler, and Hayward.

The Hon. District Secretary (Mr. E. J. Elford) said he wished to ask those present if they would favour him with suggestions for future district meetings. The new constitution would come into operation immediately after the annual meeting, and he hoped that they as a district would be able to interest and instruct themselves by fairly numerous meetings.

The President said he wished to refer to one matter which had lately come from the council. Probably some of them might have heard of what was known as the Jones case, where one of their members had to defend his good name, and, unfortunately, although he had won the day, he had been landed in rather expensive law costs which he could not recover. This matter was brought before the council, but unhappily they were unable under their constitution and by-laws to use any of their funds for that purpose. They had, however, started a fund, and the council proposed sending a circular to all the members of the institution asking them to subscribe to this particular fund. Then he wished to refer to a matter connected with this particular business. The council had referred to a special committee the question of the formation of a legal defence fund for the whole of its members. The idea of such a fund had not been started within the last few days. It was thought of some few months ago, and probably most of them had seen in the papers letters from Mr. Wakelam on the subject. Two or three meetings ago he (the president) gave notice that he should bring before the council a resolution for the formation of this particular fund. He was pleased to say that Mr. Wakelam had thrown in his lot with the council, and at the annual meeting they hoped to bring forward a suggestion for the formation of this particular fund. It would be worked separately from the ordinary institution funds, on similar lines to the Orphan Fund. He thought it was desirable to mention this in order that the members should know the council were not lacking in their duty to the members.

### MUNICIPAL WORKS AT EAST HAM.

By J. E. W. Birch,

Engineer and Surveyor to the Corporation.

East Ham is perhaps the most remarkable example of rapid transformation from a rural to an urban community. Its marvellous growth and development is probably without parallel in the history of the United Kingdom. Thirty years ago it was a straggling village, with a scattered population. At that time it possessed neither gas lamps nor sewers. Pavement, kerb, and road formation as now known were matters of an unknown kind. Trade does not seem to have been brisk. Besides a few shops, there were only two bakers in the village and one butcher, and the nearest doctor was at Barking. In 1801 the popu-

lation—including the civil parish of Little Ilford (which is now in the borough)—was 1,250; fifty years later it had risen to 1,737; and in 1871 to 5,009. Since then it has been increasing by leaps and bounds. At the last census the population was returned as 133,504. Like all rapidly growing suburban towns, it has entirely rubbed off its once rural character. From a village of market gardens for the production of cabbages and onions, it has grown into a busy town. It is surprising to see how rapidly building estates have been developed, and in how short a time the area of cultivated fields and meadows has been converted into streets of dwellings. Nor is it in point of population alone that East Ham has developed. With the growth of population there has been of necessity concurrent progress along the lines of municipal and sanitary developments. The lanes have been widened and converted into important thoroughfares, along which the electric tramcars carry the people to and from all parts of the borough. Fourteen years ago, in the whole district, there were no public buildings worthy of the name. Now there exists a town hall, technical college, and numerous other public buildings.

INDUSTRIES.

The chief industry of the borough is that of the manufacture of gas and chemicals by the Gas Light and Coke Company, who employ about 5,000 men. The Royal Albert Docks, situate within the borough, also provide employment for a considerable number of men, while the remainder (constituting the majority) are of the clerk and artisan class, and find employment in the City of London. East Ham has rightly been described as one of the great dormitories of London. But its phenomenal growth has demanded the reverse of dormancy in its physical developments.

GOVERNMENT.

In the year 1878 East Ham was constituted a local board, in the year 1894 the district was made an urban district, and in 1904 the urban district was raised to the dignity of a municipal borough. The council consists of six aldermen and eighteen councillors. The borough includes the ecclesiastical parishes of East Ham and Little Ilford, and is divided into six electoral wards.

STATISTICS.

Area of borough, 3,326 acres; rateable value for general district rate, £490,000; rateable value for borough rate, £525,000; general district rate, 3s. 8d. in the £ for the year.

Poor rate, including elementary education, higher education (local and county), free libraries, Unemployed Workmen Act, municipal purposes, relief of the poor, general county purposes, police and overseers, 6s. 5d. in the £ for year.

Inhabited houses, 26,000; houses erected, 1901-11, 8,507.

Death-rate, 12·1 per 1,000.

Levels of [illegible] 70 [illegible] 300 [illegible] datum.

PUBLIC BUILDINGS.

A site of 6 acres was purchased in the centre of the borough in the year 1899, and the following buildings have been erected thereon:—

(*a*) Town hall and municipal buildings (erected in 1901), comprising suites of offices for various departments, police court, minor hall, large hall (with seating accommodation for about 1,100 persons), caretaker's apartments, &c., costing £46,054 (price per foot cube, 1s. 0¼d.), from the designs of Mr. Henry Cheers.

(*b*) Adjacent to the town hall is the technical college, erected in 1903, at a cost of £21,676 (price per foot cube, 1s. 2¼d.), from the designs of Mr. Henry Cheers.

(*c*) In connection with the college there is a well-appointed gymnasium and workshops, erected four years ago, at a cost of £2,700 (approximately 5¼d. per foot cube), from plans prepared by the late borough engineer, Mr. A. Horsburgh Campbell, M.INST.C.E.

(*d*) Additions have recently been made to the town hall buildings by the erection of education offices and public health department, mortuary, &c., from designs prepared under the supervision of the late borough engineer, and erected by the council's own workmen, being completed under the supervision of the author at a cost of £5,600 (price per foot cube 1s. 1d.). The cost of the mortuary buildings was £450. Especial attention is directed to the simplicity of the mortuary plan.

(*e*) The central Carnegie library is also adjacent to the town hall, and was erected in the year 1908 out of funds provided by Andrew Carnegie, Esq., from designs prepared under the supervision of the late borough engineer, and erected by the council's own workmen under his supervision, at a cost of £9,000 (price per foot cube, 10¼d.).

The accommodation on the ground floor of this library comprises a magazine-room [illegible] readers, newspaper-room for fifty readers, with lending library at rear with shelves for 20,000 volumes. Also librarian's room and the usual offices. There is a book store in the basement, which has a storage accommodation for 15,000 volumes.

On the first floor there is a ladies' room, with accommodation for forty-eight readers, and a reference-room, with accommodation for about twenty readers; also a room for assistant-in-charge, and small book store and the usual offices. The reference room is connected by means of a lift for the passage of books with the lending library and basement book store.

(*f*) At the rear of the central library there has recently been erected a covered-in public swimming bath.* The swimming pond is 120 ft. by 40 ft. For a distance of 30 ft. from the shallow end it has a uniform depth of 3 ft., the remainder ranging from 3 ft. to 6 ft. 9 in. at the deep end, the deepest portion being 8 ft. 6 in. over the outlet. The bath proper is constructed of cement concrete retaining walls and floor, the whole being lined with marble terrazzo, and is fitted with the usual accessories of diving board, &c. A series of dressing-boxes (seventy-six in all) is ranged along the two sides.

There is seating accommodation for 300 persons, formed by concrete tiers, finished off with marble terrazzo. This will be supplemented on gala occasions by a temporary wooden tier at the rear for 150, and will thus together accommodate about 450 persons.

There are three shower baths, two footbaths, also efficient urinal and water-closet accommodation.

The apparatus for heating the bath has been installed by Messrs. Royles, Limited, of Manchester, and is on the aëration and filtration principle, thus avoiding the emptying and refilling of the bath with water, the same water being used over and over again. The needful supply of steam is obtained from the electric power station, which adjoins the bath, so aiding in the economy of working.

A small laundry is provided to deal with the cleansing of towels, &c.

The cost of this bath is £8,900 (price per foot cube, 6¼d.), and the work has been executed by the council's workmen, under the supervision of the author, from designs prepared under the supervision of the late borough engineer. The plan and internal arrangement of the bath presents certain unique features worthy of observation.

(*g*) Plans for a further extension to this bath, comprising slipper baths and vapour baths, have been approved by the town council, and forwarded to the Local Government Board for sanction to a loan of £3,625, the plans for this work having been prepared under the supervision of the author.

(*h*) Plans for a new fire station with firemen's dwellings at rear have also been prepared under the supervision of the author, and approved by the town council, and forwarded to the Local Government Board for sanction to a loan of £8,628.

On this same site there are erected electric power station, tramway sheds and offices, from designs prepared under the supervision of the late borough engineer, and executed by the council's workmen under his supervision, at a cost of about £26,021 (approximately 5¼d. per foot cube).

The electrical engineer and tramways manager (W. C. Ullmann, Esq., M.I.E.E., M.I.M.E.) has kindly supplied the following particulars respecting these works:—

EAST HAM CORPORATION ELECTRIC LIGHTING AND TRAMWAYS UNDERTAKING.

The electric lighting and tramways undertaking was inaugurated in June, 1901. The generating plant then consisted of four multipolar generators, coupled to cross compound engines, having a total of 1,150 i.h.p. The engines were built by Messrs. J. Musgrave & Sons, of Bolton, and the generators by Messrs. the English Manufacturing Company, Preston. The boiler-house plant consisted of four Babcock & Wilcox boilers, each having a heating surface of 3,850 sq. ft., capable of evaporating 10,000 lb. of water per hour. The initial capital expenditure amounted to £66,976. Owing to the increasing demand for supply, the plant

* An illustrated description of this building appeared in our issue of May 31st last. ED. SURVEYOR.

has been considerably added to, the first extension consisting of a 750 i.h.p. Musgrave-Dick Kerr engine and generator, the second of a 1,250 i.h.p. Musgrave-Dick Kerr engine and generator,, and recently a 1,750 i.h.p. Browett. Lindley-Westinghouse engine and generator has been installed, bringing the total up to 4,800 i.h.p. The boiler-house plant has been doubled, making eight boilers now in use. The total capital expenditure up to March, 1911, amounted to £128,993. The annual output has increased during this period from 730,642 units generated to 3,895,350 units, and the revenue from £7,094 to £27,604. One of the recent additions has been the installation of a complete new condensing plant of the evaporative type. The condenser has a capacity of 40,000 lb. of steam per hour, but the air pumps (Edwards) and auxiliaries are capable of working up to a full capacity of 60,000 lb. of steam per hour. In connection with the electric tramways, the total length of line authorised was 9½ miles, but the length of routes completed at the time of opening was 4½ miles. The rolling stock originally consisted of twenty top-seat single truck cars. At the present time forty-five cars are in use, and the route mileage open 7·6 miles. The capital expenditure has increased from the initial expenditure of £82,978 to £191,158. The total revenue has increased during the period from £15,619 to £55,084 per annum, and the passengers carried from 5,298,476 to 17,668,911.

Owing to the geographical position, inter-running with neighbouring authorities is absolutely necessary in order to meet the public convenience and the severe competition of motor-'buses which swarm over our main roads. The corporation cars inter-run with the L.C.C. West Ham Corporation and Barking Council tramways wherever possible, with good results. The electric lighting and tramways are run as a combined undertaking, under one committee and one management. The following summary will give at a glance the result of the first completed ten years' working of the combined undertakings:—

Summary of Result of Ten Years' Work to June, 1911.

| | Electricity. | Tramways. | Combined. |
|---|---|---|---|
| | £ | £ | £ |
| Capital outlay ... ... | 128,993 | 191,158 | 320,151 |
| Total revenue ... ... ... | 203,036 | 422,533 | 625,569 |
| Gross profit | 89,166 | 114,495 | 203,661 |
| Per cent to average outlay ... | 7·7 per cent | 7·1 per cent | 7·4 per cent |
| Loans repaid and sinking fund accumulated to date ... ... | 33,580 | 44,958 | 78,538 |
| Interest on loans ... | 40,821 | 52,547 | 93,368 |
| Paid as rates on undertaking... | 4,758 | 9,406 | 14,114 |
| Nett profit ... ... ... | 13,963 | 22,325 | 35,788 |
| Contributed to relief of rates | 5,720 | 14,060 | 19,780 |
| Depreciation and renewals fund | 6,828 | 4,282 | 11,110 |

LIBRARIES

The Public Libraries Act was adopted by the council on June 18, 1895, and by a local Act the corporation is empowered to raise a rate of 1½d. in the £ for library purposes.

In addition to the central library before mentioned, the council possesses three libraries. That at North Woolwich was opened in 1896, and is a freehold corner house, which was purchased by the council out of revenue. Previous to the opening of the Plashet Library, temporary premises were taken in High-street North, East Ham, which were used for library purposes till the year 1899, when the Passmore Edwards Library in Plashet-grove was opened. This building was the gift of the late Passmore Edwards, Esq., amounting to £4,000. The accommodation on the ground floor comprises ladies' reading-room for twenty readers, magazine-room for twenty readers, news-room for about thirty readers, also lending library with shelves for about 18,000 volumes. The first floor of this library is taken up for caretaker's apartments. The Manor Park Branch Library, Romford-road, was erected in the year 1904, out of funds provided by Andrew Carnegie, Esq., from designs prepared under the supervision of the late borough engineer, and erected by the council's own workmen at a cost of £5,000 (price per foot cube, 1s.). The accommodation on ground floor comprises a newspaper-room for forty readers, magazine-room for thirty-six readers, also lending library at rear, with shelves for about 15,000 volumes. On the first floor there is a lecture hall, capable of seating 200 persons, with cloak-rooms and the usual offices.

ARTISANS' DWELLINGS.

The council has purchased 15 acres of land for the erection of artisans' dwellings, and there are now sixty-six double tenements in Savage-gardens and forty double tenements in Brooks-avenue. These are let at 6s. 6d. downstairs and 7s. upstairs, the accommodation provided being a sitting-room or parlour, two bedrooms, living-room and scullery, with bath and water-closet for each tenement.

FIRE PROTECTION.

The present fire station is situate in Wakefield-street, and is well equipped for an old station. In addition to the main station, there is a branch night-and-day station at Manor Park.

The present strength of the brigade is:—

One superintendent, one deputy superintendent, one engineer, nine firemen, two coachmen—total, fourteen men, four horses (hired).

There is an electric fire-alarm system throughout the district. The present number of street alarm posts is sixteen. There are also fifteen call-bells to firemen's and turncocks' houses in close proximity to the station.

The equipment of the brigade is as follows:—

One steam fire engine, one manual fire engine, one horse-drawn escape and hose tender, two hand-drawn escapes, four jumping-sheets, six hand pumps and hose, 3,500 ft. of canvas hose, one smoke helmet, eight scaling ladders.

PARKS AND PLEASURE GROUNDS.

Central Park has an area of about 25 acres, containing cricket pitches, football grounds, bandstand, bowling green and tennis courts. The bowling green (consisting of six rinks) was laid out by labour provided by the Distress Committee. The tennis courts are constructed on the hard-surface principle, and finished off with the En-Tout-Cas Tennis Court Company's material.

Plashet Park has an area of 18 acres, and is laid out similarly to Central Park, including a bowling green, which was also formed by Distress Committee labour. The tennis courts in this park are of turf.

Beckton Park has an area of 13 acres, and contains cricket pitches, football grounds, and general playing fields.

Wanstead Flats, with an area of about 96 acres (in so far as within the borough), are situate in the northern portion of the borough, and at the southern extremity of Epping Forest. They are vested in the City of London Corporation, East Ham Corporation having control by arrangement. The borough has provided a bandstand and numerous cricket and football pitches, also tennis courts.

North Woolwich Gardens have an area of about 8½ acres, and are situated in the southern portion of the borough, on the bank of the river Thames. They are maintained by the London County Council, the borough of East Ham contributing towards the initial cost of purchase.

Barking-road, Greatfield Estate, Little Ilford, and Vicarage-lane Grounds (a total area of about 26 acres), are laid out as playing fields for children.

The foregoing parks and playing fields provide a total area of 186½ acres of open space within the borough, to a population of approximately 140,000 persons and an acreage of 3,326.

OPEN-AIR SWIMMING BATH.

In the year 1902 the council constructed by direct labour, at a cost of £1,200, an open-air swimming bath in the south-east corner of Central Park. The size of the swimming pond is 90 ft. by 30 ft., and at the deep end has a depth of 6 ft. 6 in., and at the shallow end 2 ft. 6 in. It is constructed with cement concrete retaining walls and floor, the whole being lined with terrazzo. The bath is fitted with the usual accessories, and is surrounded by fifty dressing-boxes. The pleasure of a swim and a run in the open when the weather is favourable is a feature of the open-air bath which the covered-in bath fails to provide.

HOSPITALS.

In the year 1900 17 acres of land were purchased in the south-west part of the borough, and the temporary corrugated-iron building, which for several years had been situate at Bonny Downs, near the sewage works, was removed to the new site in 1901. Two years later, an additional corrugated-iron building was erected for diphtheria and scarlet fever. In the year 1906 the late borough engineer was instructed to prepare a scheme for the provision of permanent buildings. This complete scheme provided for 100 beds, at a cost of £48,000, ranged in a series of separate pavilions. The first of these pavilions was erected at a cost of £140 per bed, or 5½d. per foot cube, the accommodation being for twenty-six beds.

The laundry and porter's lodge were built at the same time. In the year 1908 a further block of two storeys was erected, the accommodation on ground floor being for twenty beds, the upper floor being used for nurses' sleeping quarters, &c., the cost being £4,500 (approximately 6½d. per foot cube); also an observation block, built on the cubicle system, containing twelve beds, with glass partitions dividing the beds, the cost being £1,680, or £140 per bed, or 8d. per foot cube. The arrangement and economy of this plan, both in first cost and in working, commends it to notice. A bungalow for resident medical officer has also been provided, also complete laundry, disinfector, stabling and ambulance accommodation is provided on the site. One of the corrugated-iron buildings has now been converted into a shelter for the treatment of consumption, and a portion of the last erected iron building is also used for the same purpose.

ROAD AND HIGHWAY MAINTENANCE.

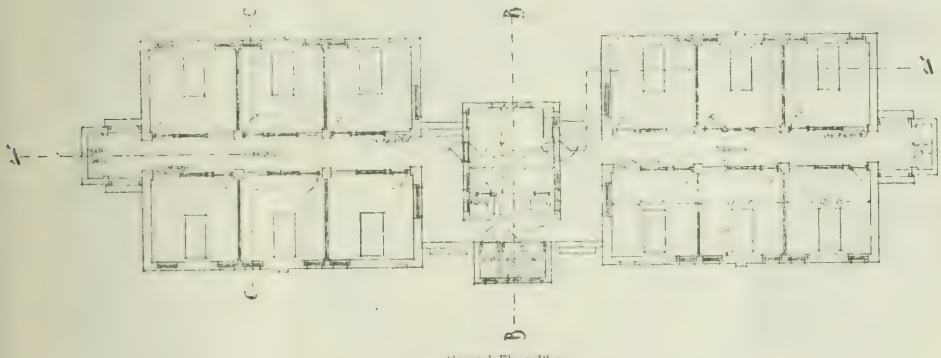
There are 66 miles of public highways within the borough, 6½ miles being county main roads. These latter are maintained by the corporation under agreement with the county council. On all the main roads, 2½ miles of tar-macadam roads, 55 miles of flint roads.

The attention of the institution is called to the paving of the Barking-road with sectional hard-wood blocks, 3½ in. in depth, laid from two to three years ago, which promise to give excellent results, particularly in relation to the tramway track and the side margins. The total area of paving so laid is about 25,000 sq. yds. of roadway and tramway.

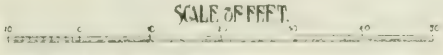
There is also a short piece of Val de Travers bituminous grouted-macadam roadway, which cost about 3s. 5d. per square yard to lay. Roadoleum has also been laid at a cost of about 2s. 10½d. per square yard. These prices include scarifying, laying 3 in. of broken granite and grouting with binder. All the flint roads are water-bound. "Glutrin" has been used in formation and repairing side roads, this material being used in conjunction with pit ballast, blue lias lime and chalk rubbish, the cost working out at about 1s. 4d. per square yard, inclusive.

During the past ten years about 21 miles of private streets have been made up by direct labour under sec. 150 of the Public Health Act, the average cost being 9s. 4½d. per foot of frontage.

East Elevation.



Ground Floor Plan.




CUBICLE BLOCK, EAST HAM ISOLATION HOSPITAL.

*(Registered Design the property of Mr. A. H. Campbell, M.Inst.C.E.*

roads there is a very heavy traffic. Especially is this the case in Romford-road, it being the main thoroughfare between London and Colchester. The scavenging and maintenance is carried out by direct labour, the horse haulage being carried out by contract. The wage of roadmen is 30s. per week for forty-eight hours. The corporation owns thirty-two water vans, the haulage of these being carried out by contract. The number of metered hydrant standposts is sixty-eight, the charge for water being 6d. per 1,000 gallons. The water is obtained from the Metropolitan Water Board. For the purposes of scavenging and road watering, the borough is divided into two districts, each being in charge of a road foreman (wage, 50s. per week). The cartage of road sweepings and slop is carried out by contract, and costs approximately £1,550 per annum. All streets are 40 ft. wide, except the main roads, which are from 50 ft. to 60 ft. wide. In each of the main roads there is a line of tram track; the maintenance of this, including 18 in. on each side of the outer rails, is carried out by the borough engineer's department on the requisition of the tramway manager and at the cost of the tramway undertaking. Within the borough are 2 miles of wood-paved roads, 1 mile of granite-paved roads, 5½ miles of granite-macadam

The carriageway is finished off with Kentish flints, and the footpaths in granolithic, laid *in situ*. The granite kerb is provided by the estate owner when the street is laid out, and is taken up and relaid on cement concrete at the time of making up. The granite channel is provided and laid on Portland cement concrete and included in the cost of making up.

The drainage of the district is partly on the "separate" system, the surface water flowing to the watercourses, and the sewage to the council's own works and pumping station.

The following particulars are kindly supplied by Mr. A. Horsburgh Campbell, M.INST.C.E., the engineer responsible for the sewage works:—

SEWAGE AND REFUSE DISPOSAL WORKS.

The sewage disposal works were originally provided for a population of about 20,000 people, when first laid down upon the designs of Mr. Charles Jones, M.INST.C.E., and Mr. W. H. Savage, ASSOC.M.INST.C.E., the first surveyor of the district. They were opened in 1886, and had to do duty in their original condition until 1902. At this time the population had grown to nearly 100,000 persons, and the demands were seriously disproportionate to the means available. A proposal was submitted for connecting the

outfall drainage with the London County Council's outfall sewer at Beckton. Subsequently, however, owing to the difficulty of ascertaining from the London County Council the terms upon which they would receive the sewage of the borough, and other local causes, it was decided, upon the advice of the late borough engineer, to at once proceed with the adaptation and extension of the then existing works and pumping plant, so as to bring those original works up to date and to make them available for a population of at least 150,000 persons. To this end the enlarged pumping station was built, new pumping plant provided as per particulars following: a refuse destructor for the supply of steam was introduced; the precipitation tanks were enlarged; 3 acres of bacterial filters were provided, the latest addition being a humus basin or tank, 1 acre in extent, for the final purification of the filtered liquid. These works (involving an expenditure of £44,000) were carried out works and in retaining the control of this important adjunct of local sanitary administration. Appended hereto is a table of the analysis of the crude sewage, and of the final effluent, which standard may be said to be consistently maintained (p. 899).

On arrival at the works, the sewage passes through a screening chamber, equipped with penstocks, by-pass, &c. On each main sewer there is a manhole containing a fixed screen, 8 ft. by 6 ft., with vertical bars ½ in. apart. These screens are cleaned by means of travelling rakes, which lift the screenings to a trough above ground level.

The rakes are cleaned automatically by a patent rake-cleaning gear. The whole of the mechanical part of this work was supplied by Messrs. Stott, of Haslingden. The power for driving same is supplied by means of a 3½-horse power vertical engine, connected by shafting from the engine-house. The sewage next flows to a pump well beneath the engine-house

Plan of East Ham Sewage Works.

by direct labour, aided, as regards the filters and humus basin, by distress labour. Certain features in the arrangement and operation of these works are worthy of notice, viz.:

(1) The completely self-contained nature of their design and operation—that is to say, a perfect cycle of operations is realised, in that the power needed to pump the sewage and to do the other incidental duties of purification is provided by the crude refuse of the town, burned in the destructor, the resultant clinker being in turn used for the subsequent purification of the effluent.

(2) Another feature of the works is the great extent of natural aëration of the sewage at its various stages of purification by extended weirs at every stage, and undoubtedly the results obtained are attributable in a very large manner to this free exposure of the liquid to the natural agency of sun, light, and air.

These results—in point of low capital and working cost, and the results obtained—amply justify the wisdom of the council's decision in utilising their own floor, from which it is pumped into precipitation tanks. The pumping plant for the crude sewage consists of two direct-coupled "Allens'" 25-in. twin centrifugal pumps, each capable of delivering 20,000,000 gallons per day, driven by high speed (460 revolutions per minute) 165 b.h.p. forced lubricating condensing engines, steam being supplied at a pressure of 150 lb. per square inch, and one 12-in. centrifugal pump, gear driven by 45 b.h.p. motor, capable of delivering 6,000,000 gallons per day. A 126-kilowatt electric generating set, by Mather & Platt, working at 230 volts, is installed for the purpose of providing electricity to light the works, to pump the tank effluent on to percolating filters, and also to provide energy for driving the 12-in. centrifugal pump in engine-house.

The total height the sewage is lifted from the normal water level of the pump well into the tanks is 32 ft. As it flows into the tanks the sewage is treated with lime, nine grains of which is applied to each gallon of sewage. There are two continuous-flow precipita-

TABLE OF ANALYSIS OF SEWAGE EFFLUENTS, &c., EAST HAM.
These figures refer to grains per gallon.

| Number. | Date. | Source. | Colour. | Odour. | Suspended matter. | Degree of Oxygenation. | Nitrogen in nitrates & nitrites | Free ammonia. | Organic ammonia. | Oxygen absorbed in 3 hours. | Impurity figure. | Degree of purification. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Per cent. | Per cent. |
| 1 | 13 Sept. | Crude sewage | Brown | Of sewage | 44·3 | Nil | Nil | 7·5 | 1·0 | 7·4 | 100 | Nil |
| 2 | 13 Sept. | Tank effluent | Cloudy | Urinous | 5·1 | 7·5 | Trace | ·57 | ·040 | 2·2 | 30 | 70 |
| 3 | 13 Sept. | Filter | Pale yellowish | Earthy | 1·4 | 10° | 1·1 | 1·8 | ·009 | 1·0 | 14 | 86 |
| 4 | 13 Sept. | Humus tank | Pale yellowish | Earthy | 1·2 | 10° | 1·4 | 1·2 | ·005 | ·08 | 8 | 92 |
| | IDEAL STANDARD | | Clear | Nil | — | 10° | As high as possible | — | 0·10 | 1·00 | | |

The above samples consisted of definite quantities taken every half-hour, between 9 a.m. and 6 p.m. inclusive, which, at the end of the day's working, were thoroughly mixed. Average samples were then taken and analysed.

(Signed) E. WARNER, Works Chemist.

Remarks by Engineer:—
1. A domestic sewage, moderately dense.
2. Putrifies after three days.
3. No putrefaction, but a good deal of mineral deposit from filter.
4. Final effluent decidedly clearer than No. 3; absolutely non-putrescent. Suspended matter is fine particles of clay from unfinished basin.

A. H. CAMPBELL, M.INST.C.E.

tion tanks, 155 ft. by 24 ft. 6 in. by 7 ft. average depth below weirs. Only one tank is in use at a time during dry weather. Each tank is cleaned out once weekly. The effluent from these tanks is treated with ferric sulphate in liquid form, to the amount of 4·7 grains per gallon of sewage. It then flows into one of the three quiescent tanks, each 200 ft. by 50 ft. by 7 ft. average depth, and is allowed to rest in same for two to three hours. One tank is cleaned out each week. Provision is made for gravitating the tank effluent back to the pump well, and retreating it if found necessary.

The final tank effluent is pumped by an electrically driven centrifugal pump, capable of delivering 6,000,000 gallons per day, into a cast-iron pipe, 15 in. in diameter, reducing to 12 in. and 9 in. in diameter, which encircle the filter-beds. From these pipes, distributing pipes, 4 in. and 3 in. in diameter, are laid in lines at intervals of 8 ft. across the bed, and "fixed sprays" are fitted on these pipes at 9 ft. distances apart. The sprays are of two types, one made by Messrs. Jones & Attwood, of Stourbridge, and the other made by Messrs. Stone & Co., of Deptford, and patented by Mr. Carpenter, the engineer and manager of the works. The filters are composed of refuse destructor clinker, broken to a gauge of 2 in. to ¼ in., one filter being 6 ft. deep and one 4 ft. 9 in. deep. The dry-weather sewage is applied at the rate of 162 gallons per cubic yard per day.

A contact bed, 1 acre in extent, 3ft. deep, the medium being broken clinker, is provided to purify the supernatant water drawn off from the quiescent tanks. The bed is only filled twice a day, the tide preventing the use of this bed in three cycles of eight hours each per day. The effluent from these beds flows through a humus basin 1 acre in area. It enters at one corner, and flows by a circuitous route over four weirs to a pipe discharging into the main effluent drain. The object of the humus basin is to allow any suspended matter in the filtered effluent to settle, and at the same time to aerate same as much as possible. The main effluent drain, 4 ft. in diameter, discharges into the tidal river Roding at low water level. The sludge from the precipitation tanks is swept out by means of squeegees through 12-in. valves into a sludge conduit, and thence to a pump well, whence it is pumped by two Tangyes' horizontal direct-acting pumps into a timber trough, along which it flows at a gradient of 1 in 90 to a lagoon, formed with banks of house refuse on the marsh.

The quantity of sludge pumped is about 1,050 tons weekly. The above sludge covers an area of about 1 acre 7 ft. deep per annum. The total area of the works is about 56 acres, of which 18 acres are still available for the disposal of the sludge.

*Refuse Destructor.*—The refuse destructor adjoins the sewage disposal works, and contains two units of three cells each, Meldrum's "Simplex" front-feed destructor. Forced draught (hot air) is supplied from two regenerators, each of 264 tubes, and 1,100 sq. ft. of heating surface. The grate area of each unit is 80 sq. ft. Attached to one unit is a Lancashire boiler, 30 ft. long by 8 ft. 6 in. diameter, with 1,100 sq. ft. of heating surface. To the second is attached a Babcock & Wilcox water tube-boiler, 2,255 sq. ft. of heating surface. An auxiliary grate is fitted to the Babcock & Wilcox boiler, thus enabling coal to be burned if the refuse is very wet or too poor in quality to generate the steam required for the works. The units are worked alternately, one working while the other is being cleaned, thus giving a continuous working of 168 hours per week.

The weight of refuse daily destroyed is from 50 to 60 tons, the average weight of the refuse in summer being 6 cwt. per cube yard and in winter 9½ cwt. per cube yard. The present chimney shaft is 100 ft. high, and a new one is being erected 8 ft. internal diameter and 150 ft. high.

| CAPITAL COST OF WORKS. | £ |
|---|---|
| Tanks and original buildings ... ... | 21,000 |
| Alterations to same ... ... ... | 2,000 |
| Destructor, two units of three cells each, boiler plant, approach roads and foundation work ... ... ... ... ... | 12,500 |
| Outfall to river Roding ... ... ... | 5,000 |
| Filters (2 acres) complete ... ... ... | 7,000 |
| New pumping plant, deep well, screening gear, &c. ... ... ... ... | 12,000 |
| Humus basin and contact bed ... ... | 4,000 |

*Number of Men Employed.*—The number of men employed is thirty-six—*viz.*:—

(*a*) On sewage pumping and purification: One manager, three shift engineers, three engine drivers, one fitter, three chemical mixers, one sludge pump man, three tank men.

(*b*) On destructor staff, working in three relays of eight hours each: Six stokers, six trimmers, one cleaner, two carmen.

(*c*) Miscellaneous duty: Six general labourers.

Total weekly wages amount to approximately £70.

Annual working cost, £6,975, made up as follows:—

| | Totals. | Whereof for: | | |
|---|---|---|---|---|
| | | Destructor. | Pumping. | Sewage purification. |
| | £ | £ | £ | £ |
| Wages ... ... ... | 3,650 | 1,507 | 1,402 | 1,141 |
| Cartages ... ... | 300 | 250 | | 50 |
| Buildings and plant (repairs and renewals) ... | 400 | 150 | 100 | 150 |
| Coal and coke ... ... | 400 | — | 300 | 100 |
| Sewage precipitants ... | 1,250 | — | — | 1,250 |
| Stores ... | 300 | 60 | 150 | 90 |
| Rates, taxes, & insurance | 220 | 100 | 50 | 70 |
| Roads and fencing ... | 125 | 60 | 5 | 60 |
| Contingencies ... | 330 | 100 | 100 | 130 |
| | £6,975 | £2,227 | £1,707 | £3,041 |
| Equivalent to rate burden per pound of rateable value, approx. | 3·42d. | 1·09d. | 0·84d. | 1·49d. |

Cost per head of population, inclusive of pumping and refuse cremation, about 1s. per annum.

WORKSHOPS.

Some years ago the council were able to purchase at a very reasonable figure a range of corrugated iron buildings, which were conveniently adapted so as to form ranges of workshops, cart shedding, and stores.

These are erected on land adjacent to the sewage works. A storekeeper's office and weighbridge are provided at the entrance.

CONVENIENCES.

Situate at junction of the main roads are two underground sanitary conveniences, one being in the centre of the borough, the other being at the northern end. The erection of further conveniences in other parts of the borough is now under consideration.

LIGHTING.

The borough is lit both by gas and electricity. The main thoroughfares are lit with arc lamps, and the side streets by electric glow lamps and with incandescent gas lamps.

The gas lamps are fitted with incandescent mantles, burning 2¾, 3¼, 4, and 4½ ft. per hour respectively. The current is supplied from the council's electric generating station, and the gas by the Gas Light and Coke Company, the lighting, extinguishing, cleaning, repairs and maintenance both of gas and electric lamps being undertaken by the council's workmen. The wages of lamplighters are 26s. per week and uniform.

DUST COLLECTION.

This work is carried out under the supervision of the chief sanitary inspector. The corporation owns the dust vans, and employ the dustmen direct, but the horse and driver are contracted for, the amount of the contract for the current year being £2,750. The collection is made once a week, the whole being carted to the refuse destructor.

WORKMEN.

The number of men regularly employed in the engineer's department is about 350, this number including those engaged on scavenging, sewer work, street works, parks, sewage works, and workshops. Each man is allowed Bank Holidays, with pay, and one day annual holiday for each two months' completed service, such holiday not to exceed one week.

SICK PAY.

After twelve months' service each workman is allowed two weeks' full and two weeks' half pay in any one twelve months. The average working hours are forty-eight per week, with a minimum wage of 30s. per week for a man twenty-one years of age. The mechanics are paid the Trades Union rate of wages, and work the hours of labour as laid down by their respective unions.

The author desires to acknowledge the very able and willing assistance rendered by his deputy, Mr. Baker, the chief assistant, Mr. Brook, and the engineering assistant, Mr. Bridgewater, together with the general staff of the department, in the carrying out of the various undertakings of the corporation.

## DISCUSSION OF MR. BIRCH'S PAPER.

Mr. E. Willis (Chiswick) proposed a vote of thanks to Mr. Birch for his paper. It was prepared in a condensed form, and one in which it was most useful to members, except that it required to be amplified in a few instances, possibly for those who were designing special works. He would like also to congratulate the borough of East Ham, with its abnormal development, especially on the general district rate. He noticed the poor rate was not low, to put it mildly, the combined rate amounting to 10s. 1d. in the £. But the general district rate had been kept, considering the development of the town, at a very low rate indeed. That rate was only 3s. 8d. in the £. For an extra metropolitan district, he thought the council and their officers were to be congratulated on the lowness of that rate, bearing in mind the many improvements and the excellent buildings they had to show for it. In connection with the library, they were told that the council were permitted to raise 1½d., instead of the ordinary 1d. rate that most of them had the privilege of raising. Might he ask whether it had been necessary to increase the rate beyond a 1d., and, if so, whether the council had expended to the utmost of their power? He was also surprised to see that was charged on the poor rate. He could not understand that, but perhaps it might be explained by Mr. Birch. Might he also ask the cost of administering fire protection throughout the borough? From the map the district appeared to be very elongated, and he did not know whether the ordinary equipment of horse haulage was the best for a great length of district, and whether motor traction would not be more efficient from the speed with which they could get to the building on fire. It was very desirable to know the cost of this particular work. The cost of the open-air swimming bath appeared to be somewhat high, unless there was something special in the work. He knew another case in which the area of the bath was three times as great, and the cost was not half as much. It might be that there were some special points about the bath which accounted for that; it might be that it was made by direct labour. He was looking forward to visiting the hospital. They had all met the medical officer, they knew how enthusiastic he was, and how he was striving to make East Ham prominent in public health and hospital administration. He did not know whether there was more than one block designed by Mr. Campbell which was registered. Then with reference to the sewage disposal works, he thought the institution, as well as East Ham, was to be congratulated on having their old friend and past-president Mr. Chas. Jones with them. Mr. Jones had been connected with many sewage and other works in various parts of the country, and he was, in conjunction with Mr. Savage, the pioneer of these works. It proved the excellence of these works that they coped with a population of 100,000 before they were enlarged. There was one thing he could not quite find out, and that was the daily flow per head. It seemed to him that if these works coped with a population of 100,000 the flow could not be very heavy. They recognised that East Ham was a dormitory for London, and probably the flow was small. He regarded the analysis of the sewage not as ideal, but as the ordinary standard.

Mr. Reginald Brown (Southall-Norwood) said he had great pleasure in associating himself with the vote of thanks to Mr. Birch. It was said that a paper was of no use without practical accomplishments: there was no doubt the paper was full of records of accomplishments from beginning to end. They had the statement showing the growth of East Ham and the tremendous amount of work done by the officials. One point upon which he would like some further information was fire protection. He would like to know what method was adopted in the borough to communicate with the firemen under the control of the council, whether the men were housed in a separate building, or whether they lived in various parts of the district, because in many districts it was difficult to communicate with the brigade, especially as in East Ham the horses were hired. As to the open-air swimming bath, he did not think that £1,200 was an excessive outlay on that. It was certainly a number of years since the bath was constructed: he believed it was in 1902: and nowadays such a bath would cost considerably more, the many Acts of Parliament of recent years being responsible for the increase. He would like to know whether in connection with that bath ordinary construction or the ferro-concrete system had been adopted, because £1,200 seemed a very reasonable amount indeed to spend on a bath of that kind. The information with regard to highway maintenance was extremely interesting, but East Ham was in the position of being on the extreme east of the extra-metropolitan district, and it would be very advisable—he might almost say essential—that there should be a better means of communication between the North and South sides of the Thames. At the present time there was a scheme on hand as to the east end of the district in connection with the docks, and if the corporation could see their way clear to approach the dock authorities to get a connection between East Ham and Greenwich, it would prove of benefit not only to East Ham, but to London generally. In his view it was a short-sighted policy when the Greenwich subway was constructed to have done more than provide for foot passengers, and so dispense with the necessity for the free ferry. The results shown in respect of the sewage disposal works were admirable. The ideal standard referred to by Mr. Willis was a very good one indeed. It was not quite what one would get in some works, but if every authority were able to arrive at that standard there would be no reason for complaint, because the river Roding, into which the effluent was discharged, was not a very large one, and was largely composed of sewage effluent from East Ham and other districts. He noticed the river in question was not one with a tremendous flow, and if the authorities of East Ham sent a satisfactory effluent into it they were to be congratulated. He wished in conclusion to associate himself with Mr. Willis in his expression of pleasure at seeing among them that day Mr. Charles Jones, who was not only a past-president, but a friend of every municipal engineer, and one for whom they all entertained feelings of the highest regard.

Mr. W. LAURENCE BRADLEY (Tonbridge) agreed that the paper was a most interesting one. In connection with the fire brigade, it might be interesting to the members to know the pressure in the mains of the system. The district was a fairly flat one, and the question of motor traction might not apply, for there might be sufficient pressure in the mains to enable them to do without a steamer. The cost of the open-air swimming bath seemed rather high, but it was difficult before one had seen it to express an opinion. Another point in that connection was whether anything had to be paid for water; also how the water was obtained, and whether it was pumped in and out. There might be a reason for the apparently excessive cost of the bath.

Mr. C. A. JAMES (Grays), dealing with the question of roads, said he would like to know how Roadoleum and Glutrin stood during the winter months. He presumed, with regard to the cost of private streets, that that did not include the cost of the kerb and the surface-water drainage, which would have been put in before by the owners. With reference to refuse collection, would Mr. Birch state the cost per house per annum of that work?

Mr. E. H. JAMES ESSEX (Leyton) said Mr. Birch was a surveyor who had endeared himself to those in his immediate vicinity by his willingness at all times to give every possible information. As regarded rates, the general district rate was 3s. 8d. and the poor rate 6s. 5d. in the £. At Leyton the general district rate was 3s. 3d. and the poor rate 5s. 8d. It was a shocking state of things that the poor rate should be so high. Mr. Birch would be able to explain that the education rate was very heavy in that part of the country. When they knew that the general district rate at Leyton was 3s. 3d. in the £, Mr. Birch could see before himself a large field for reduction. With reference to fire protection, he had looked into the question of motor-propelled vehicles instead of horsed vehicles, and it showed a very great saving in motor-propelled vehicles as compared with horse-drawn vehicles in that particular vicinity. With regard to the street watering, he would like Mr. Birch to look into this carefully, and let him have the number of loads of water per van. He suggested that the loads per van should be twenty-four, and the loads used per mile should be four, with roads of 40-ft. width. They were told that the cartage of road sweepings and slop was carried out by contract, and cost approximately £1,550 per annum. He would like to know the number of loads of slop and the cost of this per annum. Then they were told that the drainage of the district was partly on the separate system, the surface water flowing to the watercourses and the sewage to the council's own works and pumping station. The word "partly" was a word they could all think about. Did Mr. Birch mean that only the front roofs were drained into the surface-water drains, or in some parts of his district were both the front and back roofs drained separately from the sewers? The attempt to drain back premises separately was a mistake. With reference to the work carried out by "distress labour" at the sewage works, he said that labour was at times a distress to those who had to labour, but he thought in this particular case the distress fell upon the poor unfortunate individual who had to supervise it.

Mr. H. CUBITT (London) said that under the head of fire protection he thought the question of fire prevention came in, and although he understood that East Ham was now happily called a dormitory of London, this was hardly likely to be the case in ten, fifteen, or twenty years' time. There was a tendency for the manufacturing businesses to move out from London, and it was reasonable to suppose that there would in that time be a number of manufacturing and trading premises in that district. In London itself the fire prevention precautions were not confined to carrying party walls through the roofs of buildings, but there was also a requirement that all businesses carrying on manufactures were to be cut off into partial divisions. He believed the only other town where such a provision applied was Glasgow. He thought the reason why for fifteen years there had not been a big fire in London was that the big buildings in which such fires started, were cut up into divisions. Mr. Birch might be well advised to get his council to consider the desirableness of putting in some provision requiring these very big buildings to be subdivided. He thought it was quite possible that in the course of time East Ham might be in the County of London, and also subdivision would apply. It was only fair, he thought, to look a little ahead and see if the buildings which were put up in that district could not be brought into line with London. East Ham was as much part of London as other parts in the county, and more thickly populated than Eltham and Roehampton, and it was more reasonable for this regulation to apply in East Ham than in one-fourth part of the county area.

Mr. CHARLES JONES (Ealing), who was accorded a hearty reception on rising, said the meeting would not expect him to offer any critical remarks on the paper. He had been deeply interested in what he had seen that morning, and he could not but congratulate Mr. Birch and such members of the council as were there present upon the very satisfactory condition of affairs that existed in East Ham. There were very few there probably who realised that as thoroughly as he did. They had seen what had been said about him in the paper, for it was his privilege to be associated with his friend Mr. Savage in laying down the first system of drainage in East Ham. That was in the year 1884, he believed, and the works were handed over about 1886 or 1887, and it was a source of gratification to come into a district nearly thirty years later to find it still in successful operation, with probably only an extension of the principle laid down to meet the requirements of a population which had increased from 16,000 to 100,000. When he visited the borough recently, on the occasion of Mr. Campbell's departure for Edinburgh, he was astonished at the changes which had taken place. The splendid collection of buildings, of which their magnificent town hall was a central feature, was alone, added Mr. Jones, sufficient to indicate the progress which had been made.

The PRESIDENT put the vote of thanks, which was carried with acclamation.

Mr. BIRCH acknowledged the compliment, and, in replying, first dealt with the point as to the cost of the open-air swimming bath. When that bath was constructed by Mr. Campbell it was thought they might have a roof placed on the walls, and the latter were accordingly made of sufficient strength to allow for that. The only design registered by Mr. Campbell in connection with the isolation hospital was the cubicle block, the advantage of which was that, by means of an observation window in the observation block, the nurses were enabled to see the whole of the patients in the other block without going out of doors. The dry-weather flow of sewage was 3,250,000 gallons, or about 27 gallons per head per day. Motor traction with regard to fire administration had been considered by the council, but no decision had been arrived at as to whether they would adopt it, and the fire superintendent did not yet see the need of it. The horses were kept alongside the fire station, so that they were available at a moment's notice, and the firemen lived in houses within a stone's throw of the station, with which they were connected by means of electrical call bells, and the engine was able to leave in two minutes from the time a call was received. So he did not think there was much time lost in getting to a fire. Undoubtedly the means of communication between the two sides of the river, referred to by Mr. Brown, required careful watching; the council were quite alive to that, and had already considered the matter. He could not give the pressure in the water mains, but they found in most instances when they had to deal with a fire that there was no necessity to use the engine, the pressure from the hydrants being sufficient to deal with any conflagration. Only in very extreme cases was it necessary to use the fire engine. Of course, the pressure during the night was greater than during the day. The water in the open-air bath was changed twice a week. There was a considerable amount of vegetable growth, and if the water stood longer than a week the growth began to show itself. He has used both Roadoleum and Glutrin. The first-named material had been laid on the road in front of the town hall. He had used Glutrin with ordinary pit ballast, and the cost worked out at 4d. per super. yard more than the ordinary water-bound road, and he was anxiously trying to find whether the results repaid the extra expenditure. It would not make a dustless road, but undoubtedly saved watering, and gave a nice finish to the road. The road had only been down a few months, and they were waiting to see how it wore. He was glad to hear Mr. Essex give the figures as to the loads and work of the water vans. There had been a number of devices to check the loads, which was always a difficulty, but they were obliged to trust to the honesty of the carmen, unless they could have someone continually following the

vans to see what number of loads of water were put on the roads. The labour referred to by Mr. Essex was supplied by the Distress Committee; the men worked as well as they could, but he did not want them on his sewage works again.

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In the course of the morning the members made an inspection of the town hall, public baths, library and mortuary, and were conducted over the electric power station and car sheds. Following the discussion of Mr. Birch's paper, they were afforded the opportunity of examining the sectional wood-block paving laid in Barking-road, and drove thence to the Manor Park and Plashet Park libraries, proceeding afterwards to Central Park and inspecting the open-air swimming bath and En-Tout-Cas tennis courts. Finally, visits were paid to the isolation hospital and sewage works, and on the return to the town hall the members were entertained to tea by Mr. Birch.

## SCOTTISH MEETING AT STIRLING.—*(Conclusion.)*

Following the proceedings reported in last week's issue, the following paper was considered at the recent Scottish District meeting of the Institution of Municipal and County Engineers at Stirling:—

### TREATED ROADS LAID DOWN IN THE CENTRAL DISTRICT, STIRLINGSHIRE, UNDER THE GRANT FROM THE DEVELOPMENT AND ROAD IMPROVEMENT FUNDS ACT, 1909, DURING THE YEAR ENDING MAY 15, 1912.

By D. R. Cox,
County Road Surveyor, Stirlingshire.

The Imperial Road Board made a grant to the county of Stirling of the sum of £4,000, and of this the sum allocated to the Central District amounted to £2,000.

The District Committee decided to first treat those portions of the roads which carried the greatest amount of traffic, and submitted a scheme to the Road Board which involved the expenditure of £2,532, in addition to the amount of the grant—making a total of £4,532.

The roads, lengths, areas, materials and cost were as tabulated hereunder:—

| Name of road. | Materials. | Length. | | | Area square yards. | Sum per superficial yard received from Road Board. | Amount of grant received from Road Board. | Total estimated cost of work. |
|---|---|---|---|---|---|---|---|---|
| | | Miles. | Fur. | Yards. | | | £ s. d. | £ s. d. |
| Bridge of Allan ... ... | Rocmac | 1 | 5 | 46 | 20,342 | 6d. | 508 11 0 | 1,059 9 7 |
| Stirling—Edinburgh .. | Rocmac | 0 | 7 | 68 | 13,063 | 6d. | 326 11 6 | 734 15 10 |
| Stirling—Edinburgh .. | Tar-macadam | 0 | 4 | 88 | 9,841 | 2¾d. (metal)<br>4½d. (tar) | 276 15 6 | 553 11 1 |
| Stirling—Glasgow .. | Rocmac | 0 | 7 | 260 | 16,140 | 6d. | 403 10 0 | 1,040 5 0 |
| Stirling—Glasgow ... | Tar-macadam | 0 | 6 | 198 | 13,591 | 2.d. metal<br>4½d. (tar) | 403 9 7 | 744 14 8 |
| | | | | | | Tarring plant | 82 0 0 | 300 0 0 |
| | | | | | | Extra supervision | — | 100 0 0 |
| | | 5 | 0 | 0 | 72,977 | | £2,000 17 7 | £4,532 16 2 |

The Road Board approved of the scheme, and the work was commenced on May 25th of last year and carried on continuously until November 6th, when the work was stopped until the spring, fully 4 miles having been completed. The remainder of the work was commenced upon April 15th of this year, and the whole of the work was completed at the end of May last.

ROCMAC.

In laying this material the work was carried out in the following manner. The matrix in the proportion of ½ cub. yd. of crushed limestone to 5 gallons of Rocmac solution, with an addition of a similar proportion of water, was placed upon a mixing board sufficiently large to admit of its being turned over three times in a similar manner to that of mixing concrete. It was then spread evenly upon the road to a depth varying from 1 in. to 2 in., according to the thickness of coat of metal to be afterwards applied.

The area covered by each portion or batch was from 8 to 10 super. yds.

The metal was then spread over the matrix and rolled until the matrix came to the surface. All superfluous material was then swept off and the road left hard and clean. The traffic was kept off the treated road for a period of approximately twenty-four hours after completion.

After periods varying from two to twelve months, the portions of roads treated with Rocmac are in very fair condition, with the exception of a small portion of the Edinburgh-road, which has shown signs of giving way. Though the traffic upon this road is heavy, and includes motor-'bus traffic, the fact that only a small portion of the total length of treated road has given way suggests that the explanation is to be found in some local conditions, such as a defective foundation, rather than in the nature of the traffic which would affect the whole road equally. It is possible, however, that the extra rolling involved has accentuated this weakness.

The limestone used was procured from English, Irish, Welsh and Scotch quarries. The greater quantity used was Welsh, but the others were found quite satisfactory.

TAR-MACADAM.

The metal was mixed with tar at the quarry in the following manner—*viz.*:—

The metal was taken from the breaker and fed into the mixer without being heated in any way, the tar being fed into the mixer by a pipe from the tar boiler. The average quantity of tar used to each ton of metal was from 7 to 8 gallons.

The tar mixer was made by a local firm, and its cost was £75. The average quantity of metal coated with tar each day was from 50 to 60 tons. The tar used was purchased from three different firms, and was in conformity with the Imperial Road Board's Specification.

SPECIFICATION FOR LAYING TAR-MACADAM.

As the surface of the portions of roads was inclined to be flat, a coat of clean metal, from 2 in. to 3 in. deep, was laid and rolled in the usual way prior to the tar-macadam being put down. An average depth of 4 in. of tarred metal was then laid and thoroughly rolled. The author considered that a coat of metal mixed with tar, 4 in. thick, and thoroughly consolidated, would considerably strengthen the road and make it more impervious to moisture, and wear longer than a road treated by "grouting" or other such process. On one section of road a finishing coat of ½-in. size of tarred whinstone chips about ½-in. deep was laid and rolled until a perfectly smooth and uniform surface was obtained.

On the other sections of road treated with tarred metal no finishing coat of tarred chips was put on, the surface being simply tar-sprayed.

The author is of the opinion that, although it gives an improved appearance, and might with advantage be used in populous places, it is not advisable or necessary to surface tarred metal on a country road with fine tarred material. One reason for this is that during frost the surface thus treated is smoother, and it is consequently much more slippery, and must be regularly sanded to prevent accidents, which, on a long stretch of road, is not feasible.

One of the treated roads was laid with metal broken to a uniform size of 2 in., while the remaining portions were laid with metal varying in size from 1½ in. to 2¼ in.

The author found that the best results were obtained where the metal was not of uniform size, a closer bond with smaller stones being the result.

The tar-macadam roads which have been laid down

for about a year are in fair order, with the exception of that portion of the Edinburgh-road in the village of Bannockburn, where the surface of the tarred metal was coated with tarred chips. The surface coating of tarred chips gave way within a few months of the completion of the work. The result was that the whole of the surface required to be scraped off, leaving the roadway in a rather dirty state during the winter. The undercoat stood the winter well, and an excellent surface has now been obtained by tar-spraying.

GENERAL REMARKS.

In view of the importance which the question of an "improved binder" for road surfacing has for all interested in roads at the present time, the author feels it incumbent upon him to state his reasons for recommending his committee to lay down the materials already described.

In this district a great number of the roads are the Roemac dust is reduced. Further, Roemac has propensities which admit of it suiting itself to climatic changes. It is less slippery in frosty weather, and during damp weather the traffic has not the same disintegrating effect as on a tarred road. Other advantages are that it can be laid at all seasons of the year except during hard frost, and that, when once laid, frost has not the same injurious effect upon Roemac as upon other forms of road surface.

With regard to the actual cost of the work, both Roemac and tar-macadam, while certain portions worked out a little more than the estimated cost, other portions were less, and the whole work was carried out within a few pounds of the original estimate.

In the South of England the life of such treated roads is assumed to be seven or eight years. In this district the author has assumed an average life of

SUMMARY OF STATISTICS OF TRAFFIC.

STIRLING AND THE NORTH ROAD, Between Stirling and Bridge of Allan.
*Days on which Traffic was taken.*
14th to 20th August, 1911.
Time each day, 6 a.m. to 10 p.m.
Width of Carriageway, from 18 to 26 ft.
Average width, 21 ft.

STIRLING - GLASGOW-ROAD, Between Stirling and Denny
*Days on which Traffic was taken.*
4th to 10th September, 1911.
Time each day, 6 a.m. to 10 p.m.
Width of Carriageway, from 18 to 26 ft.
Average width, 21 ft.

STIRLING - EDINBURGH-ROAD, Village of Bannockburn.
*Days on which Traffic was taken.*
21st to 27th August, 1911.
Time each day, 6 a.m. to 10 p.m.
Width of Carriageway, from 18 to 26 ft.
Average width, 21 ft.

| Classification of vehicles. | Assumed average weight. | Total in seven days. | | Average number. | | Total weight in tons per yd. width of carriageway. | | Total in seven days. | | Average number. | | Total weight in tons per yard width of carriageway. | | Total in seven days. | | Average number. | | Total weight in tons per yard width of carriageway. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Tons. | No. | Weight in tons. | Per day. | Per hour. | Per day. | Per hour. | No. | Weight in tons. | Per day. | Per hour. | Per day. | Per hour. | No. | Weight in tons. | Per day | Per hour. | Per day. | For hour. |
| Ordinary cycles ... | 0·05 | 7,050 | 634·5 | 1007·1 | 62·9 | 12·9 | 0·8 | 3,330 | 299·7 | 475·7 | 29·7 | 4·7 | 0·3 | 3,312 | 298·0 | 473·1 | 29·5 | 5·3 | 0·3 |
| Motor cycles | 0·13 | 290 | 37·7 | 41·4 | 2·6 | 0·7 | 0·05 | 226 | 29·4 | 32·3 | 2·0 | 0·4 | 0·03 | 90 | 11·7 | 12·8 | 0·8 | 0·2 | 0·01 |
| Motor cars (including motor cabs and any other motor vehicles not specified) | 1·6 | 1,222 | 1955·2 | 174·6 | 10·9 | 37·9 | 2·5 | 470 | 752·0 | 67·1 | 4·2 | 11·9 | 0·7 | 394 | 630·4 | 56·2 | 3·5 | 11·2 | 0·7 |
| Motor vans (covered) | 2·5 | 23 | 57·5 | 3·3 | 0·2 | 1·2 | 0·07 | 17 | 42·5 | 2·4 | 0·1 | 0·7 | 0·04 | 13 | 32·5 | 1·8 | 0·1 | 0·5 | 0·03 |
| Motor omnibuses | 6·0 | 55 | 330·0 | 7·8 | 0·5 | 6·7 | 0·4 | 19 | 114·0 | 2·7 | 0·2 | 1·8 | 0·1 | 361 | 2166·0 | 51·5 | 3·2 | 38·6 | 2·4 |
| Motor lorries (rubber tyres) | 6·0 | 13 | 78·0 | 1·8 | 0·1 | 1·6 | 0·1 | 7 | 42·0 | 1·0 | 0·06 | 0·7 | 0·04 | — | — | — | — | — | — |
| Trailers to rubber tyred lorries ... | 5·0 | 1 | 5·0 | 0·1 | 0·01 | 0·1 | 0·01 | — | — | — | — | — | — | — | — | — | — | — | — |
| Motor lorries (steel tyres) | 10·0 | 1 | 10·0 | 0·1 | 0·01 | 0·2 | 0·01 | — | — | — | — | — | — | — | — | — | — | — | — |
| Trailers to steel tyred lorries ... | 5·0 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| Light tractors | 5·0 | — | — | — | — | — | — | 1 | 5·0 | 0·1 | 0·01 | 0·08 | 0·005 | — | — | — | — | — | — |
| Trailers to light tractors . | 5·0 | — | — | — | — | — | — | 1 | 5·0 | 0·1 | 0·01 | 0·08 | 0·005 | — | — | — | — | — | — |
| Traction engines | 12·0 | 13 | 156·0 | 1·8 | 0·1 | 3·2 | 0·2 | 1 | 12·0 | 0·1 | 0·01 | 0·2 | 0·01 | — | — | — | — | — | — |
| Trailers to traction engines | 8·0 | 28 | 224·0 | 4·0 | 0·2 | 4·5 | 0·3 | 1 | 8·0 | 0·1 | 0·01 | 0·1 | 0·01 | 6 | 72·0 | 0·8 | 0·05 | 1·2 | 0·8 |
| | | | | | | | | | | | | | | 15 | 120·0 | 2·1 | 0·01 | 2·1 | 0·1 |
| Total motor vehicles and trailers | — | 1,646 | 2853·4 | 234·9 | 14·62 | 56·1 | 3·94 | 743 | 1009·9 | 105·9 | 6·15 | 15·96 | 0·94 | 879 | 3032·6 | 125·2 | 7·75 | 53·8 | 4·01 |
| Light vehicles (one horse) | 0·4 | 1,306 | 522·4 | 186·5 | 11·6 | 10·6 | 0·6 | 957 | 382·8 | 136·7 | 8·5 | 6·6 | 0·3 | 799 | 319·6 | 114·1 | 7·1 | 5·7 | 0·3 |
| Light vehicles (two or more horses) | 0·6 | 34 | 20·4 | 4·8 | 0·3 | 0·4 | 0·02 | 40 | 24·0 | 5·7 | 0·3 | 0·3 | 0·02 | 16 | 9·6 | 2·3 | 0·1 | 0·1 | 0·01 |
| Heavy vehicles (one horse) | 1·25 | 594 | 742·5 | 84·9 | 5·3 | 15·1 | 0·9 | 957 | 1196·2 | 136·7 | 8·5 | 18·9 | 1·1 | 582 | 727·5 | 83·0 | 5·1 | 12·9 | 0·8 |
| Heavy vehicles (two or more horses) | 2·5 | 114 | 285·0 | 16·3 | 1·0 | 5·8 | 0·3 | 20 | 50·0 | 2·8 | 0·17 | 0·79 | 0·04 | 105 | 262·5 | 15·1 | 0·9 | 4·6 | 0·2 |
| Omnibuses (two or more horses) ... ... | 3·0 | — | — | — | — | — | — | — | — | — | — | — | — | 4 | 12·0 | 0·5 | 0·3 | 0·2 | 0·01 |
| Total horse-drawn vehicles | — | 2,048 | 1570·3 | 292·4 | 18·2 | 32·0 | 1·82 | 1,974 | 1653·0 | 281·9 | 17·47 | 26·59 | 1·46 | 1,506 | 1331·2 | 215·0 | 13·23 | 23·5 | 1·32 |
| Tramcars (horse)† ... | — | 521 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| Horses (led or ridden) ... | 0·5 | 94 | 47·0 | 13·4 | 0·8 | 0·9 | 0·05 | 24 | 12·0 | 3·4 | 0·2 | 0·19 | 0·01 | 25 | 12·5 | 3·5 | 0·2 | 0·2 | 0·01 |
| Cattle ... ... | 3·0 | 1,021 | 3063 | 145·8 | 9·1 | 6·2 | 0·4 | 74 | 222·0 | 10·5 | 0·68 | 0·35 | 0·02 | 25 | 75 | 3·5 | 0·2 | 0·1 | 0·01 |
| Sheep and pigs | 0·1 | 4,559 | 455·9 | 651·2 | 40·7 | 9·3 | 0·6 | 239 | 23·9 | 34·14 | 2·13 | 0·37 | 0·02 | 999 | 99·9 | 142·8 | 8·1 | 1·6 | 0·1 |
| Hand carts and barrows ... | — | 112 | — | 16·0 | 1·0 | — | — | 185 | — | 26·5 | 1·66 | — | — | 18 | — | 2·5 | 0·1 | — | — |
| Horses drawing vehicles (to be calculated from number of vehicles | 0·5 | 2,196 | 1098·0 | 313·7 | 19·6 | 22·4 | 1·4 | 2,034 | 1017·0 | 145·28 | 9·08 | 16·14 | 1·0 | 1,623 | 811·5 | 231·8 | 14·4 | 14·4 | 0·9 |
| Grand total ... ... | — | 19,247 | 9965·4 | 2674·5 | 166·92 | 139·8 | 8·71 | 8,604 | 4037·7 | 1083·32 | 67·05 | 64·30 | 3·75 | 8,297 | 5584·2 | 1184·4 | 73·40 | 98·9 | 6·68 |

laid upon a clay subsoil. Further, the drainage is far from perfect. The result is that, after a heavy fall of rain in summer and it might be said for three or four months of the year during the winter—the roads are never dry. The author's experience has been that under these conditions and with any considerable volume of traffic, tar in any form soon gives out. After careful consideration he came to the conclusion that Roemac, though not perhaps ideal in every way, was best suited to the prevailing local conditions.

After a year's experience of this material, the author sees no reason to alter his views. In comparison with a bituminous binding, it is not, under certain conditions, so dusthss; it makes a harder and less yielding road, it takes longer to lay, and is a little more expensive. Its advantages are: The dust is not so obnoxious as from tar, and after a few months, when the superfluous limestone has been washed off, five years. Certain portions will have a shorter life and others longer, and although still only an estimate, he sees no reason to alter his original estimate of an average life of five years.

Much might be said with regard to the economic aspect of such road improvements, but the paper is confined to the subject allotted to the author, and is concluded by certain summaries of statistics of traffic taken in August and September, 1911, to enable members to compare the results of the work already done on the different roads. It will be observed from these tables that certain classes of traffic are greater on one road than on another, such, for example, as the large proportion of motor-'bus traffic on Edinburgh-road and the large proportion of ordinary motor and cycle traffic on the North-road, but a sufficient interval has not yet elapsed to admit of apportioning the tear and wear according to the class of traffic.

## DISCUSSION OF MR. COX'S PAPER.

Mr. DRUMMOND moved a vote of thanks to Mr. Cox, whom he congratulated on his paper. He had seen the work when it was being put down and on several occasions since, and he must congratulate him on the way it was done and the way it was wearing. He was sure all the members would be satisfied when they saw the roads with Mr. Cox's efforts to improve the roads of Stirlingshire.

Mr. ORGELL said it would be a great advantage if those having experience of tar-macadam and Rocmac would draw conclusions as to the relative merits of the two systems.

Mr. R. H. DORMAN (Armagh), who seconded, said the one thing which struck him in the two papers was that the Road Board refused a contribution towards Rocmac for the town of Stirling, whereas they contributed towards it on the main roads in Stirlingshire. Mr. Cox gave 1s. 3d., or rather less, as the cost of Rocmac. That seemed a very small figure indeed. In making an estimate of the price of Rocmac if used as a binder, he estimated that it would cost 10d. per yard super. He did not know how he had been able to surface his road at 1s. 3d. He presumed that the stone could be got very cheaply. With regard to the tarring plant, he saw the Road Board contributed £82 towards that. He took it that the plant, which cost £300, would be permanent, and although the Road Board only contributed £82, that it would be used for many years in the county. He would like Mr. Cox to give them the exact figures for Rocmac and tar-macadam. In his county of Armagh he found the extra cost of treating stone with tar came to about 3s. per ton, and he had calculated that Rocmac would cost something like 7s. per ton. At the same time he was very anxious to lay down Rocmac. As far as he could learn, it was an excellent material to form a binder for rural roads. He would like to know when they spread a coat of Rocmac 4 in. thick what it would roll down to, whether it would roll down much or only consolidate to a small extent as Tarmac or loose metal would do. As to the specification for Tarmac, he noticed Mr. Cox objected to putting a fine coat of tar on the top surface. He agreed with him, although many members might not. When they put down this fine metal and spread a thin veneer of tar on the surface, as they did in Kent, he did not think it was suitable in a district where they had young horses and cattle on the roads; half the cattle would be going on their knees to the fair. In laying down tar-macadam and fluxing it afterwards there were a great many interstices left which they had to fill up with tar or small stone, but he would not like to have a veneer on the top. He liked to see every stone showing on the surface.

Mr. R. S. ANDERSON (Peebles) said he would like to have seen a table of prices per square yard for Rocmac and tar-macadam. As far as he could calculate it the tar-macadam came out at 1s. 0½d. per square yard, which seemed a very small price. It was clear that Mr. Cox must obtain his metal at a very low price per ton. He laid down a stretch of Rocmac a year ago, which cost him 1s. 1d. per square yard; but that was with metal at 2s. 6d. per ton. So Mr. Cox's figure was ½d. per square yard less than he was able to do it. The Road Board was up against giving a grant for Rocmac. He thought if surveyors found it the best method of road making they should insist upon having a grant for it. He might mention the Road Board were through his district again the other day. They said if he could show so good a surface with tar-spraying they did not need Tarmac or Rocmac, but if the road was going to last three or four times as long, it was a saving. The Rocmac he had was in a better condition now than the day it was laid down. He was not in the happy position of Mr. Cox of knowing the traffic where the road was being made. If a tar-macadam was laid it was without any tar-spraying over it at all, with the result that there were no appearances to be found in the worst months. If they put a coating of tar on the surface in the autumn how they were going to manage in times of frost.

Mr. J. ANDREWS (Helensburgh) said that about three years ago he had an experimental stretch of Rocmac, and to-day it was in as good or better condition than when it was laid down. It was put down on the Gladwell system, and a good deal of rolling was required to bring it up. The next stretch was put down on the cement system; there was less punishing of the metal, and the result was quite as good. Having found that was so satisfactory all the Rocmac he had laid since had been on the cement system, and the result was as good as the Gladwell system. Rocmac was not absolutely dustless, and he did not think any system could be; because if a road was dustless it was obvious that dust was brought on to it. Where it was possible they closed a street during the work, or rather they had half the street closed for a time, and allowed the traffic to go over the other part. Like Mr. Anderson, he had put down Rocmac and allowed the traffic to go over it. There was one thing about it, that the work could be done in all kinds of weather with equally good results. The average cost in his case had been from 7d. to 10d. per yard over the ordinary cost of a macadam road. No matter how thick it was laid, it could be rolled equally well. He had put it down as deep as 9 in. when altering the level of a street, and it rolled equally well.

Mr. A. FORBES (Dunfermline) spoke of his interest in the statistics of traffic. He wished those who were collecting statistics would say something as to the character of the traffic. Some of these roads might not require renewing for ten or fifteen years. Mr. Cox's traffic was nearly 9 tons per yard width, but with some of the roads Mr. Anderson had referred to it was very much less than that. The paper also showed the motor-propelled traffic. There was 40 to 50 per cent of self-propelled traffic, which showed the necessity of having some stronger wearing material on the roads.

Mr. D. RONALD (Falkirk) said this was an important point raised by Mr. Forbes. There was one factor wanting, that was the weather, or rather the climate of the district in which the roads were made. It was not always the amount of traffic on the road, they must also take into consideration the temperature, the rainfall, and all the other factors which had a bearing on the life of the road. They could never say that the same class of road would do for the South of England as for the North of England, or for the East of Scotland, with a rainfall of 25 in., and the West of Scotland, with 100 in. of rain. Weather and climate must be considered along with traffic, and if that was done a very great advance would be made in the system of road making.

Another member said he came from the West of Scotland, where they had from 70 in. to 80 in. of rain per annum. When their Rocmac work was being carried out the greatest rainfall was 1·23 in., and the lowest rainfall ·02. The rainfall had not the slightest effect on the work, and he defied any man to tell the difference between that laid on the wet days and that laid on the dry days. The road was laid to the pier, where all the traffic went, and to-day, more than a year after the work had been done, there was not the slightest sign of wear and tear on the road. The cost was a few pence more than a water-bound road. They paid 5s. 2d. to 5s. 6d. per ton for their metal, and the cost had worked out, including scarifying the old road, at 1s. 6d. per yard. In a district with so much rain it would not be possible for them to use tar. The committee were considering the use of Rocmac for the strengthening of all the roads. With regard to the question which had been raised as to the refusal of the Road Board to give a grant, they made a claim last year, and it was ignored, but since then representations had again been made, and they were hoping next year they would be more fortunate.

Mr. A. STEVENSON (Ayr) said with reference to these experiments, that so far as Scotland was concerned they were in a purely experimental stage, and he took the liberty of having a discussion with Mr. Walker Smith at the Local Government Board offices, and also communicated with the Road Board as to the idea of having a considerable number of experimental stretches of road conducted by the Road Board on thoroughly scientific lines, so that the information obtained might be of value to the county councils in Scotland as to what was the proper material to work with. Sir George Gibb, in discussing the question, did not think it was necessary in Scotland to have more than two experimental stretches, one in the east and one in the west. He thought in the north there should be an experimental stretch in Elgin and Nairn, where they had one of the mildest of climates, in Argyleshire, where they had one of the wettest, and also in Lanarkshire; they had different conditions in every one of those counties. He thought if the Road Board were to make these experiments in all parts of the county in that way they would arrive at some proper data to work upon. But it was no use going on as they were doing now, of having 100 yds. here and another 100 yds. somewhere else. He

had carried out some small experiments, and his experience of Rocmac was that it was an excellent material as a binder. His experiments worked out at 9d. and a fraction per yard. The cost depended entirely upon the locality. He thought if an expression of opinion were made by that meeting it would strengthen the possibility of getting experiments made all over Scotland.

Mr. HOGG (Midlothian) said that two years ago in Midlothian a considerable stretch of the main road between Glasgow and Edinburgh was laid with Rocmac, and he was able to agree as to the conduct of the material. The climate there was very dry. The continuous sections of the road were laid with macadam, one surface-tarred and the other pitch-grouted, so the three materials were used on a continuous road. This was a road with much heavier traffic than Mr. Cox's roads. In the first year it required no treatment in the winter at all, and it was one of the best roads he had ever made as to surface and contour. When the summer came they objected to it as not being dustless, and a petition was got up to have the road tar-sprayed. He pleaded with them to give it another year's trial. It was still good, but they insisted on it's being tar-sprayed this year. Rocmac had thoroughly justified itself as a binder, but with heavy traffic it was far from dustless. He could back up what Mr. Anderson said of Peebles. He was there two days ago with the Road Board, and a finer section of road he had never seen. But the weather was wet, and the road shaded with trees. With these conditions he did not know a better road material. But at Glasgow it was far from dustless. No doubt the material could be regarded as the best material for a damp climate, but it would not do on the East Coast. Mr. Cox seemed to be against pitch-grouting. On the main road from Edinburgh he had fixed his mind on pitch-grouting as the best road material for all kinds of traffic, and the county council so far had backed him up. He did not know whether they would get two years' extra life out of it, but if they did the thing would pay. They had done 50 miles this year. He agreed with Mr. Cox that near any city, or where the traffic was very heavy, so far as he had been able to judge, tar-macadam would not stand. A tarred road with a fine surface dressing he thought was a thing of the past. The pitch-grouting had been better than Rocmac, but it was not altogether dustless. He still held, however, that it was the best road for all traffic until the horse entirely disappeared. Mr. Cox had not dealt with surface painting at all, but in conversation with the Road Board the other day Sir Geo. Gibb favoured it, and pointed out the small cost at which road metal could be obtained in Scotland. Under those circumstances, when they could get a water-bound surface renewed at 9d. per yard, Sir Geo. Gibb was of opinion that the treatment for country roads, except where the traffic was heavy, was surface tarring, and not going to the expense of tar-macadam or pitch-grouting.

The vote of thanks having been passed

Mr. Cox, in reply, said in answer to Mr. Dorman that the low price of Rocmac was entirely due to the low cost of the metal. All the roads treated were within a mile and a half of their own quarry, so it made the cost of the metal about 2s. 6d. per ton, while the Rocmac worked out at about 7d. per yard. Mr. Dorman asked how it rolled down—about the same as macadam. He was laying tar-macadam, and the stone he was using ranged from ¾-in. to 2¼-in. in size. He had the honour, like Mr. Hogg and Mr. Anderson, of a visit from the Road Board on Tuesday, and they took decided objection to the size of the stone he was using. In fact, they said he would have to stop the use of it and use a smaller stone. He must say he did not agree with them, and told them so. He said it was all very good given a road of little or no traffic at all, their ideas were right enough; but given any weight of traffic on the roads he did not agree with them. He told them as they were paying they had the right to say what size of stone should be used, but he hoped they would return in a year's time to see the bit of road he had done, and that portion made to their specification. Mr. Ronald mentioned about comparing the English roads with the Scottish roads as to climate. Now, as a matter of fact, that was what the Road Board had done. They had taken the South of England roads as a sample; and to do that every condition ought to be the same as in the South of England. It was entirely different. On Tuesday, when the Road Board went over his roads, they said they were splendid roads, as nice as they could see anywhere. He pointed out the difference of climate, and that they got more rain in Scotland. He asked Sir George Gibb if they were prepared to give a grant for Rocmac, and he said they were not. He said they were prepared to stand by tar-macadam and nothing else. He would suggest that everyone who had spoken of Rocmac and its good qualities should see that a strong representation was made from their different counties to get a grant for Rocmac.

## ROYAL AGRICULTURAL SHOW AT DONCASTER.

The Phœnix Engineering Company, Limited, of the Phœnix Works, Chard, will be exhibiting at Stand No. 390 (Implement Section) at the above show. The exhibit will include a number of their well-known high-capacity hand pumps, capable of dealing with from 2,000 to 6,000 gallons of water, liquid manure, &c., per hour.

The "Floodgate" pump, which has a 10-in. barrel and 3-in. suction, is good for an output of 3,000 gallons per hour, and its design makes it eminently suitable for dealing with thick liquids on the maximum of lifts. This pump can be fitted to a steel barrow, making a most complete portable hand-pumping appliance.

The "Phœnix" diaphragm pump is fitted with a specially moulded india-rubber diaphragm of large diameter, which gives the pump its large output. This pump is also fitted on to a steel barrow for portability if required.

The "Highland" pump is a lift and force, suitable for 1,200 to 1,500 gallons per hour, and is good for total lifts up to about 60 ft. Mounted on a barrow, it has proved to be a most useful appliance. For country houses it is also most serviceable as a fire pump.

Several pumps will be fitted up under actual working conditions, thus allowing visitors to test the output and prove for themselves the remarkably small amount of energy required for operation.

A tar-spraying machine will be worthy of special notice. This is the outcome of the firm's twenty years' experience as leading manufacturers of road-tarring machinery.

**Shorland's Exhaust Roof Ventilators.** The new schools, Birlingham, are being supplied with Shorland's patent exhaust roof ventilators by Messrs. E. H. Shorland & Brother, Limited, of Failsworth, Manchester.

**Institute of Sanitary Engineers.**—At the Royal Agricultural Hall to-morrow (Saturday), at a meeting of the members of this body, Prof. E. G. Coker, M.I.MECH.E., will deliver a lecture on "Lines of Stresses in Metals." The chair will be taken at 4 p.m. by the president, Mr. A. J. Martin, M.INST.C.E.

**Uckfield Urban District Roads.**—The highway surveyor to the Uckfield (Sussex) Urban District Council, Mr. E. W. Ray Johnson, in the course of his annual report, says: "It gives me pleasure in stating that, although traction and light motor traffic over the highways has considerably increased, a steady improvement is shown in the road surfaces, but even at the present rate of progress it will be many years before the roads are in good condition. The first-class roads have suffered the greatest wear and tear, this being accounted for, to a great extent, through their not being wide enough, in consequence of which the traffic keeps one track up the centre; some of the roads are at present not more than 12 ft. wide, whereas for true economy in upkeep the width ought not to be less than 18 ft." After suggesting the widening by degrees of certain roads to a width of 18 ft., Mr. Johnson proceeds: "I find that by keeping the men to their work, and where necessary employing a better class of man, the whole of the roads can be sided through once in the year, whereas formerly some did not receive attention for at least a period of three years. Providing a roadman takes an interest in the keeping of his roads as well sided as possible, and attends to the keeping clear of all drains and water tables in wet weather, a great saving of macadam can be effected. The old proverb, 'A stitch in time saves nine' has been well proved during the past winter months by a system of patching up holes directly they appear, thus in many cases saving a very much larger area becoming worn, and preventing in time the whole of the surrounding road falling into a mass of potholes."

E.

# Institution of Water Engineers.

## SUMMER GENERAL MEETING AT CHELTENHAM.

Among the papers considered at the recent summer meeting of the Institution of Water Engineers at Cheltenham, was the following:—

### THE HINCKLEY WATERWORKS.

By E. H. Crump, Assoc.M.Inst.C.E.,
Surveyor and Water Engineer.

While appreciating the honour of being invited to contribute a paper, the author fears that a paper which is simply a description of works is neither so acceptable nor so suitable for discussion as one dealing with research work or theory; nevertheless he ventures to believe that the following paper may be interesting to the younger members of the institution who, like himself, have the management and control of the waterworks of small towns, and he hopes to elicit suggestions of improvements both in regard to the carrying out and the administration of waterworks.

In June, 1868, a resolution was carried at a meeting of the Hinckley Local Board to the effect that steps should at once be taken to procure an efficient supply of water for the town, but it was not until August, 1891, or after a period of over twenty-three years, that this resolution was carried into effect. During this period no less than eighteen schemes were considered by the council, of which three were for sinking boreholes, thirteen for utilising springs and brooks, one for taking a supply from the Nuneaton Waterworks Company, and one for securing a supply from Snarestone, as now carried out. Six different consulting engineers were called in to make reports on these schemes, and the boreholes were actually sunk and headings were driven. It therefore can be seen how the twenty-three years were occupied, and the considerable amount of money that must have been spent. It was in April, 1887, that the council first became aware that a supply of water was available in a disused coal shaft at Snarestone, about 14 miles distant from Hinckley. This had been tested by the Leicester Corporation as a probable supply for that town, but had been abandoned by them partly on account of insufficiency of quantity and partly on account of the excessive hardness and the large quantity of total solid matter, including common salt, in the water, especially in that obtained from the lower portion of the shaft.

In September, 1887, Messrs. T. and C. Hawksley advised the board to purchase the shaft at Snarestone, and to obtain an Act of Parliament in connection with the scheme. The board therefore promoted a Bill in Parliament which duly received the Royal Assent as the Hinckley Water Act, in July, 1888. The scheme, to which there was not much opposition, included the purchase of the shaft, the erection of a pumping station over the shaft, the laying of a 12-in. pumping main from Snarestone to Hinckley, a distance of about 14 miles, the construction of a tower for the supply of the higher portion of the town, and of a reservoir for the supply of the low level portion of the town, and the laying of the necessary distributing mains. The Act gave the board power to supply the following parishes, being those in which the works were situate, and through which the pumping main was intended to pass—*viz.*, Snarestone, Swepstone, Market Bosworth, and Stapleton. Under one of the clauses of the Act the inhabitants of the villages of Snarestone, Swepstone, and Newton Burgoland are to be supplied with water for domestic purposes at an amount equal to one half of the water rate for domestic purposes at Hinckley, but unfortunately for these parishes nothing was mentioned as regards the charge for water for other than domestic purposes, consequently this is somewhat high.

After the passing of the Act, tenders were invited for the various parts of the works, and the whole of these were completed in August, 1891, at a total cost of about £45,000.

The water was taken from the shaft at a depth of about 100 ft. from the surface, the yield at this point being over 360,000 gallons per diem. To increase this yield it was also intended to drive lateral adits or headings at a depth of 100 ft. from the surface through the water-bearing stones. As the council were of opinion that this yield (360,000 gallons per diem) was sufficient for some years, the headings were omitted from the scheme, but, nevertheless, the right of driving the headings within a specified time was included in the Act. The total depth of the shaft itself is 534 ft., and at the bottom there is a borehole 3 in. in diameter for a further 312 ft.

On analysis, it was found that the water below the 120 ft. level contained from 17 to 20 grains per gallon of common salt, and therefore it was not intended to pump from below this level, and an oak floor was inserted in the shaft at a distance of 130 ft. from the surface. Careful gauging showed that there was a flow of about 360,000 gallons per diem entering the shaft above this level. The suction pipes of the pumps were taken to a depth of 8 ft. 6 in. below the floor.

#### MACHINERY.

The pumping engines are in duplicate, and the following description applies to each set.

The engine is of the beam type, the steam cylinder being 24 in. in diameter, with a working stroke of 4 ft. At the connecting-rod end of the beam a lift pump 10½ in. diameter by 4 ft. stroke is fitted to draw water from the well at a depth of 130 ft., which is delivered through a launder box into a cistern, and is thence forced into the pumping main by a force pump, 13¾ in. diameter by 2 ft. stroke. The main beam also works the circulating water, boiler-feed and air pumps. The suction pipes of the well pumps are 11 in. in diameter. The nominal horse power of each engine is 30, at a speed of 20 strokes per minute, delivering 15,000 gallons per hour, or 360,000 per diem. The total lift from the floor of the well to the top of the tower is 350 ft.

The pumping station accommodation includes an engine-house, boiler-house, coal store, store-room, &c. A carpenter's shop has recently been added over the store. The boiler-house contains three Cornish boilers, each 24 ft. long by 6 ft. diameter, working at 30 lb. per square inch. The boilers are worked singly, for a period of about forty days each. The water for the boilers is obtained from the canal adjoining. The average amount of nutty slack used is 1 lb. to 76 gallons pumped, the fuel cost working out at 1d. per 2,400 gallons lifted.

The pumping main is about 14 miles long, and is of cast iron pipes, 12 in. diameter, and of varying thicknesses. The following villages are supplied *en route—viz.*: Snarestone, Swepstone, Newton Burgoland, Odstone, Market Bosworth, Cadeby, and Stapleton. On reaching Hinckley, the water is delivered into the bottom of the tower or high level reservoir. When the tower is full the water overflows into the low level covered service reservoir.

The tower is square on plan, and the understructure is of brickwork, the walls varying in thickness from 2 ft. 7½ in. at the base to 2 ft. 3 in. at the bottom of the tank. It is built 4 ft. in the ground on a foundation of cement concrete. The tank is constructed of four tiers of cast-iron flanged side plates, with similar plates in the bottom of the tank; the roof is now formed of steel plates supported on steel joists.

#### SERVICE RESERVOIR.

The covered service reservoir is 100 ft. 6 in. by 78 ft. 9 in. in plan, and 12 ft. deep, having a capacity of 500,000 gallons, and constructed of brickwork in cement. The walls vary in thickness from 2 ft. 3 in. at the base to 1 ft. 10½ in. at the springing of the roof arches, which are 9 in. thick. The whole of the exterior walls are backed with clay puddle, from 2 ft. 9 in. to 1 ft. 6 in. thick; the floor is of brickwork in cement 3 in. thick laid on a bed of sand, 1½ in. thick; under this bed of sand is clay puddle, about 18 in. thick, and under this cement concrete 12 in. thick. The roof arches are covered with sand and soil, the surface being turfed. The reservoir is built half in the ground and half out, the portion out of the ground being banked and turfed.

The question of providing an additional low level reservoir will soon have to be considered by the council, as the total capacity of the tower and the existing reservoir is only about one and a half days' supply, and the author is of opinion that three days' storage should be provided. Sufficient land for this purpose was purchased last year, adjoining the present reservoir.

There are about 11 miles of distributing mains, which vary in diameter from 2 in. to 9 in. The service

pipes to the houses were originally of iron, but a few years ago the council decided that none but lead services were to be fixed, as the majority of leakages detected have been found to be due to the corrosion of underground iron pipes, the renewal of which with lead piping had to be paid for by the council.

CONSUMPTION.

The population at present is about 13,000, and the average daily consumption is about 271,000 gallons, or about 21 gallons per head per diem, which includes 5 gallons per head for trade purposes.

In January, 1905, the author presented a report to the council on the increasing consumption, and was instructed to have a test made of the yield of the shaft at Snarestone. From this test it was found that the yield of the shaft had decreased from 360,000 gallons per diem in 1893 to 295,000 gallons, and was still gradually decreasing. The council immediately took steps to augment the existing supply, and the author tested various supplies at other disused coal shafts in the neighbourhood of Snarestone, also one or two old boreholes which had been sunk as above-mentioned, but none of these schemes were found to be feasible. A supply from the mains of the Leicester Corporation was also considered, but this was rejected by the council, one of the reasons being that this water would have to be lifted into the Hinckley mains by means of an additional pumping station which it would be necessary to instal between Hinckley and Leicester. The author then recommended the Council to proceed with the driving of the headings at Snarestone as originally suggested, and this advice being adopted, Messrs. Hawksley were instructed to prepare plans for the completion of their original scheme, including the construction of a pilot shaft about 80 ft. distant from the existing shaft, so that the work could be carried out without interfering with the latter, the connection of the two shafts by a northern heading, and the driving of two headings, one in a westerly and the other in an easterly direction, each about a quarter of a mile long. The doubling of the capacity of the water tower was also included in the scheme. The total estimated cost was £13,000 for the pilot shaft and headings and £1,000 for the heightening of the water tower. The scheme also included the purchase of 1 acre of land adjoining the pumping station, and easements for the headings. The author acted as resident engineer for both schemes with various assistants.

SHAFTS AND HEADINGS.

The lines or directions of the eastern and western headings of the Snarestone works were, of course, determined by reference to geological maps and reports of this district. The works were started on September 10, 1908. The new pilot shaft is 138 ft. deep, 8 ft. diameter, lined with 9 in. of blue brickwork in cement. All cavities between the brickwork and the rock were filled with cement concrete well rammed in. At a depth of 70 ft. a flow of 50,000 gallons per day issued into the shaft, and it was noticed that the water level in the existing shaft was being slightly affected. At 100 ft. the quantity of water entering the shaft was suddenly increased to 240,000 gallons per diem, and at 102 ft. to 360,000 gallons, and on gauging it was found that the yield of the existing shaft had decreased from 235,000 to 170,000 gallons per day, one of the springs feeding the existing shaft having been apparently tapped in the pilot shaft. It then became necessary to curtail the working hours of the contractors so that sufficient water could be obtained in the existing shaft for the daily supply to the town. As this was found inconvenient, a supply of water was lifted from the pilot shaft into the existing shaft, but this, of course, could only be done when the men were not at work in the pilot shaft. The largest quantity of water issuing into the pilot shaft was met with a depth of 101 ft., at a junction of the sandstone and conglomerate. In this conglomerate the excavation was difficult on account of the presence of pebbles firmly embedded in it. . . . The only method of dislodging this was by means of gelignite and rippite cartridges, thirty of which were required per lineal yard. The work was therefore very slow, and in addition great care had to be exercised to prevent the fouling of the water entering the existing shaft, and much difficulty was experienced by the contractors owing to the grit and sand in the water, which necessitated the rings of their pump buckets having to be renewed several times weekly. At this stage continuous pumping, both by the council's and the contractors' pumps (in the pilot shaft) became necessary in order to keep the water down sufficiently to allow the excavation to proceed. This continued until the northern heading was completed.

When the new shaft and northern heading were completed it was found that the yield of the two shafts was only 450,000 gallons per diem, and it was decided to proceed with the eastern and western headings. This work was carried out very slowly, an average of not more than about 1 yard per day being excavated. . . .

In the eastern heading, at a point 75 yds. from the new shaft, the supply suddenly increased to 700,000 gallons per diem, which remained constant after six weeks' continual pumping. The council therefore decided to cease driving headings, and instructed the contractors to remove their plant. The works were finally completed on February 20, 1910, it having taken about eighteen months to construct a shaft 140 ft. deep and headings 165 yds. long. The cost of this work proved materially less than the estimate of £13,000, mainly owing to the fact that only 165 yds. of headings were actually constructed instead of the 1,030 yds. estimated for.

The water pumped from the pilot shaft was constantly gauged by means of Parkinson's float recording apparatus, in connection with a rectangular notch, 12 in. wide.

The contractors commenced the work with a pulsometer pump, but as this was found insufficient, a pair of Rocker pumps worked by a portable boiler was substituted, lifting about 17 gallons each per stroke. The drilling was performed by hand in the pilot shaft, but a rock drilling machine worked by compressed air had to be used in the headings. One of the chief difficulties in connection with the work was the washing out of the cement in the brick lining by the water entering the shaft while this work was in progress. This was partially overcome by forming channels at the back of the brickwork and building in iron pipes, draining the water through the brick lining and carrying it thence by means of a vertical pipe to the bottom of the shaft.

Another difficulty was the small space available in the pilot shaft, which might with advantage have been 10 ft. diameter instead of 8 ft. With two 12-in. pipes on either side of the shaft, and the bucket lifting the excavated material continually passing up and down the shaft, there was scarcely any room left for the construction of the brick lining.

Another fact which may be of interest to members of the institution when carrying out similar work was that the pilot shaft was too near the existing shaft, and consequently the use of the existing shaft for the supply of the town was interfered with more than was anticipated, and during the later stages of the work continuous pumping had to be carried on at both the shafts.

The whole of the excavated material was deposited around the top of the shaft and levelled down in the acre of ground purchased; for this acre £300 was paid, and the cost per lineal yard of the easements for the headings was £1 1s.

The whole of the northern heading and the junctions of the eastern and western headings with the pilot shaft were lined with blue brickwork in cement 9 in. thick. The lengths of the eastern and western headings are respectively 72 yds. 1 ft. and 65 yds. 2 ft.

The following items of cost may be interesting:—

Pumping, use of plant and machinery, £400; pilot shaft, complete, £1,220; northern heading, complete, £580; excavation per lineal yard of the eastern and western headings, unlined, £3 12s.; pumping during test, per hour, 3s.

As the nett yield of both shafts after continuous pumping is 700,000 gallons per diem, and the daily consumption is under 300,000 gallons per diem, the town of Hinckley is well supplied with water for some years hence.

During the drought of 1911 no inconvenience was experienced except that for some weeks continuous pumping by one engine was necessary to keep the town supplied; but, nevertheless, as during the current year the parishes of Barwell and Earl Shilton, with a total population of about 8,000 will be added to the district of supply, the author has recommended the council to increase the capacity of each of the existing pumps from 360,000 to 550,000 gallons per diem, in order to avoid the necessity for working both the existing engines and pumps together. This suggestion was adopted, and the council are now awaiting the sanction of the Local Government Board to the necessary loan. It is proposed to enlarge each of the well pumps from 10½ in. to 12⅝ in. diameter, and the

force pumps from 13¾ in. to 17 in. diameter, the estimated cost being £2,000.

From the accompanying analyses given it will be observed that the chief disadvantage of the present supply is the excessive hardness, which, of course, has a detrimental effect on factory boilers and hot

Analyses of the Town Water.
Results expressed in parts per 100,000.

| Sample. | Free & saline ammonia. | Organic ammonia. | Chlorine in chlorides. | Nitrogen in nitrates or nitrites. | Total solid matter. | Temporary hardness. | Permanent hardness. | Total hardness. |
|---|---|---|---|---|---|---|---|---|
| (A) From original shaft... | 0 | ·002 | 1·07 | 0·11 | 50 | ·885 | 24·00 | 32·85 |
| (B) From both shafts and headings | 0·1 | ·004 | 7·3 | trace | 50 | 5·15 | 22·10 | 27·25 |

water installations, and the owners of the dye works have been compelled to instal a softening plant.

The number of fire hydrants in the town is 250.

The following are the weights of the cast-iron mains used:—

| Diameter. | Length. | Weights. cwt. | qr. | lb. |
|---|---|---|---|---|
| 2 in. | 6 ft. ... | 0 | 2 | 4 |
| 3 .. | 9 .. | 1 | 0 | 10 |
| 4 .. | 9 .. ... | 1 | 2 | 0 |
| 5 .. ... | 9 ,, | 2 | 0 | 0 |
| 6 .. ... | 9 ,, ... | 2 | 2 | 0 |

All pipes are coated inside and out with Angus Smith's solution, and in the case of large consignments the pipes are inspected and tested on behalf of the council at the maker's works.

All communication or service pipes are laid by the council's workmen as far as the stop-cock, which is generally fixed immediately outside the boundary of the property to which the connections are laid, and the following are the charges made for such connections, which are, as previously explained, of lead: ½-in., £1 12s. 6d.; ¾-in., £1 15s.; 1-in., £2 2s. 6d.

All payments for water connections, as well as for water for building purposes, &c., have to be made in advance, a system which saves a large amount of book-keeping.

FITTINGS.

All new fittings are thoroughly examined by a qualified inspector. Night inspections are made of all yards, &c., where taps are fixed, also of all services, waste being detected by means of the sounding rod. No connections are supplied with water until the internal pipes, &c., have been examined by the inspector, who is a practical plumber. All draw-off taps, &c., are washered by the council's workmen free of expense to the consumer.

In order to minimise waste as much as possible in yards and courts, where standpipes supply water to perhaps six or more houses, the author has recently fitted spring taps in place of the ordinary taps, and has found them to answer the purpose admirably.

The question of insisting upon all waterworks fittings being tested and stamped will shortly be considered by the council, for this system, as adopted in other towns, is the most effective method of ensuring that all taps, cocks, cylinders, tanks, &c., are up to a certain standard as regards quality, strength, and efficiency.

Only 2-gallon water-closet flushing cisterns are allowed, it being considered that with a properly constructed and up-to-date pan the 2-gallon flush is ample.

The weights of lead pipe prescribed by the council are:

| Diameter. | Weight per lineal yard. |
|---|---|
| ½ in. ... ... ... ... ... | 5 lb. |
| ¾ ,, ... ... ... ... ... | 7 ,, |
| 1 .. .. .. .. | 11 .. |
| 1 ,, ... ... ... ... ... | 16 ,, |
| 1¼ ,, ... ... ... ... ... | 22 ,, |

Altogether there are 152 meters in Hinckley and the districts supplied. The inspector and his assistants make daily inspections of the district, and all leakages, waste, and other defects found are immediately corrected, and the owner called upon to remedy the same.

The charges for water in the town of Hinckley are as follows: For domestic purposes (including the supply to one water-closet and one bath) 7½ per cent on the rateable value of houses rated at over £8 per half year, and 3d. per week for each house rated at £8 and under. For additional baths and water-closets beyond the first in houses or shops not assessed at more than £40 rateable value, the charges are as follows: 10s. per annum for each bath, and 6s. per annum for each water-closet. Bakehouses, greenhouses, gardens, boilers, fishshops, butchers' shops, engines, photographers, warehouses, hotels, factories, &c., are all supplied by meter, at a rate varying from 1s. 3d. to 9d. per 1,000 gallons, according to the quantity used. Inferential meters are generally used, but a few positive meters are kept for testing purposes. In the event of a consumer complaining of his meter registering incorrectly, the rule for testing the meter is as follows: If the meter be found to be correct a charge is made of 2s. 6d., if it be found incorrect no charge is made. The charge for water for building purposes is 15s. per £100 estimated cost of the brickwork, concrete work, and plastering. An agreement has recently been entered into to supply the districts of Barwell and Shilton with water at a charge of 9d. per 1,000 gallons. The author is now carrying out this scheme at a cost of £11,500, including the necessary mains, water tower, &c.

INCOME AND EXPENDITURE.

The yearly expenditure, including interest and sinking fund on loans, is now about £3,534; and the revenue from all sources £3,745, which shows an annual profit of over £200.

The following is a statement of the amounts borrowed in respect of the waterworks: Loan for original works, £45,000; loan for extensions, £2,199; loan for additional supply, £6,300; total, £53,499. As only about £19,000 of this amount has been repaid, about £34,500 remains to be paid.

## DISCUSSION OF MR. CRUMP'S PAPER.

Mr. F. Griffith (Leicester), in opening the discussion, said he had not had time thoroughly to read the paper, but he had noticed the reference to the Leicester Corporation, and might say that he was engaged in 1881 in investigating the value of the borehole at Hinckley as a future source of supply for Leicester. The experience he had then extended over 18 months. Pumping engines and boilers were erected at the shaft, which was already disused, and the water was pumped and delivered into the canal running alongside so as to prove the quantity of water available, and, after analysis, Leicester decided to adopt this as a source. Eventually, however, it was found that the water was very hard, and that the quantity was not sufficient to justify the laying of a pumping main across country for a distance of about 25 miles, and on those grounds they reluctantly abandoned the source. But they were very pleased to let their neighbours have the benefit of the information obtained, and it had proved, he believed, a blessing to the thriving town which Mr. Crump represented. The only objection to the water was its excess of hardness, and in a manufacturing town that was, of course, a serious objection.

Mr. T. Reader Smith (Kettering) observed that Mr. Crump had stated that, in order to minimise as much as possible waste in yards and courts, where standpipes supplied water to perhaps six or more houses, he had recently fitted spring taps in place of the ordinary taps. These had answered very well, but the few spring taps which he (the speaker) had installed had not been satisfactory. Perhaps Mr. Crump had hit upon some new form of tap with which he (Mr. Reader Smith) was not acquainted. The ordinary practice in Kettering was to have a tap with a removable key, for which the tenant was held responsible. Then Mr. Crump had stated that the question of insisting upon all waterworks fittings being tested and stamped would shortly be considered by the council. He did not know what powers the local authority possessed, but a few years ago, when the Kettering Council were before the Local Government Board, they were informed that they could not have this power, with the result that they had to rely on the ordinary means of inspection. In regard to the testing of meters, he would be glad to know what margin was allowed in connection with carrying out the work.

Mr. F. C. Cook (Nuneaton) said that, having held an appointment at Hinckley some years ago, Mr. Crump's paper was of special interest to him. Mr. Crump had given a curious account of the delay in securing a proper water supply for the town—possibly due to the fact that no fewer than six consulting engineers, who appeared to have presented an average of three or four schemes each, were called in. The council were lucky in ultimately having pointed out

to them a most excellent source of supply in the Keuper sandstone at Snarestone, and that being so, it was difficult to understand the reason for considering other schemes, when the time came to augment the supply, instead of at once deciding to complete that at Snarestone on the lines originally laid down by Mr. Hawksley. Two points impressed him in regard to the original scheme. One was the varying thickness of the pipes in the cast-iron pumping main. This was only 12 in. in diameter, and the head varied very little; consequently there could have been little economy in diminishing the thickness of metal in places, and it might easily lead to trouble in a time of emergency, such as in the case of a broken pipe. The second one was the over-elaboration of the buildings at the pumping station—a point which occurred to his mind when reading Mr. Valon's paper. The pumping station had a country by-lane on one side and a little-used canal on the other. It was to be hoped that the beauties of Gothic architecture duly impressed the minds of the few canal boatmen who passed that way; but the saving on the pumping main must have been absorbed in over-elaboration of the pumping station many times over. He disagreed with Mr. Crump as to limiting flushing cisterns to 2 gallons, and in his opinion a 3-gallon cistern did not necessarily mean waste of water. He objected to the charge for extra baths and water-closets. No person could be in two places at once, and extra provision of that sort did not mean extra use of water. Where municipal bodies, as at Hinckley, incurred an annual loss in respect of the upkeep of public baths, it was unjustifiable to penalise a person for providing similar accommodation in his own house.

Mr. F. W. HODSON (Loughborough) remarked that under the original scheme Hinckley went out a great many miles into an area where there was some water. He believed the author was right in saying there was no serious opposition, but that was because the Hinckley authorities gave way on their first intention and allowed a supply of water to the people in the vicinity at a reasonable figure. The object that was supposed to have been achieved was got round in some manner by charging a somewhat excessive rate for water supplied for other than domestic purposes. He believed the original arrangement was to charge a 10 per cent rental for the domestic supply, and that if the income did not meet the expenses an additional charge could be made for parishes outside the district. That was withdrawn, and it was agreed to give a supply at a reduced charge equal to about one half the water rate. That, of course, was only fair, because the local parishes had no interest in the 14 miles of main going to Hinckley. There was another point. The works were supposed to have cost rather less than the original estimate, but he saw from the tabular statement at the end of the paper that the loan was for £45,000, although the figure of £35,000 was first mentioned. There must, therefore, have been some expenditure beyond what was originally anticipated. The sinking had been made in the first instance with the idea of finding coal, and as the worst of the water appeared to have been in the lower part of it, the well had been boarded off with an oak floor with the idea of keeping the bad and hard water down and making use of only the top water from the sandstone. He would like to know whether that floor had been of any service, because it did not seem to be a very efficient method of accomplishing what was desired. In the matter of excavation, referred to later, having regard to the tremendously hard nature of the material dealt with, he thought the council had been greatly favoured, when the experience of the contractor was taken into consideration.

Mr. C. H. ROBERTS (Aberdeen) inquired why, in view of the difficulties encountered, the conglomerate was driven through in preference to the sandstone, for it appeared that the largest quantity of water issuing into the pilot shaft was met with at a depth of 101 ft. at a junction of the sandstone and conglomerate. He thought it would have been a little more interesting if they could have had a geological section to refer to, because it was not easy to follow the work otherwise. Mr. Crump had stated that the pilot shaft was too near the existing shaft, the consequence being that the use of the existing shaft for the supply of the town was interfered with more than was anticipated. Eighty feet seemed to have been the distance between the two—a little too close, as he said. The hardness of the water was rather a striking point. An average of about 30 deg. of hardness was, of course, considerable for a town supply, and he would suggest, if the cost were not too great, the desirability of softening the water. Mention was made in the paper of a proposal to increase the capacity of the existing pumps from 360,000 to 550,000 gallons per day, but Mr. Crump did not explain how he was going to do that. The engines appeared to be very economical ones for their size, but if he were going to increase the size of the pumps without increasing the cylinders, he would not get the same efficiency as in the past. The pumping station seemed to be a long distance from the town, and he would like to know what means were adopted for indicating the level of the water in the tower.

Mr. C. H. PRIESTLEY (Cardiff) said he did not think he author had given the cost of the service reservoir. The structure seemed to be excessively strong, especially in the matter of the floor, which was of brickwork in cement 3 in. thick, laid on a bed of sand 1½ in. thick, under which was clay puddle about 18 in. thick, and under that cement concrete 12 in. thick. Unless there was something abnormal in the foundation, there would seem to have been a waste of material; generally, also, the construction of the reservoir appeared to have been more expensive than was necessary. According to the paper, for additional baths and water-closets beyond the first in houses or shops not assessed at more than £40 rateable value, a charge of 10s. per annum for each bath and one of 6s. per annum for each water-closet was made; it appeared to him, however, that premises of higher rateable values should be charged more than ones of lower rateable values. But he thought it was becoming the general opinion that baths and water-closets should not be charged for, but that they should do their best to promote the health of the people by encouraging the use of water.

The PRESIDENT (Mr. J. S. Pickering) congratulated Mr. Crump on the interesting discussion which his paper had elicited. Mr. Crump was an old assistant of his, and he was very proud of the way in which he had prepared his paper. He had always been a very hard-working man, and he was sure his work had been carried out in an admirable manner. When he (the president) saw the buildings in course of construction they had struck him as being over-elaborate. The floors and walls of the reservoir were very thick, and the latter were backed with clay puddle as much as 2 ft. 9 in. in thickness in parts. It was rather interesting to compare the reservoir with the one at Skegness described by Mr. Percy Griffith. In that case the reservoir was of ferro-concrete, the walls being only 8 in. in thickness, as compared with 5 ft., which, including the clay puddle, was the measurement of the one at Hinckley. A comparison of the cost would also be interesting. Unfortunately the Local Government Board refused to grant loans for periods of thirty years for reservoirs in the newer style of construction, fifteen years only being allowed for repayment at Skegness. His opinion was that the time had arrived when the board should reconsider their attitude in that connection. In regard to the geological section asked for by one speaker, he might say that Mr. Crump had submitted that with his paper, but it had been thought that in view of the good description of the strata which he had supplied it was unnecessary to reproduce it.

Mr. CRUMP, in reply, said the discussion which had taken place and the questions raised had quite repaid him for his trouble in preparing the paper. As to Mr. Reader Smith's question, the spring taps were of the ordinary type. They had a little trouble with the springs and valves, but that was not as great as that experienced through the loss of keys and the running of water *ad lib.* until it was turned off. They well repaid the extra cost and labour, and they had little difficulty with them. As regarded the testing and stamping of fittings, the Local Government Board had issued a new set of model by-laws dealing with waterworks fittings, and he had just had some under consideration for another district. These new by-laws permitted one to specify various types of fittings, or what the corporation would approve, and he took it that under that clause one could insist upon taps and fittings standing a certain pressure. With regard to the reading of the meters a 10 per cent margin was allowed—that was to say, if it registered 10 per cent wrong or excessive they took the corresponding period of the previous year. With regard to the varying thickness of the pipes, he agreed there was hardly any necessity to vary the thickness over such a short length. The total head was only 200 ft. As to the water-closet cisterns, he held that a 2-gallon flush was quite sufficient, provided the fittings were up to date, and he considered also that where a man chose

to put in more than one bath or water-closet, he should be charged extra for all beyond the first on the basis he had stated. The duplication of such fittings, to his idea, was a luxury, and should be paid for. With regard to the floor in the well, this was simply made up of a few boards laid across at the point the council used to consider was the bottom of the well, and below which was salt water. As to increasing the pumps he did not think they would have any difficulty with the engines, and they had already received the sanction of the Local Government Board for the carrying out of the work. He was sorry he had not got the cost of the service reservoir by him, and was afraid he would have some difficulty in getting it.

*(To be continued.)*

## CORRESPONDENCE.

*"Many questions ... easily to settle a question rightly as to work it out as one of them."* MACAULAY'S *"Critical and Historical Essays."*

### MUNICIPAL AND COUNTY ENGINEERS: MUTUAL AID AND PROTECTION: SECURITY OF TENURE.

*To the Editor of* THE SURVEYOR.

SIR,—I have to thank you for the insertion of my letter in your issue of the 7th inst., and for your note to it, which a correspondent describes in your last issue as a "well-merited rebuke." I do not read it as such, but accept it as a fair expression of opinion, based on the misconstruction of the words "wait and see." I would point out that I did not use them in the sense of the indefinite or the Parliamentary "wait and see," but the definite, having the assurance that the objects we all desire are within reasonable period of accomplishment. My point is this: the council of the institution has been but recently remodelled; to my personal knowledge members having the above objects at heart have been elected on that body, and in fairness to them and the council generally they should have time and opportunity to bring these matters officially forward; hence my "wait and see."

Mr. Wakelam is an elected member of the council, and, in my humble opinion, it would have been more considerate and courteous to his fellow councillors if he had propounded and submitted his scheme to them in the first instance; the spirit of the age and my own in particular revolts against the autocratic "I." Let us have some real work from the institution in order that it may justify its existence.

I have read, more in sorrow than in anger, and with a good deal of pleasure, Mr. Wakelam's letter appearing in your issue of the 14th inst. I note that, pursuing his Cromwellian propensities, he gives me the happy despatch with the blunt edge of an old proverb, ignorance being the crime. But in what instance do I err?

The pleasing portion of the letter is that Mr. Wakelam at last recognises that the council, even as at present constituted, and without his presence, is competent to deal with the matters in question, and that he is perfectly satisfied now that it has been referred to a committee to report.

By the way, Sir, might I suggest the publication by Mr. Wakelam of the many names received by him in support of and in sympathy with his scheme? It might act as an incentive to that committee and waken the indifferent.

With respect to the letter of Mr. Prescott, of Tottenham, in the same issue, Mr. Prescott has always been to the front in championing the cause of the weak and in this latest case he has my sympathy, for although he holds the brief for the plaintiff, the case has been settled behind his back, or, to use a parliamentary term, I fail to comprehend a good deal of his letter, more particularly his remark, "Once again, he [Wakelam] shows the arrogance of the game he is so fond of," does it refer to the time when he led the revolt against the old *régime* (in which he had my sympathy, I think I remember the term "wooden-top" was used then. Mr. Sir, I can go one better, my recollection dates back some years before that of Mr. Prescott.

Loyal to the institution, I am anxious that the good name of that which Mr. Prescott has taken such a prominent part in forging about should have no fair chance to justify itself and justify of the wisdom of the decision and principles of the institution by the individual.

Mr. Wakelam goes on the council to support municipal and professional mutual aid and protection and security of tenure. Mr. Prescott at present only goes as far as a "Mutual Aid Protection Society," and drops the security of tenure. There are others on the council who will go for both the above objects—plus superannuation.

On the whole things look brighter; but, again, let us "wait and see."—Yours, &c.,

FRANK HARRIS.
Engineer and Surveyor, Tonbridge Rural District Council.

Broadway, Southborough.
June 17, 1912.

### PORTLAND CEMENT AS A ROAD BINDER.

*To the Editor of* THE SURVEYOR.

SIR,—Referring to your "Minute" under the above heading, it may be useful to give you my experience with cement for this purpose or as a "grout." The area of road so treated was about 413 yds. super. of the London-Portsmouth main road. The work was carried out in two halves in the autumn of 1910, and each half was shut off from traffic a minimum period of eight days.

The road was scarified and contoured in the usual way, and a 3-in. coating of Clee Hill stone was then laid and well rolled dry. A Portland cement matrix, consisting of one part of cement and two parts sharp, clean sand, was then applied, the rolling being continued until a perfectly smooth finish was obtained, water being added from a rosed can. The quantity of cement required worked out at 32 lb. per yard super., and the whole costs were as follows:—

| | £ | s. | d. |
|---|---|---|---|
| Cement ... ... ... ... ... ... | 0 | 4 | 4 |
| Sand ... ... ... ... ... ... | 0 | 1 | 6 |
| New metalling ... ... ... ... | 1 | 9 | 4 |
| Roller scarifying ... ... ... ... | 0 | 1 | 3 |
| Rolling ... ... ... ... ... | 0 | 4 | 2 |
| Labour (breaking up and preparing and laying metal) ... ... ... | 0 | 2 | 7 |
| Labour (grouting, sweeping, &c.) ... | 0 | 4 | 0 |
| Labour (watching, guarding, &c.) ... | 0 | 2 | 4 |
| Carting ... ... ... ... ... | 0 | 2 | 5 |
| Repairing tools, &c., and sundries ... | 0 | 0 | 5 |
| Per yard super. ... ... | 3 | 9 | 0 |

The length remained in good condition during the winter of 1910-11, and was tar-painted in the spring of 1911. Towards the end of 1911 it was observed that one-half of the road was becoming disintegrated, and early this year the face of this half was removed and ordinary granite rolled down in its place, the whole of sound and repaired parts being subsequently retarred.

The length repaired has now again broken up in places; the other half remains in fair condition.

I can only assume that the cement of the first half was not so good in quality as it should have been, or that it required longer setting time than was allowed.

The work was carried out for us by Messrs. A. Streeter & Co., of Shalford, Guildford, who had interested themselves in this form of construction, but I am afraid the experiment is not promising.—Yours, &c.,

J. H. NORRIS.

Godalming.
June 15, 1912.

**Housing in Liverpool.** The Bevington-street area housing scheme, Liverpool, which was formally opened last Friday, consists of 226 tenements, each of two, three or four rooms, and includes fifty-two self-contained cottages. The scheme has been completed at a cost exceeding £100,000, on the site of the former slum dwellings.

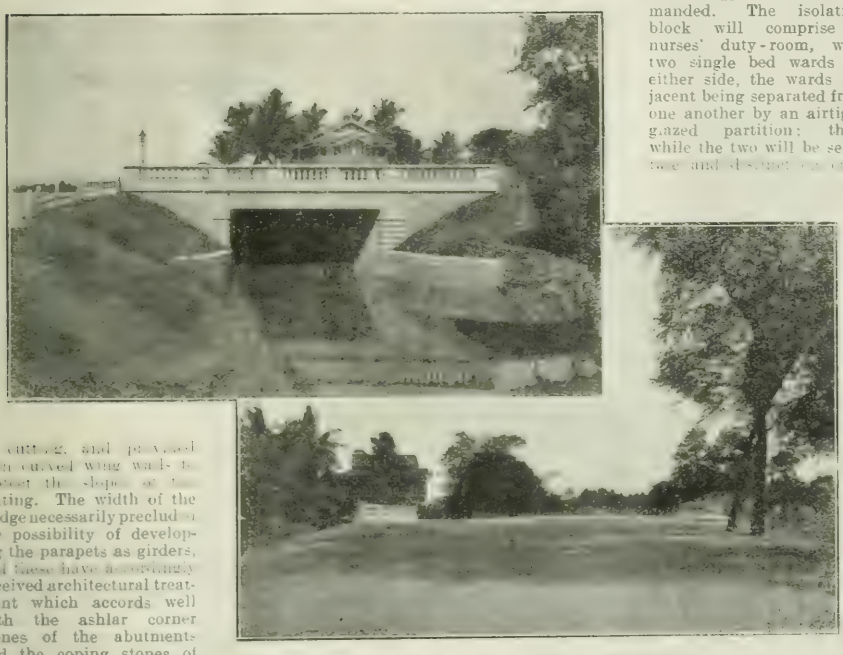
**East Birmingham Town Planning Scheme.**—At a meeting of the Birmingham Town Planning Committee Councillor Neville Chamberlain stated that the committee had now completed their town-planning scheme for East Birmingham. They had adopted the principle of dividing the area into zones, with differing building densities. The lowest limit was the same as in Harborne and Quinton—namely, twelve houses to the acre, and the highest limit was eighteen houses to the acre, the number which was being erected now in many cases in the suburbs. There was also an intermediate zone, which would give fifteen houses to the acre. In all cases the maximum number of houses which could be built on any one area was twenty, the same as in Harborne and Quinton.

## FERRO-CONCRETE BRIDGE CONSTRUCTION IN COLOMBO.

The accompanying illustrations, which have been sent us by Mr. Clive H. Kilmister, chief assistant works engineer, Colombo Municipality, depict the new bridge which has been built in place of an old one carrying Skinner's-road over the old Dutch waterway known as St. Sebastian Canal, Colombo. This canal is an important one, by which rice, tea, rubber and other produce is brought from the Low Country estates to Colombo for shipment.

The abutments of the new bridge are of stone masonry, and the span, which is of ferro-concrete, with Kahn bar reinforcement, is the first of its kind to be erected in Ceylon. The span is 25 ft. and the width 100 ft. It was built entirely with cooly labour, to the design of Mr. Robert Skelton, ASSOC.M.INST.C.E., municipal engineer, Colombo. The cost was Rs.70,000, or Rs.28 (about 37s.) per square foot of waterway width.

This is by no means a high rate for a span of 25 ft. between massive abutments spanning a canal



Skinner's-road Bridge, Colombo

of cutting, and provided with curved wing walls to protect the slopes of the cutting. The width of the bridge necessarily precludes the possibility of developing the parapets as girders, and these have accordingly received architectural treatment which accords well with the ashlar corner stones of the abutments and the coping stones of the wing walls. In situations where the cocoanut palm is the dominating tree, the best architectural effects are produced, as a rule, and as far as ordinary buildings and bridges are concerned, either by a light structure in which the prevailing colours are brown or subdued reds, or by massive structures with bold, straight outlines, in which the prevailing colour is white. The palm-thatched hut and the low bungalow with a tiled roof are examples of the former class, while a conspicuous example of the latter class is the flat-roofed, two-storied house with a large porch supported by plastered and white-washed pillars.

Skinner's-road bridge is a good example of this class, the only adverse criticism which is suggested being that a little of the effect is lost by the division of the elevation of the span and the parapet above it by the panels, which, to some extent, deny to the beam the expression of its true character. This, however, is but a minor criticism of a piece of municipal engineering work which is a credit to its designer and to all concerned in its construction.

**Montrose Water Supply.**—The new water scheme for Montrose was formally inaugurated last Saturday.

## NEW INFECTIOUS DISEASES HOSPITAL AT EASTLEIGH.

Mr. W. W. Gandy, the engineer and surveyor to the local authority, is the architect of a new infectious diseases hospital for Eastleigh, the foundation-stone of which was laid on the 8th inst. The site of the hospital comprises 12½ acres of land at Chandlersford, and is within convenient distance of the town. All the blocks of buildings are so arranged as to facilitate extension of accommodation, either by enlargement or by erecting additional blocks. The buildings at present contemplated comprise a pavilion accommodating eight beds, an isolation block accommodating four beds, administration block, laundry and mortuary. The pavilion will be built having a ward holding four beds on each side of a nurses' duty-room, with the necessary accessories. The two wards will each be 24 ft. long, 26 ft. wide and 13 ft. high internally. Each bed will have 2,000 cub. ft. of air space, 144 sq. ft. of floor space, and 12 ft. of wall space. The wards will be warmed by means of stoves. From the nurses' room, by means of observation windows, a view of the wards can be commanded. The isolation block will comprise a nurses' duty-room, with two single bed wards on either side, the wards adjacent being separated from one another by an airtight glazed partition; thus, while the two will be separate and distinct [illegible] each side of the duty-room by means of the glazed partition, and the observation window in the wall of the duty-room, the nurses will have equally good facilities for observation of the patients as in the pavilion. Each ward will be 12 ft. square and 10 ft. high, and each bed will thus have about 1,400 cub. ft. of air space. Warming in this instance will be by means of open fireplaces. A verandah will run in front of each pair of wards.

**The Cheapest Gas.**—A scheme has been submitted to Widnes Town Council by the gas and water engineer, Mr. I. Carr, for the complete reconstruction and extension of the corporation gasworks. The estimated cost is £30,000, and the productive capacity of the works will be increased to 2,500,000 cub. ft. of gas a day, with coal storage for 9,000 tons. The saving which will be effected by the adoption of modern plant is estimated to be £8,000 a year, and the present selling prices of 9d., 11d. and 1s. 1d. per 1,000 cub. ft.—which for lighting are 20 per cent and for power 25 per cent less than the prices charged by any other works—will also be capable of further reduction.

# Law Notes.

EDITED BY J. B. REIGNIER CONDER, 11 Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

*The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, one side only) should be addressed to "The Law Editor," at the office of* THE SURVEYOR, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies (not the originals) of local Acts or documents referred to should be enclosed.* **All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction — i.e., without re-drawing or amendment.** *Unless these conditions are complied with we cannot undertake to reply to queries.*

HIGHWAY: DEDICATION: RIGHT OF ACCESS. A most interesting illustration of the circumstances from which the dedication of a highway will be inferred is afforded by the recent case of *Tottenham Urban District Council* v. *Rowley* (Chancery Division, Mr. Justice Joyce, May 2nd, 3rd, 7th and 11th). The defendant was the owner of land bounded on the east by Downhills-road, Tottenham, and on the north by a public park belonging to the council. In 1905 he laid out this land as a building estate, and deposited with the council plans in which a strip of the land immediately adjoining the park was appropriated as a road. The plans were approved by the council, and in 1908 the defendant erected houses on the south side of this road (which was known as Keston-road), and threw it open to the public by removing a hoarding or fence which had previously separated it from Downhills-road. The southern portion only of the road was made up, but the road had from the time of its being thrown open been used continuously by the public, both for foot and vehicular traffic. The council having removed part of the fence separating the park from Keston-road, so as to obtain access to the road from the park, the defendant blocked up the opening. The council claimed a declaration that the defendant was not entitled to erect or maintain any obstruction to prevent or impede their entering upon their land from Keston-road, and an injunction—also damages. The defendant contended that the road had never been dedicated as a highway, or alternatively that the strip immediately adjoining the park had never been dedicated, or had been dedicated as a footpath only. Mr. Justice Joyce decided in favour of the council. In the course of his judgment his lordship said he came to the conclusion that on the balance of evidence there had been a dedication before this dispute, and that Keston-road was a public highway before the opening of access thereto by the council through their fence. It was argued that the strip on the northern side, which had not been made up, to the width of 7 ft., had been dedicated to foot passengers only. There was no evidence to support this ingenious theory, and this contention was untenable. Then, because the south side of the roadway alone was made up, and because cyclists and vehicular traffic naturally preferred the south side, where the road was made up, it was urged that the north side had never been used by the public for vehicles, so that it was the south side only that was dedicated or became a highway at all. He was of opinion that no such distinction could be maintained. The defendant intended to dedicate the whole width of the road to the public as a highway, and the user by the public had been sufficient to complete such dedication.

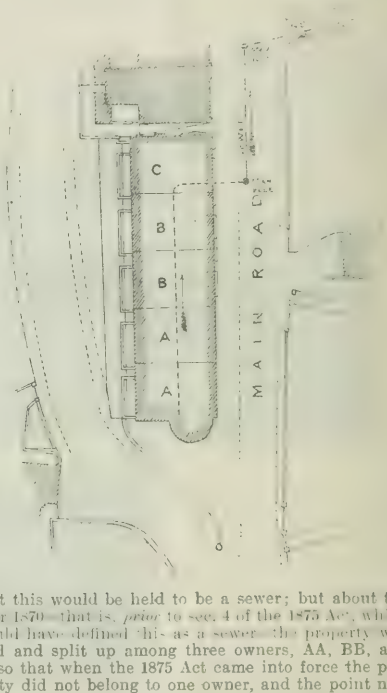
## QUERIES AND REPLIES.

*In order to avoid confusion queriists are requested to use distinctive words as* noms de plume. *The letter X. combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.*

ROAD SUBSIDENCE: ACCIDENT: LIABILITY.—"H. H." writes: A local tradesman (hawking draper) who does some little trade in several of the parishes in my council's area met with an accident to his pony recently (I may say he carries his things about in a trap drawn by a small pony). While going along one of our district roads a sudden subsidence occurred, and one of the pony's legs got into the hole, about 1 ft. square, throwing the pony down, damaging its head, shoulder, and its knees, also, so the owner says, seriously affecting its sale value by the fall. The hole was not on the surface previous to his arrival. He is claiming for loss of trade for the day, cost of hire for another pony while his own is unable to work, veterinary's fees, and loss of sale value to pony through the fall. The crust of road broke in through rabbits burrowing underneath it. Are we responsible?

In my opinion, upon the facts stated, the council are not responsible. There appears to have been nothing amounting to misfeasance on their part, and the ratepayers liable for damages arising from non-repair or neglect to repair (see *Cowley* v. *Newmarket*, 1892, A.C., 345, where a highway was left out of repair and in a dangerous condition, and it was held that the authority were not liable for the consequent injuries suffered by the plaintiff).

COMBINED DRAINS: "O. W." writes: I shall be glad if you will kindly give me your opinion as to whether the drain under the property of AA, BB, and C, and shown by dotted line as far as the manhole in the main road, is a combined drain, the cost of the relaying of which in cast-iron is recoverable from the owners under sec. 19 of the Public Health Amendments Act, or whether it is a sewer repairable by the local authority? The property in question was erected in 1866 and belonged to one owner, and under sec. 4 of the Public Health Act of 1875 I presume there is no doubt




that this would be held to be a sewer; but about the year 1870 (that is, *prior* to sec. 4 of the 1875 Act), which would have defined this as a sewer, the property was sold and split up among three owners, AA, BB, and C, so that when the 1875 Act came into force the property did not belong to one owner, and the point now is as to whether it can be treated as a system of combined drainage, or whether the fact of it once, *prior* to the 1875 Act, having belonged to one owner, has for all time constituted it a sewer? Your opinion will be very much esteemed.

See, 19 of the Act of 1890 only varies the definition of a sewer to this extent—viz., that under the circumstances mentioned in the section a pipe which would otherwise be a "sewer" repairable by the local authority is to be a "drain" for the purposes of sec. 41 of the Act of 1875. But for all other purposes it remains "sewer." See *Regina* v. *Jackson*, 1891, 1 Q.B., 671. The pipe in the present case, from the point at which it takes the drainage of the second house, would, you say, appear to be precisely one of these qualified "sewers" to which the Act of 1890 applies, that is to say, a "single private drain" for the purposes of sec. 41 of the Act of 1875. See, however, the decision in *Wood Green Urban District Council* v. *Joseph*, 24 T.L.R., 859, and reply to query by "H." in THE SURVEYOR for December 22, 1911, p. 757. With this meagre statement of the case it is impossible to be certain that any combined drain would now be held to be a "single private drain" within the Act of 1890. That portion of the pipe which drains the first house only is, however, a "drain" up to the point where it takes the drainage of the second house.

BLASTING STONE NEAR HIGHWAY. "Gas le" writes: At one point in my district a river runs alongside the highway, and I have been in the habit of getting stone from the bed of the river for highway repairs, blasting generally having to be resorted to. Complaint has recently been made to the police authorities as to the blasting, and they hold the opinion that his is unlawful within 50 ft. of the centre of the highway under sub-section 13 of sec. 72 of the Highway Act, 1835, but I contend that the word "wantonly" in

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And Municipal and County Engineer.

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the section puts the work altogether outside its scope. I should like your opinion as to whether it is permissible for me to [illegible] this work, and what, if any precautions are necessary to protect the travelling public. I may say that most of the blasting has to be done within 30 ft. of the centre of the highway, and that there is no other place available for getting stone within a considerable distance.

Unless the blasting causes an injury to the highway, or any injury, interruption, or personal danger to any person travelling thereon, it is not within the section, in my opinion. See Simey v. Bowman, 5 L.J.M.C., 152, where a wheelwright erected a fire for the purpose of his business also *Hyde* v. *Stevens*, 31 J.P. 742, where a man rode a lighted tar barrel along the road on market day, and was thereby endangered. As to what precautions should be taken for the protection of persons using the highway, that is not a matter about which I am competent to advise.

**School of Town Planning.** An announcement has been made that a School of Town Planning [illegible] will be held from August 3rd to 17th next, under the auspices of the London University Extension Board, at the Hampstead Garden Suburb. The first week [illegible] is intended to follow in that case each meeting of the session there shall be given three lectures and visits to stations on the subway, and that an additional visit shall be arranged to various places having a special interest in connection with town planning or housing. The various courses of lectures will deal with the subject of town planning from every point of view, special attention being given to the practical, historical, legal, engineering and health aspects. The recent progress of the town planning movement and the powers which it received in consequence of the passing of the Act of 1909 certainly appear to provide sufficient material for the proposed "school." It is hoped that many of those who are actually engaged in municipal offices, or who are otherwise practically interested in the town planning question, may, without serious interference with their ordinary work, attend by means of such a summer school a thorough course of lectures by acknowledged authorities dealing with different branches of the subject. Inquiries should be addressed to the Hon. Secretary, The Institute, Hampstead Garden Suburb, N.W.

## LONDON COUNTY COUNCIL CHIEF ENGINEERSHIP.

### RESIGNATION OF SIR MAURICE FITZMAURICE.

The resignation of Sir Maurice Fitzmaurice, C.M.G., M.INST.C.E., of the position of chief engineer to the London County Council, was reported at Tuesday's meeting of that body.

The chairman and others spoke in terms of appreciation of the services rendered by Sir Maurice, whose resignation will, it was stated, take effect in December next. It is his intention to commence private practice.

Sir Maurice Fitzmaurice was born in 1861, and educated at Trinity College, Dublin. He was apprenticed to the late Sir Benjamin Baker, K.C.B., is a member of council of the Institution of Civil Engineers, and a member of the Institution of Mechanical Engineers, the Royal Institution, and the Canadian Society of Engineers, an honorary Fellow of the Society of Engineers, chairman of the Committee on Vitrified Ware Pipes of the Engineering Standards Committee, and Lieut.-Colonel of the Engineer and Railway Staffs Corps. He was engineer of the Rotherhithe Tunnel, the new Vauxhall Bridge, the Kingsway new street improvement, with its tramway subway, and the electric tramways in London, and has duplicated (since 1902, at a cost of £4,000,000) the London main drainage system. He was also engaged on the Forth Bridge, railways and docks in Canada, the Blackwall Tunnel, and the Nile reservoir dam at Assouan (Egypt). He was made a knight of the Order of Mejidieh in 1901, and in 1902 was decorated C.M.G. His Majesty the King personally conferred a knighthood upon him on March 9th last, on the occasion of the laying of the foundation-stone of the new County Hall for London, which is being erected on the south side of Westminster Bridge. His publications include: "Plate-Girder Railway Bridges," "Shrinkage of the Thames and Lea," "London County Bridges," "Main Drainage of London," and many papers and other publications on engineering subjects.

**Sewage Disposal at Rothesay.**—The Town Council of Rothesay have adopted the sewage disposal scheme of Mr. J. B. Brodie, who has been appointed engineer for the work. The cost of the undertaking is estimated at £15,000.

**The Dee Power Scheme Sanctioned.**—The town clerk of Chester has received a communication from the Local Government Board sanctioning loans totalling £14,000 in respect of the Chester Corporation's hydro-electricity scheme. This is the scheme by which it is proposed to make use of the water power of the old Dee Mills, now dismantled, for the generation of electricity.

**Spalding and the Housing Question.**—The Spalding Urban District Council have approved a report presented by the Housing Sub-Committee recommending the building of 36 houses, in blocks of two, at a cost of £5,646, to be provided by loan repayable in 60 years. The rent proposed is 3s. 6d. per week clear. The opinion was expressed that eventually the scheme would be self-supporting.

**Margate Water Supply.**—Owing to the rapid growth of the town and the continued increase in the number of visitors, Margate Town Council propose to erect a new pumping engine of applying to the town an additional 3½ million gallons of water every 24 hours. There is already plant capable of delivering 12½ million gallons a day. The new machinery will meet the needs of the borough for many years.

**Vegetables from Sewage Farms.**—The question as to the dangers that may possibly lurk in vegetables raised on sewage farms was referred to at a recent meeting of the Keighley Rural District Council. The clerk said that some correspondence had taken place in the course of which Dr. Atkinson, the medical officer, stated that if the question referred to cabbages or other vegetables that had to be cooked there was no fear of infection of any description. Dr. Kaye, the Riding officer, and Dr. Wilson, of the Rivers Board concurred, independently, in the view that there was no danger at all with cooked vegetables, but that if it was lettuce or any vegetable eaten in a raw state there might be a danger of typhoid. The board were expecting an opinion on the point from Dr. Newsholme, of the Local Government Board.

# Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 23 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top, left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

### REPRINT OF QUESTIONS AND ANSWERS.

**We have had many requests from readers of the "Assistants' and Students' Section" that the questions and answers should be reprinted in permanent form. This has now been done, and the result is a work issued under the title "Problems in Engineering," in which the most interesting answers have been revised and classified. Copies, price 5s., may be obtained from the St. Bride's Press, Limited, 24 Bride Lane, Fleet Street, E.C.**

### THE MONTHLY PREMIUM.

Mr. E. F. Scholfield, to whom the premium for May was awarded, has chosen the following books, which have been duly forwarded to him: –

"Harbour Engineering," by Brysson Cunningham. (Griffin & Co.)

"Theory of Engineering Construction," by E. H. Essex. (St. Bride's Press.)

### QUESTIONS.

This week answers are invited to the following questions: –

**250. Pier Pavilion Roof.**—Show by sketches how you would roof a pier concert room 60 ft. by 40 ft. If desired, there may be two columns 20 ft. apart below each truss.

**252. Girder Bridge**—Design a girder bridge to carry a 24-ft. road over a river and railway (at an angle of 60°) in two spans, 70 ft. and 42 ft. respectively. The mean height of road surface above bed of river is 21 ft. 6 in., and 17 ft. above rails, and the foundation is clay. Please show calculations and give an estimate of the cost. ("Nomad.")

**253. Hospitals.**—Give a typical cross-section of an infectious hospital ward. Specify for finishing the internal surfaces. Give detail sketches of a window. ("M. and C.E.")

**254. Books.**—Would any of your readers kindly recommend any books on bridge construction and tramway construction suitable for the examination of the Institution of Municipal and County Engineers? (F. H. H.)

**255. Surveying.**—What effect has a steep hill of moderate height on a survey whose accuracy is important. It is obvious that if the reading of the chain line was taken and plotted the resultant plan would be distorted. Describe the means taken to obviate this distortion. (H. S. G., *Ashford.*)

### REPLIES TO QUESTIONS.

**251. Disinfection.**—Distinguish between disinfectants, antiseptics, and deodorants, and name some examples of each. ("Sanitary.")

The following is an extract from a contribution by Louis C. Parkes, M.D., D.P.H., in volume 32 of the Royal Sanitary Institute's Journal, and will be found to answer the above question admirably:

"A disinfectant destroys the organisms with which it is in contact. It is therefore a germicide. An antiseptic inhibits the growth of organisms with which it is in contact and prevents decomposition, but does not necessarily destroy organisms. A deodorant absorbs, oxidises, or destroys odorous products, but may have no disinfectant or antiseptic action."

Dr. Reid gives the following as essential conditions in a true disinfectant: "(1) That it shall be capable of killing germs and their spores, (2) that it shall be applied to any part, (3) in sufficient strength, (4) for a sufficient time."

Examples:

Disinfectants.—Liquid: Formic aldehyde, chloros, perchloride of mercury, corrosive sublimate, &c. Gaseous: Sulphur, formalin gas, chlorine vapour. For clothes, moist heat is used by most local authorities. Antiseptics: Boracic acid, potassium permanganate, peroxide of hydrogen, quicklime and various patents. Deodorants: Pine sawdust, naphthaline, charcoal, various scents and patent preparations. (G. A. W., *Fulham.*)

A disinfectant is the name given to any liquid, solid or process by which the life of harmful organisms bacteria or spores—is destroyed. The oldest method and the most complete is by cremation of the noxious material; to avoid destruction, but yet to obtain disinfection, steam, under pressure and of a temperature of 220 deg. Fahr. to 250 deg. Fahr., may be applied in a suitable apparatus. High temperature dry heat may be used, but is not so efficient as the steam process. Of liquid disinfectants cyllin, izal and carbolic acid (phenol) are obtained from coal tar products, and are perhaps the safest to use; salts of mercury, chlorine, formalin, sulphur and permanganate of potash are also used.

An antiseptic is a process or material which, when applied to a body, prevents the further growth of microbes, but which does not necessarily destroy them. For example, by applying extreme cold to food, decay may be postponed almost indefinitely; boracic acid is used in milk and cream as a preservative, while eucalyptus oil, chloride of lime, and sulphate of iron have their uses.

A deodorant must be entirely distinguished from either of the above, in that its duty is merely to counteract or mask an offensive smell, having little or no effect on the cause. Any strong smelling liquid may be used, such as eucalyptus oil, carbolic oil, formalin or chlorine gas; permanganate of potash and chloride of lime have the power of absorbing within themselves noxious fumes.—(H. S. G., *Ashford.*)

**249. Applied Mechanics.**—What is meant by the reciprocal of a point, and a pair of reciprocal figures?

Two figures are said to be reciprocal when the lines composing them fulfil the following conditions: (1) That their lines are respectively parallel or perpendicular to each other. (2) That lines radiating from a point in one figure are parallel or perpendicular to the corresponding lines forming in the other a closed

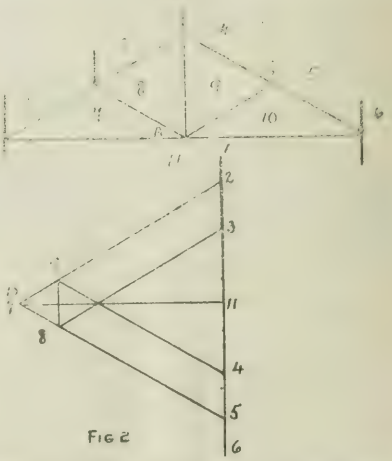

Fig 2

polygon. The commonest instances of reciprocal figures are fernicular or bending moment polygons, and their corresponding polar polygons; and line diagrams of loaded frames and the corresponding stress diagrams (see figure). The reciprocal of a point at which 3 or more forces cut is the closed polygon in the reciprocal figure, which represents the forces meeting at the point. In diagram the reciprocal of the point A, Fig. I., is 7, 8, 9, 10; 11, 7 Fig. II.—(H. F. B., *Milton Regis.*)

**British Fire Prevention Committee's Tests.** The British Fire Prevention Committee's summer season has now commenced at the conclusion of the Whitsuntide vacation, and an interesting programme of fire tests has again been arranged for at the committee's Regent's Park testing station.

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Bristol T.C.** (June 14th. Mr. W. O. E. Meade-King).—£29,615 for the purchase of Redcliffe Wharf, to be used as a depot, and £600 for the construction of two muniment rooms at the council house.—Mr. W. H. Wise, representing the town clerk, stated that the property proposed to be purchased at Redcliffe Wharf contained 7,411 sq. yds. It was situated on the east side of the floating harbour, and had a frontage of 283 ft.

**Dublin T.C.** (June 12th. Mr. P. C. Cowan).—This was an inquiry into an application made by the corporation for a Provisional Order confirming an improvement scheme made by the council under Part I. of the Housing of the Working Classes Act, 1890, in respect of an unhealthy area situate in Linenhall-street, Lurgan-street, Lisburn-street, and North King-street. The corporation require a loan of £5,130 for the purposes of the scheme.

**Gosforth U.D.C.** (June 13th. Mr. Courtenay Clifton).—£2,230 for the widening of Elmfield-road, Gosforth.—There was no opposition offered. At the conclusion of the inquiry Mr. Clifton inspected the road where the improvement is to be carried out.

**Haslingden T.C.** (June 5th. Mr. R. H. Bicknell).—£1,500, being the amount of the probable cost of paving with granite the main road from the junction of the Haslingden-Bacup road to near Tor View-road, the length of paving being about 420 yds., and also for the sum of £3,000, being the estimated probable cost of taking up and relaying kerbs and strengthening and sheeting the main road from Ewood Bridge to the junction of Haslingden and Bacup road. The Lancashire County Council have agreed to contribute 90 per cent towards the repayment of the principal and interest of the cost of the works. The borough surveyor, Mr. J. S. Green, said that the length of the proposed sheeting of Ewood Bridge-road was 1 mile and 13 yds., and the average width of the carriageway was about 30 ft. The road was at present macadamised with Penmaenmawr granite, and it was last surfaced about fifteen months ago. It was blinded with millstone grit sand and limestone chippings. The road was kerbed and channelled on one side, and had a set paved channel on the opposite side. Water and gas pipes were laid down the road, the gas pipes only for a certain distance, while the road was main sewered. The road surface was in very bad repair. The granite varied from 4in. to 6in. in depth, and was laid with local boulder, which varied from 6 in. to 9 in. It was proposed to scarify the surface about 3 in. deep and put down new material about 4 in. in depth, the Penmaenmawr granite being consolidated by steam roller, while there would be about 7 yds. to the ton.

**Loughborough T.C.** (May 11th. Mr. H. R. Hooper).—£1,600 for the purpose of the sewage disposal works, and for the permanent housing of the refuse destructors.—The borough surveyor, Mr. A. H. Walker, explained various items in connection with the sewage disposal works, which, with the destructors, were running night and day. He had received no complaints as to the pollution of the river. They had no means of dealing with storm water apart from the overflow. The inspector thought some means should be adopted for dealing with the storm water, for it seemed to him this would save the land from a great deal of unnecessary irrigation. As they went on, especially if the population increased in the future as it had done within the last 18 months, they would require more land, and had no means of dealing with it.

**Newry No. 2 (Co. Armagh) R.D.C.** (June 13th. Mr. Barnwell Crofton).—£5,440 for the erection of thirty-two labourers' cottages.—Mr. W. R. Bell, clerk to the council, stated that it was proposed to erect thirty-two cottages, the land to be acquired compulsorily.

**Pontefract T.C.** (June 13th. Mr. Courtenay Clifton).—£22,000 for the erection of workmen's dwellings—thirty to let at 6s. 6d., thirty-two at 5s. 9d., and forty-two at 5s. Evidence was produced of overcrowding in the borough, and many cases were cited of two families living together in one house. There was slight opposition on the ground that no houses should be erected at as high a rent as 6s. 6d., but it was contended that they would readily be let, and that a row of houses in the Old Church neighbourhood, recently built, were all applied for before the foundations were laid.

**Richmond (Surrey) T.C.** (June 6th. Major C. E. Norton).—£960 for work of surface-water drainage in Kew-road; £607 for the purpose of laying a water main in Kew-road; and £3,250 for the purpose of extending the public baths.—Referring to the first application, the town clerk, Mr. H. Sagar, said he was directed by the council to urge that this matter might be dealt with by the board at the earliest possible moment, as these works were intended to be carried out before the wood-paving of the Kew-road, which had actually been commenced at certain points. The borough surveyor, Mr. J. H. Brierley, gave particulars of the proposed works, which would, he said, be carried out by contract. With respect to the loan for the baths, the borough surveyor explained the plans, and stated that application would be made to the Office of Woods for permission for an emergency exit to be made into the Old Deer Park. It was also proposed to make an emergency exit into the playground of the county school for girls.

**Shrewsbury T.C.** (June 13th. Mr. P. M. Crosthwaite).—£520, making nearly £9,000 in all, to cover the cost of the new public slaughter-houses.—The council further applied for a loan of £1,250 to enable them to widen the Comet and Factory Bridges, two old camel-backed structures on the main entrance to the borough from Whitchurch.—The town clerk, Mr. H. C. Clarke, stated the facts in each case, and said that towards the cost of the bridges the Salop County Council would contribute £200 and the Shropshire Union Canal Company £200. There was no opposition.

**Stafford T.C.** (June 17th. Mr. Edgar Dudley).—This was an inquiry with respect to an application of the council for permission to devote part of a plot of land at the Green purchased for effecting street improvements as a site for the new free library, to the erection of which Mr. Carnegie had offered £5,000, provided the council gave a free site. There was no opposition to the application.

**Watford U.D.C.** (June 5th. Mr. A. A. G. Malet).—£7 948 to be expended on new sewers and street water mains.—Plans and all necessary details affecting the construction of the sewers and the laying of the water mains were furnished by the surveyor, Mr. D. Waterhouse.

**West Bromwich T.C.** (June 14th. Mr. P. M. Crosthwaite).—£4,500 for works of street improvement in High-street, Birmingham-road, Great Bridge-street, Dudley-street, Holloway-bank, Old Meeting-street, and Carter's-green. The borough surveyor (Mr. A. D. Greatorex) said the great increase in motor traffic in the last ten years had resulted in the centre poles being very dangerous, besides being inconvenient. Recently there was an accident to a mail van, which dashed into one of the poles, and they had had a number of other accidents.

**Whitwood (Yorks) U.D.C.** (June 13th. Mr. H. R. Hooper).—£3,300 for additions to the electric lighting undertaking.—It was stated that the first year's revenue was £180, and the expenditure £270, the deficit being paid for out of the rates. The inspector advised a careful keeping and publishing of accounts each year, so as to show exactly what the trading was. There was no opposition to the application.

### APPLICATIONS FOR LOANS.

**Batley T.C.** £16,395 for the extension of sewage outfall works.

**Bridlington R.D.C.**—£260 for the extension of the water main.

**Bridlington U.D.C.**—£1,500 for a new outlet sewer.

**Brierfield U.D.C.**—£1,625, further loan for sewage works extension.

**Egremont U.D.C.**—£4,000 for the extension of the gas-work.

**Featherstone U.D.C.**—£35,745 for the provision of 170 workmen's dwellings.

**Hale U.D.C.**—£3,740 for the purchase of buildings and land in adaptation as public offices.

**Harrogate T.C.**—£3,797 for street improvement purposes.

**Holyhead U.D.C.** £1,358 for part of a proposed sewerage scheme.

**Lepton U.D.C.** £2,420 for twelve workmen's dwellings.

**Macclesfield R.D.C.** £750 for sewerage works.

**Margate T.C.** £17,000 for a new pumping engine and pumps for the Wingham pumping station.

**Middlesex C.C.**—£1,850 for the purchase of a site at Southgate for a school, and £4,143 for relaying wood paving in Chiswick High-road.

**Morpeth R.D.C.**—£9,000 for a drainage scheme for Chevington.

**Norwich T.C.**—£9,700 for a new school.

**Oswestry R.D.C.**—£3,561 for the Weston Rhyn sewerage scheme.

**Prestwich U.D.C.**—£14,049 for surface-water drainage works.

**Ramsgate T.C.**—£1,680 for the provision of public conveniences.

**Stretford U.D.C.**—£6,000 for improving and widening Eagle-lane.

### LOANS SANCTIONED.

**Chester T.C.**—£14,000 for a hydro-electricity scheme.

**Church U.D.C.**—£5,465 for main sewerage works.

**Doncaster T.C.**—£8,000 for the extension of the water mains.

**East Ashford R.D.C.**—£3,400 for sewage disposal purposes.

**Ilfracombe U.D.C.**—£1,730 for cemetery purposes.

**Meltham (Yorks) U.D.C.**—£3,707 for a sewage disposal scheme, to be repaid in thirty years, and £210 for engines, to be repaid in fifteen years.

**Midsomer Norton U.D.C.**—£603 for sewer extensions.

**Nelson T.C.**—£22,225 for new plant for the gasworks.

**Reading T.C.**—£753 for the erection of a manual centre.

**Scarborough T.C.**—£2,500 for drainage works.

**Sutton-in-Ashfield U.D.C.**—£2,001 for private street works.

**Thornton U.D.C.**—£1,905 for private street works.

### FORTHCOMING INQUIRIES.

JUNE.

| | | £ |
|---|---|---|
| 24 | **Leyton.** For the electricity undertaking (Mr. F. H. Tulloch) ... ... ... ... | 1,300 |
| 25.— | **Abersychan.** For the provision of workmen's dwellings (Mr. Edward Leonard) | 26,000 |
| 25.— | **Chelmsford.** For road improvement purposes (Mr. Edgar Dudley) ... ... ... | 4,760 |
| 25.— | **Kingston-upon-Hull.** For depot and refuse disposal purposes (Mr. M. K. North) ... | 3,935 |
| 25.— | **Newton Abbot.** For water supply purposes (Mr. W. O. E. Meade-King) ... ... | 560 |
| 25.— | **Sheffield.** For works of sewerage and paving (Mr. R. H. Bicknell) ... ... | 28,920 |
| 25.— | **Silsden.** For sewage disposal works (Mr. R. G. Hetherington) ... ... ... ... | 550 |
| 25.— | **South Shields.** For the new municipal buildings (Mr. H. R. Hooper) ... ... | 8,850 |
| 26.— | **Chelmsford.** For water supply purposes (Mr. F. O. Stanford) ... ... ... ... | 6,350 |
| 26.— | **Chorley.** For sewerage and sewage disposal works (Mr. R. G. Hetherington)... | — |
| 26.— | **Cleckheaton.** For the extension of public baths (Mr. R. H. Bicknell) ... ... ... | 910 |
| 26. | **Dawlish.** For road widening purposes (Mr. W. O. E. Meade-King) ... ... | 350 |
| 26.— | **Featherstone.** For burial ground purposes (Mr. R. H. Bicknell) ... ... ... ... | 1,100 |
| 26.— | **Radstock.** For the provision of workmen's dwellings (Mr. Edward Leonard)... | 6,600 |
| 26.— | **Sunderland.** For electricity purposes (Mr. H. R. Hooper ... | ... |
| 27. | **Bootle.** For recreation ground purposes (Mr. Courtenay Clifton) ... | 803 |
| 27. | **Crediton.** For sewage disposal works (Mr. A. W. Brightmore) ... | 16,300 |
| 27.— | **Falmouth.** For street improvement purposes (Mr. W. O. E. Meade-King) ... | 665 |
| 27.— | **Fylde.** For reservoir purposes (Mr. P. M. Crosthwaite ... | 120,000 |
| 27. | **Manchester.** For street works and the construction of an aerating plant (Mr. M. K. North ... ... ... | 4,725 |
| 27. | **Newbury.** For the provision of workmen's dwellings (Mr. Edward Leonard) ... | 2,020 |
| 27.— | **Radcliffe.** For the provision of workmen's dwellings (Mr. Courtenay Clifton) ... | 26,610 |
| 28.— | **Carlisle.** For sewerage and sewage disposal purposes (Mr. H. R. Hooper) ... | 1,250 |
| 28.— | **Penzance.** For water supply purposes (Mr. W. O. E. Meade-King) ... ... | 2,350 |
| 28.— | **Widnes.** For street improvement purposes (Mr. M. K. North) ... ... ... | 17,200 |
| 28.— | **Yeovil.** For sewerage and sewage disposal purposes (Mr. A. W. Brightmore) ... | 3,540 |

JULY.

| | | |
|---|---|---|
| 3. | **Hornsey.** For the provision of steam laundry and disinfecting chamber (Mr. W. W. E. Fletcher) ... ... ... ... | 4,560 |

## DEVONSHIRE MAIN ROADS.

### THE QUESTION OF MANAGEMENT.

Devonshire County Council last week discussed a special report by the Bridge, Main Roads and County Buildings Committee recommending the adoption of the system of directly maintaining the main roads. The committee expressed the opinion that the time had come when, with a view to economy and efficiency, there should be a change in the present system of management. The committee were of opinion that the county should be divided into two divisions, with a chief surveyor for each division, that each division should be subdivided into not less than six subdivisions, with an assistant surveyor for each subdivision, each assistant surveyor to be responsible under the chief surveyor for the main roads in his subdivision.

Eventually an amendment was carried deferring the consideration of the matter until the resolution passed last year had been considered by the committee appointed for the purpose.

The council subsequently agreed to a proposition that in order to secure better supervision of the main roads, and the carrying out of the work required by the Road Board, the question of affording assistance to the county surveyor be referred to the Bridges, Main Roads and County Buildings Committee to bring up a report on the subject, and that in the meantime they be empowered to provide such temporary assistance as the committee think needful for the purpose.

**Slough Waterworks Purchase.**—On Tuesday the Slough Urban District Council received the award of the arbitrator, Mr. A. J. Ram, K.C., in the matter of the price to be paid for the acquisition of the local water company's undertaking. The water company claimed about £110,000, and the council expressed their willingness to pay about £90,000. The award of the arbitrator is £90,623.

**Huddersfield Town-Planning Scheme.**—The Huddersfield Town Council on Wednesday adopted recommendations of the Housing and Town Planning Committee that a town-planning scheme should be made for nine areas, that the town clerk should apply to the Local Government Board for authority to prepare a scheme for each area, and in due course for their approval of the schemes, and that four of the areas should be set apart for competitive schemes for three prizes of 100, 50, and 25 guineas.

**London Water Supply: Additional Reservoirs.**—In the course of the last meeting of the Metropolitan Water Board the Works and Stores Committee presented a report on the works to be authorised under the New Works Act of 1911, and recommended that reservoirs 6 and 7 should be undertaken. Reservoir 6, at Littleton, would have a capacity of 3,500 million gallons, and Reservoir 7, near Penton Hook, a capacity of 3,500 million gallons, with 15 acres of filter-beds at Kempton. The machinery would be capable of delivering 30,000,000 gallons of water a day, through a steel aqueduct from Kempton to Shepherd's-Hill. The pipe-line would be 15 miles in length. The first section would be ready in 1917. The cost of the whole scheme, of which this was a part, would be £3,481,900. The cost of the first section would be £1,646,400. Subject to approving of plans and estimates, the board decided that reservoirs 6 and 7 should be undertaken by the board.

# Municipal Work in Progress and Projected.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Bishop's Stortford, Cumberland £10,000, Shrewsbury £11,430; housing and town planning Ripley; roads and materials—Cardiff £30,441, Lambeth £14,500; sewerage and sewage disposal—Batley £16,395, Elham £4,450, Middlesbrough; water, gas and electricity—Southampton; miscellaneous—Ayr £16 000. —Particulars of other works projected will be found in our "Local Government Board Inquiries" pages.

## ADMINISTRATION.

**Scarborough T.C.**—A report has been agreed to recommending that labourers, asphalt makers, sewermen, estate workmen, gardeners, &c., should work an average of 2,600 hours annually—that was fifty hours per week on the average—and be paid 6d. per hour for hours actually worked, making the total wages £65 per year, or 25s. per week, £6 10s. per year more than they were receiving at present. They would have to work 137 hours more. As to sweepers and scavengers, the recommendation was that their hours be fifty per week, or 2,600 annually, and their pay £1 4s., which was £2 4s. more than they were receiving at present, and their hours were increased to 137 more. Cartmen and drivers, it was recommended, should not have their times altered, but that their wage be increased from 24s. 7d., which they now averaged, with extra money for night duty, to £1 5s., 2s. 9d. more than the amount paid by local employers.

## BUILDINGS.

**Bishop's Stortford U.D.C.**—With respect to the proposed public swimming bath at South Mill, it has been decided that in consequence of the amount of work at present in the hands of the surveyor, Mr. R. S. Scott, the sum of 25 guineas be paid for preparing plans, estimates and report in connection with the scheme.

**Cumberland C.C.**—The Education Committee have decided to spend upwards of £10,000 on school extensions in the Maryport district—at Maryport, Grasslot, Flimby, and Dearham.

**Evesham R.D.C.**—The tender of Mr. G. Field, of Blackheath, at £9,325, has been accepted for building sixty cottages.

**Falkirk T.C.**—Plans have been approved for the extension of the electricity works, at an estimated cost of £1,300.

**Llanelly U.D.C.**—The tender of Mr. T. Rogers, of Swansea, at £3,800, has been accepted for the erection of twenty-five workmen's dwellings.

**Midhurst R.D.C.**—Stonebridge, West Lavington, is to be reconstructed, at an estimated cost of £496.

**Newburn U.D.C.**—The Walbottle housing scheme is to be proceeded with, official sanction having been given to a loan for the purchase of the necessary land.

**Salford T.C.**—The tender of Messrs. W. Thorpe & Son, of Manchester, at £1,369, has been accepted for alterations at the electricity works.

**Shrewsbury T.C.**—The council have adopted the report of a special committee recommending the widening of the English Bridge, a narrow camel-back structure that spans the Severn, known to all motorists going into North Wales as dangerous, but which is famous as one of the most beautiful bridges from an artistic point in the country. The cost of the work is estimated at £11,430.

**Stoke-on-Trent T.C.**—A shelter is to be erected in the market at a cost of £300.

**Teignmouth U.D.C.**—The question of extending the sea-wall at the Point is under consideration.

**Wigtown T.C.**—A bandstand is to be erected in the public square.

## HOUSING AND TOWN PLANNING.

**Erpingham (Norfolk) R.D.C.**—It was announced by the chairman that the Edgefield Housing Compulsory Purchase Order had been received from the Local Government Board. He understood it was the first of any such orders obtained by a rural district council in the United Kingdom.

**Esher and the Dittons U.D.C.**—It has been decided to consider, at some time after the expiration of two calendar months, a formal resolution to make application to the Local Government Board for authority to prepare a town planning scheme for an area comprising about 1,500 acres, defined on a plan submitted by Mr. H. C. Fread, the surveyor, and to take at once the necessary steps preliminary to such application.

**Leominster T.C.**—The Local Government Board, while not condemning the plans for six cottages forwarded to them by the council, have sent one which they consider would be more economical and better meet the needs of the class of people for whom they were intended. Many councillors commented favourably upon the plan, and eventually the matter was referred to the Housing Committee.

**Maldens and Coombe U.D.C.**—It has been decided to serve and publish the statutory notices under the regulations of the Local Government Board (Articles I. and II.), of the council's intention, after the expiration of two months, to apply to the board for authority to prepare a town planning scheme in relation to lands lying in the parishes of Old Malden, New Malden and Coombe.

**Pembroke (Co. Dublin) U.D.C.**—It has been agreed to erect thirty-one cottages, at a rent of 4s. 3d. per week, and twelve cottages, at a rent of 4s. 9d. per week, at an estimated cost of £7,664.

**Ripley (Derby) U.D.C.**—The surveyor, Mr. G. W. Bird, recently submitted a plan for the erection of twenty-five dwelling-houses under the Housing of the Working Classes Acts, at an estimated cost of from £190 to £200 each, exclusive of the land. If, he said, the money could be borrowed as the Act authorised, the cost of land repayable in eighty years, and the cost of the houses in sixty years, the annual repayments would be £3 10s. per house, or £89 18s. 4d. as capital repayments on the twenty-five houses. On the other hand, the most advantageous policy to the council would be to borrow on the annuity system, and let the houses at an inclusive rental of 4s. 9d. per week. The council have approved of the scheme, and immediate steps are to be taken to secure land.

## PARKS AND OPEN SPACES.

**Falkirk T.C.**—The William Dawson Park, about 12 acres in extent, which has been secured, at an annual rental of £5 per acre, has been formally opened.

**Widnes T.C.**—It has been decided to lay out Pex Hill, a favourite resort of Warrington, St. Helens, and Liverpool picnic parties, as pleasure grounds, at a cost of £685.

## REFUSE COLLECTION AND DISPOSAL.

**Guildford T.C.**—It has been decided that in future dry trade refuse be collected free.

**Maldens and Coombe U.D.C.**—It has been decided not to proceed with the provision of a refuse destructor station and plant, in spite of the opinion of the surveyor, Mr. R. H. Jeffes. With due deference to the council, we venture to think their decision is unfortunate.

## ROADS AND MATERIALS.

**Bridgnorth T.C.**—The General Purposes Committee reported against the proposal to wood-pave High-street at a cost of £2,300, and recommended that the surface of the street should be temporarily repaired until the deputation had reported on the experimental lengths of different kinds of material and methods on a road leading out of Shrewsbury which the county council had in hand. This course was agreed to.

**Cardiff T.C.**—Councillor J. Mander, presiding at a meeting of the Cardiff Public Works Committee last week, said they had to face the question of an expenditure of £30,441 for hard-wood paving in certain parts of the city. Mr. W. Harpur (city engineer) said that the work would have to be done within the next two years. Queen-street, Castle-street, and Cowbridge-road were in an especially bad condition. The question was deferred for a month.

**Cockermouth R.D.C.**—Steps are to be taken to obtain an order of justices to acquire from the National Trust such land as may be necessary for widening the highway from Lodore to Rosthwaite in Borrowdale.

**Cowes U.D.C.**—The General Purposes Committee have been requested to consider the desirability of providing a motor water-cart with a detachable body, so that the motor could be used in the winter for ordinary carting purposes.

**Glamorgan C.C.**—The Roads and Bridges Committee have applied to the Road Board for a grant of £5,000 for the diversion and widening of the road between Baglan Church and the Swann Inn, Baglan, on the main road from Neath to Port Talbot.

**Kent C.C.**—There are at present several stretches of roads undergoing pitch-grouting—*viz.*, Harrietsham and Hollingbourne, and Wrotham Heath and Malling; working towards Maidstone, and also between Greenhithe and Swanscombe. The Maidstone and Chatham road has been completed.

**Lambeth B.C.**—Application has been made to the county council for the necessary sanction to borrow £14,500 for the purpose of carrying out certain paving work. The largest item is £6,789 for repaving Clapham-road with creosoted deal blocks.

**Leeds T.C.**—A special committee has given approval to a proposed local improvement which includes the construction by the corporation of a new thoroughfare in continuation of Calverley-street right through the heart of slum property to a junction with Fenton-street.

**Linlithgow C.C.**—The Road Board have agreed to make a grant of £750 towards the cost of the proposed improvements on the Linlithgow and Kirkliston road. The board have made a further offer to lend a sum of £5,000 to complete the system of strengthening the foundation and improving the crust of the Linlithgow-Kirkliston road. This loan would be free of interest, and repayable in five annual instalments of £1,000. It was stated that the board were desirous of assisting not only the strengthening of foundations, but also improving the surface crusts by the substitution of bituminous-bound for water-bound material.

**Lynton U.D.C.**—It has been agreed to pay the roadmen 6d. per day extra when engaged in tar-painting.

**Norfolk C.C.**—It has been resolved by the Eastern Highways Committee that no road tarring works be carried out that would pollute any stream. The county surveyor, Mr. T. H. B. Heslop, informed the committee that the road tarring committee had authorised him to purchase a certain quantity of a dust laying preparation which was stated to be quite innocuous to fish. He had purchased some of the material, and as soon as the weather cleared up, he would experiment with it.

**St. Austell U.D.C.**—Improvements are to be carried out in Tregonissey-road, at a cost of £385, towards which sum the rural district council will contribute £25.

**Shepton Mallet U.D.C.**—The county surveyor, Mr. R. T. Chapman, wrote pointing out the necessity for all possible precautions being taken to prevent pollution of streams and ponds in the carrying out of surface tarring, and stating that in the event of any claim he should not advise the county council to take any responsibility. In the circumstances the council decided that it was not desirable to tar-spray any of the roads this year, but they recommended that the surveyor, Mr. D. Hinchcliffe, be instructed to arrange for extra cleaning and watering over an extended area in dry weather.

## SEWERAGE AND SEWAGE DISPOSAL.

**Batley T.C.**—The sewage outfall works at Bradford-road are to be extended according to plans and estimates prepared by the surveyor, Mr. O. J. Kirby, at a cost of £16,395.

**Dawsbury T.C.** Sewage disposal works are to be constructed at Smithy Brook, at an estimated cost of £600.

**East Grinstead R.D.C.** The tender of Messrs. Hutchinson at £1,611, has been accepted for carrying out the Groombsbridge drainage scheme.

**Elham (Kent) R.D.C.**—A scheme for the treatment of the Lyminge sewage, at an estimated cost of £1,150, under consideration.

**Felixstowe U.D.C.** Fresh plans have been prepared for the extension of the Bath-road station by adding two additional ejectors, instead of one, as originally proposed, and for alterations and additions at the outfall works. The estimated cost of the scheme is £871.

**Frome U.D.C.**—The surveyor (Mr. F. W. Jones) has reported that the third and final portion of the sewage scheme is now completed. The estimated cost was £7,100, and the actual cost £7,786, showing an excess of £686. The excess was incurred for the reasons set forth by him in his report to the Local Government Board.

**Hollingbourne R.D.C.** The tender of Messrs. Kemp Brothers, of Rainham, at £2,899, has been accepted for the execution of a drainage scheme.

**Maldens and Coombe U.D.C.**—After consideration of a report by the surveyor, Mr. R. H. Jeffes, it has been decided to adopt the principle of installing at the sewage works a 50 h.p. Diesel oil engine, and to apply to the Local Government Board for sanction to a loan of £1,627. The Public Health Committee were of opinion that electric power or town gas were too costly for adoption; and that, while suction gas and oil engines each appeared to be of about equal cost for running power, the capital outlay for the latter was less than that for suction gas.

**Middlesbrough T.C.**—The borough surveyor, Mr. S. E. Burgess, has submitted to the Sanitary Committee a scheme for the laying down of a new sewer with pumping station, for the prevention of flooding the "Marshes" and Newport-road districts. It was proposed to instal a pumping station on the land owned by the corporation adjoining the Snowdon-road stables. Mr. Burgess adverted to the suggestion that conversion of privies into water-closets should be carried out at all houses and premises to which access for scavenging purposes was by narrow passages and common courts and yards, and said, as it was not possible to traverse those alleyways by sanitary carts, scavenging work was difficult and somewhat costly. The actual number of houses and premises of that nature was 8,735, and if all those were provided with a water-closet the total cost for installation would be, say, £48,042. Deducting from that £2,500 borrowed for the conversion of the Station-street area, and adding £4,457 for contingencies, the total cost would be £50,000.

**Risworth U.D.C.**—A new 9-in. sewer is to be laid from Booth Wood to Little Haven, at a cost of £450.

**Settle R.D.C.**—The sanitary surveyor, Mr. T. A. Foxcroft, has received instructions to prepare a plan for a public convenience.

**Tavistock R.D.C.**—Instructions have been given for the preparation of plans for a drainage system at Whitchurch, and a committee has been appointed to visit and report on the drainage of Clearbrook.

**Uxbridge R.D.C.**—The tender of Messrs. Stunt & Son, Yiewsley, at £80, has been accepted for the construction of settling tanks and bacteria beds at the Harefield sewage outfall works.

**Yeovil R.D.C.**—The sanitary surveyor, Mr. N. G. Fish, has submitted to the Local Government Board a scheme for the disposal of the sewage of East Coker, to cost £221.

## WATER, GAS, AND ELECTRICITY.

**Brechin T.C.**—It has been agreed, subject to the ultimate confirmation of their resolution, to adopt the Burgh Gas Supply Act and to offer the Brechin Gas Company the sum of £30,000 for the undertaking, including works, plant and goodwill.

**Brighouse T.C.**—The new tank at Hove Edge has been completed at a cost of £1,267. The Water Committee have congratulated the Chain Concrete Syndicate on carrying out the structure so satisfactorily. They also, the chairman stated, congratulated Messrs. B. Thornton & Sons, who fitted up the filtering apparatus, and Messrs. J. Blakeborough & Son for their work as regards the valves.

**Chelmsford T.C.**—With respect to the scheme of the borough engineer, Mr. P. T. Harrison, for increasing the efficiency of the pumping plant and reducing the cost of pumping, the council have approved the proposal for the installation of suction-gas plant at an estimated cost of £750. They have also adopted the plans prepared by the borough engineer for a building to accommodate the existing plant, and the suction-gas plant at an estimated cost of £1,000. The borough engineer estimates that the installation of suction-gas plant will effect a saving in the working expenditure, after allowing for the loan repayments and interest, of about £500 per annum.

**Coventry T.C.**—The accounts of the water department for the past year show a surplus of £6,945.

**Eastbourne T.C.**—Principally through the reduction in the charges and the increased cost of coal, the electricity undertaking did not yield so large a profit in the year ended March 31st as in the previous twelve months. The nett profit was £1,089, compared with £2,213 in 1910-1.

**Felixstowe U.D.C.**—A contract has been entered into with Mr. Haydn Harrison, of 11 Victoria-street, Westminster, for the conversion of the Promenade lighting from arc lamps to metal filament lamps, for the sum of £146, and it has also been decided to purchase a Harrison universal photometer for £13 10s.

**Southampton T.C.**—A report has been prepared by Messrs. W. Whitaker and Horace B. Woodward on the best means of extending the town's water supply, and the Parliamentary and Water Joint Committee recommend the purchase of land close to the waterworks to make a boring, as advised by the experts.

**South Shields T.C.**—The nett profit on the year's working of the tramway undertaking was £5,600.

**Stafford T.C.**—The net profit from the gas undertaking last year was £9,050, compared with £7,710 in the previous twelve months. From the electricity undertaking a nett profit of £639 was obtained.

**Wells T.C.**—A new scheme of lighting has been adopted, at a saving of £5 a year.

**Worcester T.C.**—The electricity accounts show a nett deficit on the year of £676, but it is explained that loans to the extent of £6,000 have been redeemed.

**York T.C.**—Negotiations have been commenced with a view to the purchase of the gasworks by the council.

## MISCELLANEOUS.

**Ayr T.C.**—It has been decided to extend the tramway system to Hawkhill, at an estimated cost of £16,000. The burgh surveyor and a committee which visited Leeds and Bradford have reported in favour of a system of railless traction, but this system will not be adopted in the Hawkhill extension.

**Glasgow T.C.**—The nett surplus of the tramway undertaking for the year ended May 31st is £52,067, compared with £68,678 for the previous year.

**Leamington T.C.**—A motor fire engine is to be purchased at a cost not exceeding £1,000.

## PERSONAL.

Mr. Arthur J. O'Connor, of Celbridge, has been appointed assistant county surveyor of Kildare.

Mr. Corbet Woodall has been elected president of the Institution of Gas Engineers for the ensuing year.

Mr. H. J. Chapman, of the borough surveyor's office, Hertford, has been appointed borough surveyor of Buckingham.

Mr. Ernest Rogers, assistant in Devonport Borough Surveyor's office, has been appointed surveyor and inspector of nuisances of Ottery St. Mary Urban District Council at a salary of £95, rising to £110.

Mr. G. P. Knowles, of 39 Victoria-street, Westminster, S.W., records another signal success, one of his pupils heading the list in the recent competitive examination for an appointment in the Valuation Office, Ireland.

Mr. Stanley Wilkinson, ASSOC.M.INST.C.E., resident engineer for Surbiton's new sewage disposal works, has been granted, by the unanimous decision of the district council, an honorarium of 50 guineas for extra work in preparing plans and specifications.

Mr. H. Ditcham, borough surveyor of Harwich, who has resigned after 39 years' service, has been presented with a silver rose-bowl by his fellow-officers. Mr. Ditcham's services are to be retained by the Harwich Corporation as consulting surveyor.

Mr. C. F. W. Marsh has been appointed surveyor to the Orsett Rural District Council. Mr. Marsh served his articles under Mr. S. A. Hill-Willis, engineer and surveyor to the Tilbury Urban District Council, when the latter was surveyor to the Orsett Council, and for the last two years has held the appointment as chief assistant.

Mr. R. S. Jemson, chief surveyor to the West Lancashire Rural District Council, has, we regret to state, died suddenly in his forty-sixth year. The council held a special meeting and adopted a vote of condolence with Mrs. Jemson, and a high eulogium was passed upon deceased, who was succinctly described by one speaker as an "ideal rural surveyor."

Mr. Roland C. Harris, the former Property and Streets Commissioner, has been placed in charge of the Works Department of the city of Toronto, at a salary of £1,600. He entered the service of the city as a junior clerk, and is now only 37 years of age. He will have full charge of the administration of the works and the waterworks departments, and will also retain control of the street cleaning department.

Mr. A. C. Beard, assistant in the department of Mr. R. H. Jeffes, engineer and surveyor of the Maldens and Coombe Urban District Council, who has left to take up an appointment in the Midlands, has been presented by the officers and staff with a clock, by the workmen with a silver-plated tea-pot, and by the officers and scholars of the Wesleyan Sunday School with a selection of useful books.

Messrs. C. R. Barlow, ASSOC.M.INST.C.E., city engineer's department, Cape Town, F. E. T. Cobb, ASSOC.M.INST.C.E., public health department, Melbourne, L. S. Mackenzie, ASSOC.M.INST.C.E., city engineer of Bristol, A. Palmer, P.A.S.I., engineer's department, Greenwich Borough Council, and A. L. Thomson, burgh surveyor, Leslie, Fifeshire, have been elected members of the Royal Sanitary Institute.

Mr. Sidney Palmer, chief assistant to Mr. H. C. Fread, surveyor to the Esher and the Dittons Urban District Council, whose appointment to the borough surveyorship of St. Ives we have already announced, was last week presented by the officials of the district he is leaving with a handsome vase and pedestal. The presentation was made by Mr. E. A. Everett, the clerk, whose laudatory remarks were endorsed by Mr. Fread and by Mr. G. C. Over, the sanitary inspector.

Mr. A. D. Greatorex, the president of the Institution of Municipal and County Engineers, desires us to state that on the second evening (Friday) of the forthcoming annual meeting he has arranged for a meeting of the Aedile Lodge, of which he is W.M., on the same lines as three years ago. Members who belong to the craft will be welcomed, and in order to permit of his making the necessary arrangements, Mr. Greatorex will be glad to have by July 1st the names of those who propose to attend.

Mrs. Mary E. Ewing, widow of the late William Bion Ewing, has (says the *Contract Record* of Toronto) the distinction of being the first woman recruit to the ranks of the civil engineers. She has taken up and is carrying to completion various sewerage and water supply schemes, costing approximately £100,000, which her husband had under way or in course of planning at the time of his death. Mrs. Ewing's training, we are informed, was secured by assisting her husband with his work throughout the twenty-five years of their married life.

Mr. E. J. Farrington, borough surveyor of Arundel, was publicly complimented recently by the mayor of that town upon his courage in rescuing a man from the river. The surveyor, said his worship, happened to to be on a steamer which was delivering the council's granite when one of the crew fell overboard. Mr. Farrington promptly took off his coat, jumped into the river, and brought the man to the mooring boat. He heartily congratulated the surveyor on his action, and proposed that it should be recorded on the minutes. The mayor mentioned that he was bringing the matter before the notice of the Royal Humane Society. The motion was carried unanimously.

Mr. J. Edington, the city engineer of Moncton, Canada, was born in Ayrshire, Scotland, in 1854, and was educated at various high schools and at the Athenæum Institute of Technology in Glasgow. For five years he was a student, and for two years assistant engineer with Messrs. Storey & Smith, civil and mining engineers of Glasgow. Later he acted as resident engineer on construction work for various British engineering firms, the projects with which he was connected being chiefly waterworks and sewerage systems. He had charge of considerable underground surveying in the Cleveland iron district in England. His last connection with the Old Country was as resident engineer on the installation of a waterworks system for Lanark, including a storage reservoir, service reservoir, leading and distributing mains. He went to Canada in 1883, and was appointed to his present post in 1895.

## FOR OTHER ADVERTISEMENTS
See End of Paper.

TO CONTRACTORS AND OTHERS.

The Council of the Metropolitan Borough of Wandsworth is prepared to receive Tenders for the Making Up and Paving of that part of Beechcroft-road, Balham, which lies between Upper Tooting-road and Glenburnie-road.

The Specification and Drawings may be seen, and the necessary forms of Tender obtained of the Borough Engineer, Mr. P. Dodd, M.INST.C.E., at the Office of the New Streets Department, No. 56 East-hill, Wandsworth, S.W., between the hours of 10 and 4 (Saturdays 10 and 12), upon payment of a deposit of Five Guineas.

Persons tendering must submit alternative Tenders for the execution of the work in accordance with the Specifications and Drawings "A" and "B" respectively.

Alternative Tenders, enclosed together in sealed envelopes, and endorsed "Tender for Paving Beechcroft-road," must be delivered at the Council House, East-hill, Wandsworth, S.W., and may be placed by the person tendering in the box provided for the purpose, not later than four o'clock in the afternoon of Monday, the 8th July next.

Persons tendering must in the case of all workmen employed by them in and about the execution of the Contract pay wages at not less, and observe hours of labour not greater, than the rates and hours recognised by the Associations of Employers and Employees and in practice obtained in the district where the work is to be executed.

No Tender will be received unless it be made upon one of the Forms provided for the purpose. The Council does not pledge itself to accept the lowest or any Tender. If required the Contractor must provide two sureties for the due execution of the Contract.

D. A. NICHOLL,
Town Clerk.

Council House,
Wandsworth, S.W.
June 19, 1912.

TO CONTRACTORS AND OTHERS.

The Council of the Metropolitan Borough of Wandsworth is prepared to receive Tenders for the Making Up and Paving of the following New Streets—viz.:—

(*a*) Gatwick-road, Southfield.
(*b*) That part of Seely-road, Tooting, which lies between Mitcham-road and the Borough Boundary.

The Specification and Drawings may be seen, and Forms of Tender obtained of the Borough Engineer, Mr. P. Dodd, M.INST.C.E., at the Office of the New Streets Department, No. 56 East-hill, Wandsworth, S.W., between the hours of 10 and 4 (Saturdays 10 and 12), upon payment of a deposit of Five Guineas in each case.

Tenders, enclosed in separate sealed envelopes, and endorsed "Tender for Paving ——," must be delivered at the Council House, East Hill, Wandsworth, S.W., and may be placed by the person tendering in the box provided for the purpose, not later than four o'clock in the afternoon of Monday, the 8th July next.

Persons tendering must in the case of all workmen employed by them in and about the execution of the Contract pay wages at not less, and observe hours of labour not greater, than the rates and hours recognised by the Associations of Employers and Employees and in practice obtained in the district where the work is to be executed.

No Tender will be received unless it be made upon one of the Forms provided for the purpose. The Council does not pledge itself to accept the lowest or any Tender. If required the Contractor must provide two sureties for the due execution of the Contract.

D. A. NICHOLL,
Town Clerk.

Council House,
Wandsworth, S.W.
June 19, 1912.

WANTED, Contractor's Assistant. One thoroughly well up in new road construction, tar-macadam, tar-spraying, &c.—Apply, with testimonials, stating age, qualifications, and salary required, Box 1,166, Office of THE SURVEYOR, 24 Bride-lane Fleet-street, E.C.

WHITTINGTON AND NEWBOLD URBAN DISTRICT COUNCIL.

SURVEYOR OF HIGHWAYS.

Applications are invited for the appointment of Surveyor for the Whittington and Newbold Urban District.

The person appointed will be required to devote the whole of his time to the duties, and must have had previous experience of road construction and repair (including county main roads) and of the construction of sewage disposal works.

Applications in the handwriting of the candidates, stating age, full experience and qualifications, and salary required, accompanied by copies of not more than three recent testimonials, endorsed "Surveyor," must be received by the undersigned not later than the 13th day of July, 1912.

Selected candidates will have notice to attend the meeting of the Council, and reasonable travelling expenses will be allowed. Canvassing members of the Council, either directly or indirectly, will disqualify.

(By order)
H. J. WATSON,
Clerk to the Council.

32 Guardian-gate,
Chesterfield.
June 20, 1912.

BARNET URBAN DISTRICT COUNCIL.

GRANITE AND HOGGIN.

Tenders are invited for the Supply of any quantity up to 620 tons of 2½-in. Broken Granite of approved quality (the description of certified crushing strain to be stated in the Tender), delivered carriage paid in trucks at High Barnet Station (G.N.R.), at the rate of 120 tons per week, when required.

Also for any quantity up to 120 tons of Hoggin, in trucks carriage paid to High Barnet Station (G.N.R.), as may be required or ordered.

The lowest or any Tender will not necessarily be accepted.

Tenders on the official Forms (to be obtained from Mr. W. F. Wilkins, Surveyor to the Council, Barnet), endorsed "Granite" or "Hoggin," must be addressed to the undersigned and delivered at No. 40 High-street, Barnet, not later than noon on the 27th day of June, 1912.

Samples must be submitted with all Tenders.

H. W. POOLE,
Clerk of the Council.

June 19, 1912.

BOROUGH OF KINGSTON-UPON-THAMES.

GRANITE KERB, CHANNELLING, &c.

The Corporation invite Tenders for the Supply of Granite Kerb, Channelling, Setts, Cubes and Quadrants, such Stone to be delivered in bargeloads during the forthcoming twelve months from time to time as required.

Payments will, so far as practicable, be made monthly.

Tenders to be on Forms to be obtained of the Borough Surveyor, Mr. R. Hampton Clucas, at the Municipal Offices, where samples can be inspected.

The lowest or any Tender will not necessarily be accepted.

Sealed Tenders, endorsed "Kerb, &c.," to be sent to me not later than Wednesday, the 3rd July, 1912.

HAROLD A. WINSER,
Town Clerk.

Municipal Offices,
Kingston-upon-Thames.
June 19, 1912.

BOROUGH OF MALDON.

The Town Council invite Tenders for Providing and Fixing one set of 7-in. Treble Stand-Pipe Pumps at the Wantz-road Pumping Station.

Specification of the work may be seen, and Form of Tender obtained, on application to Mr. T. R. Swales, M.INST.C.E.I., Borough Engineer. Tenders, endorsed 'Tenders for Pumps," must be delivered at the Office of the undersigned not later than 5 p.m. on Tuesday, the 2nd of July, 1912.

The Town Council will not be bound to accept the lowest or any Tender.

F. H. BRIGHT,
Town Clerk.

Municipal Offices,
Maldon.
June 20, 1912.

# Institution of Municipal Engineers.

## THE MEETING AT THE LONDON AERODROME, HENDON.

The weather on Wednesday, the 12th inst., was wet and boisterous, but this did not seriously mar the success of the meeting of the members of the Institution of Municipal Engineers at the London Aerodrome, Hendon, at which papers were presented on aspects affecting aviation, the first entitled "The Structures of the Future in Relation to Aviation," by Mr. Horace Cubitt, A.R.I.B.A., P.A.S.I. (member); the second on "Some Suggestions for By-laws and Regulations in Relation to Aviation," by Mr. B. Wyand (secretary of the institution); and the third on "The Hydro-Aeroplane on Lake Windermere," by Mr. Arthur Goddard. The attendance of members, their ladies and friends, including representatives of many kindred institutions and associations, was large, and the majority were conveyed to Hendon in a number of motor vehicles chartered for the occasion. At the Aerodrome a meeting was arranged in one of the commodious hangars, at which the president, Mr. E. A. Stickland (borough surveyor of Windsor), presided, supported by Messrs. John T. Pegge, city surveyor of Durham, first president of the institution, A. Ernest Prescott, borough surveyor of Eastbourne, past-president, Horace Boot, vice-president, Henry C. Adams, vice-president, and A. J. Eason Pengelly, A. Winter Gray (Lambeth), Frank Cutler (Deptford), A. A. Pateson (Newcastle-under-Lyme), W. Bevan (Haverfordwest), John Robinson (Darlington), W. L. Carr (Ruislip-Northwood), H. C. H. Shenton (London), F. Mundy (Wednesbury), R. W. Jones (Carmarthen), members of the council of the institution. Among the members present were Messrs. W. H. Read (Greenford), E. E. Ryder (Bushey), A. J. Wilshire (Barnet), J. Ashurst (Newton), C. T. Fulcher (Shoreditch), B. A. Miller (Seaford), W. Harmer (Southborough), H. J. Dauglish (Bexley), W. N. Wood (Portsmouth), J. Randerson (Sevenoaks), J. H. Thomas (Edmonton), W. Whitehouse (Cinderford), H. J. Higgins (Lewisham), J. Lewis (Ynysybwl), W. H. Peat (London), P. G. May (Wednesbury), F. A. Pacey, Epsom), A. Paterson (St. Pancras), E. W. Ray-Jones (Enfield), E. C. Pearcy (Malton), A. W. Nye (Shoreham), D. C. Fidler (Hayes), John Forrester (Theale), W. J. Coleman (Maidenhead), P. R. Gibbs (Cookham), A. W. Broker (North Witchford), E. G. Thody (Buntingford), G. Simcox (South Mimms), T. Knight (London), J. W. Brook (East Ham), Horace Cubitt (London), L. Randerson (Strood), W. Hodson (Acton), E. Trevor (Bridgnorth), G. A. Penwill (Peterborough), J. S. Wooddisse (Shardlow), W. H. Flood (Hoddesdon), R. Grant (Kirkcaldy), T. L. Bewer (London), J. W. Greave (Heywood), E. F. Davis (Durham), J. W. Kirk (London); while others present included Messrs. Chas. Adams, assistant secretary to the British Fire Prevention Committee), L. Hill, secretary of the National Association of Local Government Officers, George Langridge, past-president of the Surveyors' Institution, A. J. Martin, president of the Institute of Sanitary Engineers, H. Percy Boulnois (London), Arthur Vernon, past-president of the Surveyors' Institution, Paul N. Hasluck, secretary of the Institute of Sanitary Engineers, J. Clive, of the Aerial League of the British Empire, H. Turner, of the Grahame-White Aviation Company, and Claude Grahame-White.

Among those representing local authorities were Messrs. A. R. Cotton and T. E. Ware (Epsom), J. W. Harrison and E. A. Freeman (Uxbridge), T. Hancock, J.P., and H. H. Cooper (Yiewsley), R. E. Westaway and A. E. Tingle (East Dean), Major E. A. G. Gossett (Chiswick), A. B. Lismer and H. S. Goodall (Edmonton), E. Bass and F. H. Villar (Swanscombe), G. Paine, J.P., and H. R. Brown (Southborough), W. H. Cooke and A. Hobbs (Luton), S. Freeman (Kent), C. Dudley-Lewis (Hayes), G. Butler Lloyd (Shrewsbury), Chas. Tuff, J.P. (Strood), W. P. Harding (Wood Green), D. A. Griffin and W. J. Bailey (Ealing), W. J. Boissonnade, R. Poulton, G. P. Pratt, S. T. D. Scammell, A. C. Crane and W. Hodson (Acton), G. H. Etherton (Portsmouth), E. R. Abbott (Ruislip-Northwood), G. T. Derry (Sutton), A. Laurence Houlder (Southall-Norwood), and J. Ruth Dixon (Wallington), and others present included G. A. T. Middleton (London), T. F. L. Gopsill, S. Scammell (Acton), E. F. Marshall (London), J. G. Hardy (London), R. Nelson (Sandgate), M. Wood (Strood), D. Miller (Sandgate), S. Powell (Cotwerke), J. West (London), J. Wallis (Hounslow), Sydney R. Vernon (High Wycombe), A. C. Meston (London), P. M. Fraser (London), Percy B. Tubbs (London), Victor Bolton (Bushey), H. P. Cover (Finchley), C. Chambers-Smith (London), G. B. Grave (London), J. W. Nicholls (Hoddesdon), H. F. Hunt (Hoddesdon), A. Reed (Potter's Bar), G. M. Parkinson, A. Squires, and B. Wyand, secretary of the institution. The total number present was 359.

### THE STRUCTURES OF THE FUTURE IN RELATION TO AVIATION.

By Horace Cubitt, A.R.I.B.A., P.A.S.I.

Although a treatment of the subject-matter of this paper may appear to be but drawing a bow at a venture, yet upon analysis some conclusions result which may not be very far from the mark. A necessary preliminary to theorising on the aviation structures of the future is a consideration of the structures of the present. These, of course, are met with at every aviation ground, and consist of the workshops in which the aeroplanes are constructed and repaired, and the "hangars," or, in plain English, the sheds in which they are housed. To call a spade a spade is an English characteristic—in spite of the preference of the clergyman of the tale for terming it a certain kind of shovel—and I see no reason why we should not call a shed a shed, and have done with it.

These buildings, workshops and aeroplane-sheds—as at present constructed, seem to be of a somewhat temporary character, the enclosures being of wood studding covered either with boarding or corrugated iron, and the roofs being light corrugated iron structures. This is only natural. In the early stages of any industry it is bad policy to erect buildings of too permanent a character, as it is very probable that a short experience will show that considerable alterations in planning and arrangement are required. But in course of time, when the twin industries of aeroplane construction and aerial transit are established as large factors in our national industrial programme, buildings of this slight construction will not suffice. When, in any industry, standard types of buildings have been evolved it is bad economy in the long run to have resort merely to the semi-permanent forms of construction. Corrugated iron in our climate must be painted every year or so, otherwise the galvanising wears off and the material rusts through. The cost of maintenance is thus very heavy, and even if the material is well painted a life of more than thirty years is hardly to be expected. These remarks do not apply in quite the same degree to buildings with boarded enclosures, but there is the risk of fire to be considered, and in consequence this method of construction is prohibited by practically all local by-laws, except in situations remote from other buildings. All things considered, there seems no reason to suppose but that, when our knowledge of the requirements has been evolved from experience, aviation buildings will be as permanent in construction as those now erected in connection with the motor-car industry.

#### FORMS OF CONSTRUCTION.

When consideration is given to the form which this permanent construction will take, it is, however, a question whether plain brickwork will hold its own, or whether it will have to give place to one of the more modern forms of construction. As regards the aviation workshops, these, in common with new workshops of other kinds, may very probably be constructed of a steel skeleton filled in with brickwork, or of that new combination of materials, reinforced concrete. Aeroplane-sheds, necessarily being, it is presumed, one-storey buildings of moderate height, will hardly lend themselves to steel-frame construction, but it would appear that reinforced concrete is particularly suitable for structures of this character. Experience in connection with the new General Post Office, and elsewhere, has shown that reinforced concrete is particularly suitable

for buildings requiring large areas of unencumbered floor-space. Therefore it may be assumed that it will in due course be largely adopted for the construction of aeroplane-sheds, particularly if it is possible, as I believe now to be the case, to form watertight roofs of this material without asphalte or any other kind of covering.

One special constructional point in the design of aeroplane-sheds, whether buildings of the present size or those of the much greater proportions which we may expect to see in the future, appears to be the doors or shutters to close the necessarily large main openings. At the London Aerodrome the constructors of the various aeroplane-sheds will be seen to have exercised considerable ingenuity in the design of the wooden doors. It is evident that if the ordinary practice of making two folding doors to the main opening of a structure were adopted in the case of an aeroplane-shed, such doors would, on account of the great size of the opening, be most unwieldy, and the task of manipulating them in a gale of wind would be positively dangerous. Hence the need for doors or shutters which can be folded into several sections. While such a contrivance as that of having wooden shutters with vertical pivots sliding in grooved iron bars at the top and bottom of the opening may be efficient enough to warrant its occasional adoption in permanent buildings, it seems probable that, in the best class of work, steel rolling shutters, similar to those adopted in tramcar-sheds will be employed. Such shutters need not be in large widths, and would thus cause no difficulty in operation, while the advantage of having the shutters entirely out of the way when not in use is very evident.

A further important constructional point which does not occur in modern aeroplane-sheds, but may be anticipated in future constructions, is the obtaining of large floor-spaces with the absolute minimum of columns or stanchions. At present the aeroplanes in use are comparatively small—that is, compared with those we may expect in the future—and it is not, I believe, customary to put a number of aeroplanes in one shed. But, in due course, when an enterprise with such a title as the London Aerobus Company is in full swing, each building at the company's depots will doubtless be constructed to contain a considerable number of aerobuses, and with these vehicles exceeding by many times the size of a modern biplane it will be necessary to keep the floor-space almost entirely free from columns. To effect this with due regard to economy will not be easy, but probably by a skilful use of reinforced concrete the problem will be satisfactorily solved.

Thus far the structures considered have been those for important aeroplane enterprises. But, with the development of the science of flying, it is to be anticipated that before very long venturous spirits will be seized with the desire of discarding their motor-cars for aeroplanes, and an aeroplane-shed will be a necessary complement to the outbuildings of a well-equipped house. The only special question which appears to arise in connection with such a building is the provision of a sufficient space for starting in front of the shed, it being an obviously difficult matter to "take wing" in the middle of a street of ordinary width, should such be allowed, as it probably will not be, by the responsible authority.

### Town Landing Stages.

The subject of the structures to be erected as workshops for the manufacture of and as sheds for the housing of aeroplanes makes no great demands on the imagination. Structures of this kind already exist as a guide, and, in any case, the uses to which the building are to be put are not such as to necessitate any startling departure in construction. When the landing stages to be erected in large towns are considered, a more difficult case for speculation occurs. That such landing stages will be necessary is almost certain. As soon as the risk associated with aeroplane flights has been reduced to a reasonable minimum the present prohibition of flying over towns will be removed, or at any rate modified so as to be made applicable only to the central portions. Since town arrival and departure stations will require to be erected in populous districts where land is of considerable value, it will be a financial impossibility to provide open space at ground level of sufficient area to enable aeroplanes to descend and ascend without running the risk of coming into contact with the adjoining buildings. Hence the necessity for landing stages a little above the level of the buildings.

When I came to give a little direct attention to the subject of the design and construction of these landing stages for aeroplanes, I found upon self-analysis that such impressions as I then possessed had been formed by the perusal of a few works of authors of "futurist" tendencies, who, in writing of the wonders of a coming century, had given free rein to their imagination, regardless of the result—so long as it was sufficiently extraordinary. Landing stages, as thus described, were to be gaunt steel structures with legs, like small Eiffel towers, dominating the country for miles around, and making our ordinary buildings look mere pigmies beside them. There is no reason, however, to think that we are coming to this. In the first place, we are not likely to get uncased steel structures, standing in the midst of ordinary buildings. Local authorities would hardly allow them because of the risk to adjoining buildings by their collapse in the event of a fire. Also we are not in ordinary cases, I think, going to have stages consisting merely of legs and a platform like a derrick. If, as seems certain, tall landing stages are to be erected in districts where land is very valuable, it will obviously be desirable to utilise the space below the landing stage—*i.e.*, to erect ordinary buildings upon it. But if the site is cleared, and the buildings and the landing stage are to be erected at the same time, the question will at once arise, Why not form them as one structure? If this is done, it will be obviously a waste of space to provide separate legs for the landing stage, as such stage can be easily supported on the walls or other enclosures of the building. Thus, prosaic as it may seem, the aeroplane landing stage of the future will probably be nothing more than a large and lofty building with a flat roof, on which and from which the aeroplanes will alight and depart. Lifts will of course be provided from the landing stage to the street level. The necessary waiting-rooms, &c., in connection with the aviation service will be placed in the top storey, and the lower storeys let as offices or for trade purposes.

It may be asked, How big are such aviation buildings likely to be? With aeroplanes of present-day size probably a landing stage 80 ft. to 90 ft. in width and about 200 ft. long would suffice to provide both departure and arrival platforms side by side. But, with the machines increased very considerably in size so as to be able to carry a fair number of passengers, it would seem that an area of at least 200 ft. by 200 ft.—nearly that of the Selfridge building, Oxford-street—would be required. Then there is the question of height. The ordinary limit of height for London buildings is 80 ft. to the top of the parapet *plus* two storeys in the roof, which results in a height of, roughly, 100 ft. from the street level to the ridge of the roof. Having regard to the desirability of being above all roof eddies, it would seem that the landing stage level should be about 120 ft. or 130 ft. above the street. This may appear an excessive height in a position where the surrounding buildings are comparatively low, but, except in a case where the immediately adjacent ground and buildings are in the ownership, or by some other means are under the control, of the body erecting the landing stage, it will be a questionable policy to erect a stage of less than this height. For, if such is done, there will always be the risk of its utility being jeopardised by the erection of new buildings, or the reconstruction of existing ones, to the legal limit of height.

As regards the form of construction to be adopted, neither brickwork nor stonework are suitable, if economy is a consideration. Both steel and reinforced concrete possess great advantages over the older forms of construction in the case of the erection of lofty buildings. As to which of these two forms of construction—a properly encased steel frame or a scientifically designed arrangement of steel and concrete—is likely to be adopted, it is hard to say. Probably both forms will find their supporters. A great deal has lately been written in praise of reinforced concrete, but the advantages of a steel frame for a lofty structure must not on this account be overlooked.

Although it would doubtless be desirable for all aeroplane landing stages to be erected and controlled by municipal bodies, it is not unlikely that in many districts recourse will be had to private enterprise. The persons responsible for the erection of the first landing stages will naturally be seen with ideas a little in advance of those of the general public, and leading members of municipal bodies are hardly able to move

in advance of public opinion. The need for private enterprise therefore arises. Possibly, in due course some of the existing transport companies may think it worth while to run aeroplane services in connection with their other enterprises, in which case they would presumably themselves erect landing stages. Or enterprising individuals in control of other commercial concerns may, with an eye to advertisement and increased business, take the initiative by erecting a landing stage in connection with their premises, recouping themselves for part of their expense by the receipts obtained from landing dues. The number of landing stages to be erected in any locality will be within the discretion of the local authority, as the consent of such body will require to be obtained to the erection of the stages if such exceed, as apparently they must do, the legal limit of height of ordinary buildings.

SITUATION OF AVIATION STRUCTURES.

A treatment of the aviation structures of the future is hardly complete without some reference to the situations in which they are likely to be erected. Having regard to the great distances that aeroplanes are able to cover in a few minutes, it seems reasonable to suppose that the sheds for the storage of the machines will be erected in the extreme outer suburbs of our towns, where land can be purchased at very little above agricultural value. The workshops will doubtless adjoin the sheds, but, of course, there will need to be a workshop or two in the heart of a town, so that urgent repairs can be dealt with without delay. The landing stages in towns of ordinary size will doubtless be erected in the centre of the inner commercial districts. It will then be possible for business men to come direct to their offices from country districts some twenty-five or thirty miles out in the short space of half an hour. In very large cities, in London especially, it is questionable whether the responsible authorities will not do well, for reasons of public safety and convenience, to reserve a small area in the extreme centre of the commercial districts within which flying is prohibited, the landing stages in such case being erected at intervals along the boundary line enclosing such area. There is a good deal to be said for such a restriction.

As an illustration of what is likely to take place when—it may be twenty years, it will certainly not be fifty years—aeroplane transit is established as one of the ordinary forms of locomotion, let London be considered. As regards the housing of the aeroplanes, the necessary buildings will probably be erected, for the most part, well outside the present county area. The land on the south of the Thames beyond Woolwich will probably be found to be especially suitable for the erection of aeroplane sheds and workshops, as it is cheap, and materials, machinery, &c., may be conveyed to it by water. The question of the situation of the landing stages in the inner districts of London is a very attractive one for speculative thought. If flying is to be allowed without restriction over the whole of London, the obvious position for the principal landing stages will be along the Oxford-street and Holborn route, from the Marble-arch to the Bank and on to Aldgate, this being the backbone of business London. The Strand route from Piccadilly-circus to the Bank, being next in importance, would of course be similarly served. But it is very questionable whether the erection of landing stages in the very centre of London should be allowed. The thought of fleets of aeroplanes converging on a landing stage at the Bank hardly suggests security. The tangle of traffic at the ground level at this point is sufficiently bad without the introduction of a further tangle in the air, with aerial police on point duty emulating the City police below. The reservation of a comparatively small area in the centre of London for ordinary surface and underground transit would tend to prevent any congestion of aeroplane traffic, with its obvious great dangers, and probable injurious effect on the subjacent locality. Such an area might be bounded on the north by the Marylebone, Euston, and Pentonville roads, on the west by a line following the ordinary omnibus route from Chapel-street *viâ* the Marble-arch and Hyde Park-corner to Victoria, and extended to Vauxhall-bridge. On the south the river would appear to constitute the natural boundary, and on the east a line could be arranged to extend from the City boundary adjoining the river, through Aldgate to the Angel, Islington. It will be seen that even with our present means of locomotion any part of central London can be reached in less than ten minutes from some point on this suggested boundary line. The extra time in transit which such a restriction would involve is therefore comparatively trifling, and the little inconvenience would be very greatly outweighed by the advantage of having this clear area reserved in the centre of the metropolis.

Experts are prone to differ, and on this question of the important aviation structures of the future, every one who has a knowledge of the construction of buildings is as much of an expert as any one of his fellows. For we are all on a level as being, at present, pure theorists on this subject. It is therefore by no means anticipated that the views here put forward will meet with general acceptance, but that useful and interesting divergences of opinion will arise in the discussion. Although the problem is one which the allied professions of engineering and architecture will be required to solve, yet very great interest will be taken in what the aviators themselves have to say. For on this subject they may be expected, if not to pay the piper, to have at least some voice in setting the tune.

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## SOME SUGGESTIONS FOR BY-LAWS AND REGULATIONS IN RELATION TO AVIATION.

By B. WYAND.

Little can be done in a paper such as this beyond the throwing out of a few suggestions; hence its title. Except for what I regard as a piece of "scare" legislation, I know of nothing in the way of regulations or by-laws in relation to aviation. That the matter is one of the utmost importance, calling for early consideration, this one attempt goes far to prove, for nothing is more deplorable or more likely to retard progress than legislation of a "scare" nature. We are having rather too much of the policeman lately, and there is danger of Russification—or at least of Berlinisation—if matters progress at their present rate. Our lives are, day by day, becoming more controlled by officials, and there are enough Acts of Parliament, by-laws, and regulations in force in the County of London alone to run a score of solar systems. Caution and restraint should, then, be exercised in the framing of new laws, and only those restrictions which reason and experience tell us are absolutely indispensable should be laid upon the practical application of the new science. Measures should not be other than temporary, and should be subject, for some long time to come, to enforced periodical revision. Aviation is even now in its infancy, and the swaddling-clothes of the infant are not proper apparel for either the adolescent or the matured man.

One word more by way of preliminary. I propose to deal only with this country, leaving international questions alone. I shall not touch, either, upon questions of State, and military and naval matters will therefore be beyond my scope. As regards the various craft of the air, my mind will be centred upon those of the heavier-than-air type. The balloon is already obsolete, and the fate of the dirigible balloon or "airship" is in the scales. In order to avoid needless repetition and tautology, it must be understood that the word "regulations" embraces Acts, by-laws, and regulations of every kind.

ADMINISTRATION.

Regulations may be administered, roughly speaking—(*a*) Nationally, by one special body; (*b*) by the county councils, or any grouping of them into boards; (*c*) by the various city, town, borough, urban, and rural authorities. Parish councils and similar bodies may be ruled out once and for all from any consideration here. An army of officials is employed by the various bodies; indeed, officials bid fair to outnumber the general public. "Policeman" is a convenient and comprehensive word to use, and by it I must be understood to mean the official of every rank and degree employed in the administration of regulations.

In administration by any other method than (*a*) the question of boundaries enters. It is easy to say: Retain the present boundaries; but these would have to be aerially projected, and the further *up* they went the longer they would become. The aerial projection of irregular boundaries may be regarded as a practical impossibility. A policeman standing here, in the Edgware-road, sees, at an altitude of a mile, a craft

which is breaking some regulation. Let us assume that he has means of determining, by a line drawn from the centre of the earth to the craft, the position, relatively to the earth's surface, of the craft. Now, unless this line goes through himself the vessel is not immediately over him, and all the time he is engaged upon his calculations the delinquent is travelling at anything from 50 to 100 miles an hour. Its location may be rendered still more difficult by the fact that at the point where he is standing two districts—the Hendon urban and the Kingsbury urban—abut. There is sound argument, I venture to think, in this *reductio ad absurdum*.

Precisely the same argument applies in lesser degree to administration by county—lesser, I say, because the proportion of mileage of boundary to area would be less. To still lesser degree it would apply to county groups, and we are thrown back upon the seaboard as the only practical line—practical because of the elasticity of such a boundary. Even then difficulties would arise; but with these a nautical police would be more competent to cope than would an inland force recruited largely from the plough-tail.

The national certainly appears to be the only sound system, with the one set of regulations applying to the whole country. Anything in the way of local regulations would be quite unworkable, and could but result in confusion and the harassment of the aviator. It would fall to the lot of the local authority to administer (at least for a time) the greater proportion of these national regulations; but that is quite a different thing to each authority administering its own.

LIFE AND PROPERTY.

The protection of life and property calls for first consideration in the framing of regulations. It is usual, of course, to place property first, the protection of life being deemed of small comparative importance in this country. We have a good example of this in the motor vehicle, the most modern device for the infliction of injury upon life and limb. The motorist may kill, practically with impunity, as many people as he pleases; but let him damage property and his punishment is a matter of certainty. A simple illustration will serve my purpose. A motorist in a tight fix has two alternatives presented to him. He must run into either a child or a plate-glass window. If he hits the child, and kills it, there will be an inquest and a lot of fuss certainly; but by saying that the car skidded, or the child hesitated—there are certain stock formulæ to meet such cases—he will clear himself of liability. If, on the other hand, he hits and smashes the window, nothing can save him from paying for the damage. Car-skidding is no defence then.

Now, we do not want a perpetuation of this state of things as regards aviation. It should be possible to prepare a comparatively simple code of regulations—I use the word in its widest sense, it must be remembered—under which action would be swift, cheap, and equitable. None of these can be obtained by legal process, as at present understood; and I am going to make a suggestion of a somewhat daring nature. I would suggest the formation of a society to which every person using the air (I need not amplify the expression) *must* belong. The society would not be a club in any sense of the word, for admission would be a right claimable by, nay, an obligation upon, every person holding a certificate. To this society every claim for damage as regards both life and property—I deal with life again further on—would come for consideration. Cases would be stated, witnesses examined, and so on precisely as in a court of law; but—and this is one of the most important features of my suggestion—no professional pleader would be allowed admittance. I would absolutely bar every member of the legal profession, and this merely in order to save the waste of time, the expense, the delay, and the tricks and devices which are such features of the law-courts to-day. There would necessarily be the right of appeal to the courts, failing satisfaction with any decision arrived at; but I venture to think that ninety-nine people out of a hundred would be only too ready to abide by a decision which allowed the winner to get what was awarded to him and the loser to pay only such sum as might be decided upon by way of compensation.

Apart from any question of regulations, some such society might be started voluntarily by aviators, a committee of its members sitting from time to time to assess in claims for damages. I am led to the conclusion of the practicability of some such scheme from the fact that balloonists have for years settled, without reference to the courts, disputes concerning damages to crops, and so forth, while making descents. What balloonists have done aviators can do, and the result would be the saving of thousands upon thousands of pounds annually in legal costs.

As regards the taking of life, this would, I am afraid, involve an appearance before the ordinary courts and amenability to the ordinary process of the law. There should, in my opinion, be punishment for the mere fact of killing. The person killed has been punished pretty heavily, and surely the killer can bear a little himself! Had hard labour followed as an invariable rule killing by motor, the number of deaths would have been surprisingly few. Aviators are, I am sure, the last people in the world to wish to see the old nursery saying "pigs may fly" come true, and the air-hog must be severely dealt with. Aviation is at present in the hands of experienced men. It will later become a popular sport, in which, of course, for many years, only the rich will be able to indulge. Money produces quite as many blackguards as does the lack of it, and a fine will be an utterly inadequate punishment for serious misconduct. There is this great difference, too, between motoring and aviation. In the former there is every possibility of being caught; in the latter the chance is most remote. When an unfortunate *is* caught, then, such an example will have to be made of him as to put the fear of the gods into the heart of his fellows.

STARTING AND LANDING.

It has been contended that aircraft should not be permitted to fly over large towns or assemblies of persons, but aviation will surely become too general to admit of any such restrictions. The usefulness of our railways has been seriously curtailed by the early fears of damage to towns, while motoring narrowly escaped being hampered by the flagman. Regulations as to aviation must, as I have already said, be universal for the country, and no exception-proved rule should be allowed to enter.

The two operations of starting and landing would appear at first sight to call for special treatment. To start from or land in a busy thoroughfare is a very different thing to performing the same operations in the open country! That goes without saying; yet precisely the same regulations could apply in both cases. Thus, if a man cared to start from Cheapside at midday, he should be at perfect liberty to do so, provided (*a*) that he created no obstruction, and (*b*) that he did damage to neither person nor property—both obvious impossibilities. In the same way, he might utilise the roof of the Bank of England on precisely similar conditions, although I fear that he would experience some trouble with the telegraph and other wires, unless the helicopter (or other principle) was in a more perfect state than it is now. My point is that any hard-and-fast lines, such as the application of certain restrictions to towns above a certain area or a certain population, and of certain other restrictions to small towns and country places, may at once open the way to grave dangers on the one hand and to harassing the careful and experienced aviator on the other.

Certain advantageous places for landing would, of course, be rendered prohibitive. Thus, public parks (and, to a less degree, public commons) would probably be barred as regards most of their area, and every man would, I presume, endeavour to reserve the right to prevent the use of his private property. Where then could the aviator descend?

Now, in this free and glorious country, we are kindly allowed the use of certain narrow ribbons of soil which have been converted into highways. I say "the use," as the soil of even these miserable ribbons is vested in the owners of the land on either side; indeed, with the exception of a few parks, for which fancy prices have been paid and for which enormous rates are levied—the whole of the country belongs to what is comparatively a handful of its inhabitants. And this same handful is not content with owning the surface of the land. It lays claim to the soil beneath and the air above; indeed, every holding represents a wedge of the universe, from the centremost point of the central fires (if there are any) to the uttermost bounds of the imponderable ether. A gentleman who supposed himself the owner of millions—he is now in a nursing home undergoing treatment—confided in me once that he

was much troubled about the passage of the stars through his property: indeed, if the men of this planet had painted the universe red, in the way of conquest, there would have been the possibility of endless litigation over the ownership of the fixed stars, which would at one time be within the diverging lines struck by Jones's property, at another time within those struck by Brown's, and so on. No litigation of this kind could ever now take place. The ownership of the air has been lost for ever to the "comparative handful," and even the sacred rights of game preservation will not permit of the shooting of aviators.

To come back to my point, however: Where can the aviator land? Really I am disposed to reply: Where he pleases. He certainly cannot be confined to the highways, like the motor, and while the country may be studded with special stations, there will always be times when, either through ignorance, accident, or stress of circumstance, the aviator will have to descend at the most convenient spot to hand. No regulations can compel him *not* to descend, and it would surely be better that he should land quietly and easily than, in endeavouring to reach some far-off station, come down with a bump. Possibly the owners of land will step forward in a true spirit of patriotism. Possibly—and very much more probably—they won't! What is the position then? I can see no other course than to put pressure upon them. It would of course be ridiculous to expect a man with only a small pleasure-garden to welcome descents into it; but the large estates, with thousands of acres lying comparatively idle, might be utilised for descents, subject to payment for any real damage done. Surely no one will argue that the highways are sufficient for the aviator, and it has to be remembered that the existing conditions of land tenure are somewhat antiquated and require serious revision Aircraft were never thought of when the system now obtaining was devised, and the vitality of a nation depends upon its moving with the times.

There should be scope for municipal enterprise in the provision of starting and landing places These would be controlled locally, but the regulations governing their use would be the same throughout the country, and while the dues (if any) payable by aviators would go to relief of the local rates, the amount of these dues should not vary.

It has been suggested that, as regards nations ownership of the air should not extend above a certain height. Thus, if the limit was fixed at 5,000ft., the space over this country above that altitude would be open to free occupation by the foreigner, while the space below would be prohibited territory to him. I fail entirely to see any sense in such a restriction. The time is fast coming when internationality must be a factor in civilised life. Insularity is fast giving place to cosmopolitanism, and it is only the cheerful idiot who now regards an Englishman as worth five Frenchmen. Aviation must above all things be international. The conquest of the air has thrown aside every barrier, and fences as high as heaven round a country would not keep out the aviator. For how is any such restriction as a national height limit to be enforced? If it is to be tried, why not carry the principle further and divide the air into national strata (one stratum for each nation), with right of way to reach them? This would be every bit as sensible as the other suggestion.

BUILDINGS.

Building by-laws are based mainly upon a model set prepared by the Local Government Board. Unfortunately—or fortunately, it is quite a matter of opinion—numbers of local authorities have no building by-laws, and any addition to or modification of the model would have effect only in those districts where by-laws had been adopted. It is clear that aviation buildings should be subject to the same by-laws in whatever part of the country they might be erected; consequently the administration of these by-laws could not be left to the local authorities, many of which would have no official to supervise the structural work. The county authorities should then administer them, and every county would work under the one code. A landing-stage should be a landing-stage, and not a Hastings landing-stage, a Cardiff landing-stage, or a Hendon landing-stage. I need not labour this part of my paper, as Mr. Cubitt has gone into the question of structures, and by-laws would have to be based upon the various types of structure.

London would doubtless claim exemption, but the claim should on no account be allowed. Her existing building by-laws are proof of her unfitness to legislate in this way. Too, the administration of the by-laws being in the hands of the county authority, it should not be delegated to the district surveyors, who act, to a great extent, independently of the county authority.

MARKS AND SIGNS.

The provision of these calls for no regulations. The Government has awakened to the fact that aviation must be studied for defensive purposes, and a system whereby its aviators will be enabled to locate their position must necessarily be established. I noted the other day that "a chain of naval aeroplane bases, extending from Dover along the east coast as far as the Orkneys, has been planned by the Admiralty." By means such as these will the first step towards the establishment of a complete system of signs and marks be taken, and the future must look after itself. The public can scarcely be expected to spend money in this way yet; but here again municipal enterprise may enter, and a few go-ahead, advertising authorities (such as Blackpool) may find it pay to indicate their position in some way.

Distinctive county marks such as those employed for motors—these marks have been suggested—do not appeal to me. They seem singularly devoid of application in the case of aviation. Marks should be rather at stated distances, and should correspond with the marks upon the maps specially prepared for aviators. What form these signs and marks may take is beyond the scope of this paper, as is the question of maps, which will doubtless now be prepared under the direction of the Ordnance Department.

TELEGRAPH AND TELEPHONE WIRES.

The practice of laying overhead wires should now cease. The danger to aviators even in daytime is obvious. Existing overhead wires should be laid underground as speedily as practicable, those at the greatest height being dealt with first.

It is possible that landowners will resort to wires for the circumvention of aviators desirous of landing. The confiscation of that portion of the estate upon which such wires were placed might work wonders; anyway, a strong regulation, carrying proportionate penalties, should be framed, and its administration left, as is that of the Barbed Wire Act of 1893, in the hands of the local authorities.

ADVERTISING.

Advertising in every form and shape should be prohibited on both buildings and machines. The possibilities of an aerial bill-posting company are too awful to contemplate.

NUISANCES.

Under the heading of nuisances fall acts or omissions which cause inconvenience, annoyance, or damage to others. And there may be plenty of these where aviation is concerned. To drop articles of a liquid or solid nature would amount to a nuisance, and the by-law against spitting, unless the act was performed at a fair height (and here the whole difficulty would arise), would have to be rigidly enforced. With the advent of large "ships" and long journeys, the question of the disposal of waste waters and matters will become a pressing one. Flying at an insufficient height above ground or buildings might certainly rank as a nuisance, as likely to cause fear and annoyance to persons and damage to property. Careless landing would come within the same category, but the fall of the aviator from his machine or of the aviator *and* his machine certainly would not!

Regulations, to be administered by the local authorities, will, I suppose, have to be framed dealing with the above and similar matters, and for the registration of craft and the carrying of identification numbers.

PASSENGER SERVICES.

Regular passenger services will be installed ere long, and the need will then arise for regulations as to construction of craft, qualification of crew, capacity, speed, rule of the road, height, landing, lights, storage of petrol, precautions in fog and bad weather, means of escape, and so forth. These are the kind of things that the Government will possibly refer to a committee of gentlemen expert in deep-sea soundings: anyway, it may reasonably be asked that someone having some experience of aviation be given a seat upon the committee. "Means of escape" opens up a large question

Possibly parachutes may be compulsorily provided in place of lifebelts, and the descent of a score or two of passengers would be an interesting sight!

CONCLUSION.

In view of the difficulty of policing the air, much must be left to the good sense and good taste of the aviator. A comforting thought for the landsman is that the major risk is run by the aviator in case of recklessness, and that he cannot, like the motorist, kill with impunity. He will therefore exercise greater caution. A society such as I suggest would go far towards the maintenance of decency and order.

I have said nothing in my paper as to the part which will be played by the municipal engineer in the aviation of the future. That it will be an important one there can be no doubt, and although many of the new duties will go to the county officials, there will still be quite enough left for those serving urban and rural bodies.

## DISCUSSION ON THE PAPERS.

The President said they were met there by the courtesy of Mr. C. Grahame-White and the directors of the Grahame-White Company to take part in the discussion of three papers which had been prepared for the occasion. He thought they were to be congratulated on the large number of ladies who had made their way to the flying ground that afternoon; and probably they did not attend so much to listen to the discussion as in the hopes of seeing some exhibitions of flying. Unfortunately the weather was quite against them, and he was therefore afraid there would not be much possibility of an exhibition of flying. There was a paper by Mr. Cubitt dealing with the structures of the future in relation to aviation—the construction of buildings to be erected in towns and villages for the purpose of receiving the aerial machines in the future. Then there was a paper by Mr. Wyand containing suggestions for by-laws for the regulation of aviation. Such regulations were generally made by the Local Government Board in a hard, cast-iron form, and though Mr. Wyand's suggestions might not be received with acclamation at the Local Government Board offices, he had put his ideas before them, and he was sure they would accord that gentleman a vote of thanks, though they might not approve all that he proposed. A paper on flying on water had also been prepared, and this was a subject that would probably be new to most of them, though on Lake Windermere it had been tried with a certain amount of success.

Mr. Horace Cubitt at the request of the president, briefly indicated the leading points of his paper (which was taken as read), and remarked that he had tried to be practical in dealing with what they were likely to get during the next twenty or thirty years in the nature of aviation structures. The paper seemed rather tame—tamer than he thought it would be—but as engineers they were practical people, and what they had to consider were the structures they were likely to get. He had not dealt with structures for military purposes, but he believed there were gentlemen present conversant with that part of the subject, and they would perhaps supply what had been omitted in the paper. Ten years ago such papers and such a meeting as that would have been looked upon as an absurdity. Events, as he suggested, had been moving quickly, and were still moving quickly, and in less than ten years' time they would probably be meeting on one of the town landing-stages to listen to a paper by the constructor on how he had solved the various problems involved.

Mr. B. Wyand said he wished it to be specially noted that his paper only dealt with suggestions. He did not pretend to give any particular form of regulation, Act of Parliament, or anything of that kind. The administration, he concluded, must be national; it was no use maintaining existing arbitrary boundaries in such a matter as aviation. He considered life to be more important than property, although in this country that doctrine did not seem to obtain as regarded motor cars. As to the operations of starting and landing, he would give a man full right to go where he pleased, subject to payment for what damage he might do. He had sympathy with the owners of land. He did not own any land himself, and he objected to being condemned to toil the dusty highways and admire what belonged to the other fellow. The aviator could avoid these and go where he pleased, and no system of fencing could keep him out.

Mr. H. Percy Boulnois (Member), observed that, as an old municipal officer and past-officer of the Local Government Board, it gave him great pleasure to open the discussion upon the papers. Their meeting that day was a new departure, and he might say that the whole matter was very much in the air. There was no doubt whatever that the time was rapidly approaching—indeed it had come—when they would have to take seriously into consideration the question of aviation. As to administration, which Mr. Wyand dealt with in his paper, that, of course, was an exceedingly difficult matter. They had to deal with quite a new order of things, and he did not see how the Local Government Board, with all its ability, could frame by-laws and regulations for flying. When a machine was in the air it could go where and how the aviator pleased, vertically or horizontally. In the town by-laws would be necessary with regard to landing. There again was a difficulty, because unfortunately, aviators had to land in a hurry—in too great a hurry, indeed, for they sometimes lost their lives. Something might go wrong with the machinery, and the aviator might have to come down at a place where there was no regular landing stage. There were many difficulties to be got over, but there was no doubt, at all events, that the aviator and the municipal engineer must come in touch with each other. If he might say so, the borough engineer had greater knowledge of the locality he controlled than any one else in the town, and he would have to consult the aviator as to places for landing, their position, gradients and surroundings; in fact, everything would have to be carefully considered. With regard to the buildings, there, again, the by-laws would have to be very elastic; the present by-laws would not allow buildings of the sort required. Probably all buildings in connection with aviation must be more or less isolated from other buildings in front in order to allow the aviator to get into the air. All of them felt that there should be some regulations with regard to the aviation ground, for, as they knew, there had been serious accidents on these grounds, particularly at Paris, where not very long ago the Minister for War was killed and other people seriously injured. There were many points that one could discuss, and these he should be pleased to go into, but he hesitated to do this, as time pressed. After all, he simply rose to commence the discussion, and he hoped as it progressed that they would hear something from the side of aviation as well as the side of engineering. He represented the engineering side, and it was to be hoped they would learn from aviators what had to be provided for.

Mr. G. Langridge (past-president of the Surveyors' Institution) observed that he really came to learn, because it had been suggested that the members of the Surveyors' Institution might have to deal with some of the matters mentioned in the papers. He promised that he would listen with great interest to the discussion, and report to his institution as well as his humble capacity would allow. Aviation was with us, and was likely to be with us still more in the future, and its regulation must of necessity be a matter of importance in this and other countries.

Mr. J. Clive (Aerial League of the British Empire) explained that the chairman of the league he represented was, unfortunately, unable to be present owing to a committee meeting, and proceeded to say that legislation in regard to aviation would have to be national. It was rather difficult to draw up regulations, and he quite agreed with Mr. Wyand that at the present juncture it was desirable to limit themselves to suggestions. Mr. Boulnois had mentioned the Paris accident, and that case would seem to suggest the necessity for making rules for the public rather than the aviator. After all, such accidents in aviation grounds would appear to belong to the question of the management of the aerodrome. He thought that under the head of by-laws there should be a provision for some sort of special appliance for the landing of aeroplanes. With respect to structures, it seemed to him probable that in a short time aeroplanes would be collapsible, and it would not, therefore, be necessary to provide so much space to house them. In this connection he mentioned that at the Festival of Empire there was shown an "aero cottage" provided with the necessary facilities for an aeroplane. He thought it would be imperative to provide permanent structures in towns for landing, as fragile structures like tents would be unsuitable.

Mr. A. J. Martin (president of the Institute of Sanitary Engineers) said he had brought with him a profound sense of ignorance of these matters, and he therefore attended as a learner rather than a talker. He confessed that he was much impressed with Mr. Wyand's able and interesting dissertation on the

question of legislation. He supposed they all agreed that, as time went on and aviation was practised by all sorts and conditions of men, in all sorts of ways, some regulations would be necessary. He trusted that when they did legislate they would not legislate in a panic. It was not an easy matter to legislate for a new industry. The motor car was an old institution in this country, and Parliament in its wisdom undertook to legislate for it. They would remember what form this legislation took. It was made compulsory that three men should navigate the car, the speed was not to exceed 4 miles an hour, and a man had to travel in front with a red flag. The result was that the motor car was legislated out of existence for the greater part of a century, and that the nation had to follow in the wake of Continental nations in so far as the motor car industry was concerned. It would be a national misfortune if, through anything working on the nerves of our very nervous Government, legislation of a similar nature was proposed in regard to aviation. As to structures, he would say that all of them who were concerned with putting up structures of any kind ought to have a very anxious thought for the gallant little army of pioneers of aviation who took their lives in their hands, and at all risks to themselves—sometimes to others, but more often to themselves—were with rapid strides bringing a new industry into a position of being *un fait accompli*. It would be regrettable if telegraph and other wires were to be a danger to the aeroplanist, and he thought they ought to insist that structures should be made as safe as possible for him; in fact, they should study his convenience as far as was reasonably possible.

Mr. T. FRANK L. GOPSILL (member of the council of the Institute of Sanitary Engineers) said that, although aviation seemed to lean to the side of romance, they were approaching to the point of practical utility, and it was time, therefore, that those who were responsible for the safety of the individual in the air and on the earth should consider how the aviator should fly and how he should land. He confessed he was interested in the idea of the structure Mr. Cubitt had placed before them, and he thought that gentleman's suggestion contained a germ that would ultimately develop in our towns, large and small. It must be evident that aviation merely as a sport could not find an outlet for all the genius and energy that were being put into it. It must become a matter of practical utility, used not merely in the country, but also in the town, and he felt that large buildings, such as Mr. Cubitt mentioned, would have to be built, with good, sound landing places, where aviators could land their machine in safety; and he did not see any reason why it should not be so arranged that the machine could be left there if necessary—that, in fact, there should be a sort of garage for aeroplanes. As Mr. Boulnois had pointed out, it was sometimes necessary for an aviator to land in a hurry, and that being so he did not think any obstruction should be placed in the way by any authority, either national or local, to prevent him landing in a field where he could do no damage. If, however, the aviator dropped down upon growing crop or a poultry farm, he must, of course, be held liable for the damage he did. The question of having a brake for the machine was outside the scope of the municipal engineer, but he thought it might be necessary that brakes should be developed and enforced by the authorities so that the aeroplane might be stopped in the least possible space. The great question, after all, was the requirements of the aviator, and that must develop as the aviator developed his business. When aviation became more a business than a sport the aviator would push up more and more again the public and the authorities representing the public, and it would become necessary to consider how far his push and energies would have to be restrained.

Mr. H. C. H. SHENTON (London) remarked that he attended with the idea of learning, and he was therefore afraid he could not say much of any particular value. There was only one matter he should like to speak about, and that had been mentioned by one of the speakers. Greater care, it was urged, should be taken to regulate structures which were likely to be a danger to aeroplanes or flying machines. There seemed to be no reason why the country should be covered by unsightly telegraph poles and wires. These were put up in a ridiculous and indiscriminate manner, and if attention was drawn to the matter it would be not only for the benefit of aviators, but also an advantage in improving the appearance of the country.

Mr. SCAMMELL (Acton) suggested that this was a subject that might appropriately be considered at a town-planning conference. It would be a question in the future of having no chimneys at all, and, of course, all wires would have to be done away with.

Mr. TURNER (of the Grahame-White Company), referring to the question of damage done to growing crops by the aviator, said that the damage was usually infinitesimal, most of it being caused by the unruly people who rushed after the aviator. As to enforcing brakes, he did not think that would be necessary, for they might trust the aviator to fix brakes as soon as it was possible to do it. He was thoroughly in sympathy with the remarks of Mr. Shenton with respect to telegraph wires. These were extremely dangerous, because it was so difficult to see them. It would perhaps be too much to ask that all overhead wires should be removed, but it would certainly be of great benefit to the aviator on a cross-country journey if a sheet or something of the kind was thrown over them in order to indicate where they were. He had known a low wire fence which could not be seen cause £100 damage to a machine. As to flat roofs, they would have to remain in abeyance for a long time. Unless the roof was 200 ft. sq. it would not as a matter of fact be much good to the aviator, and special launching gear would also be necessary, so that that was rather a large question.

Mr. JOHN T. PUGGE (city engineer of Durham) moved a vote of thanks to Mr. C. Grahame-White for his kindness in granting the use of the aerodrome for that meeting.

Mr. A. ERNEST PRESCOTT (borough engineer and surveyor of Eastbourne) seconded, and the proposition was carried by acclamation.

Mr. HENRY C. ADAMS (London), in proposing a vote of thanks to the authors of the papers, said that Mr. Wyand's paper had afforded him considerable amusement. The suggestions he made were quite up to date, and the paper was written in an interesting style, but he must say the time had not yet arrived when they were called upon to carry out Mr. Wyand's proposals. They were proposals that gave them something to think about. One difficulty that appealed to Mr. Wyand was the question of boundaries. The only trouble in that regard that occurred to him (the speaker) would be if anything dropped from the machine, or if it was flying too low or near structures. If a machine was flying so low as to be near structures, there would be no difficulty in fixing the locality, and if anything dropped it would fall in a straight line, and Mr. Wyand's policeman would be able to locate it. When he heard that Mr. Cubitt intended to read a paper on the structures, he felt interested to know how he was going to deal with the subject. He could now say, after reading the paper, that he was in accord with practically everything that gentleman had written. The buildings must be permanent, fireproof, and, he thought, reinforced concrete would be the material employed. The descent would call for considerable skill, but this was a matter in which experience was giving good results already.

Mr. HORACE BOOT (Tunbridge Wells) seconded the proposition, and remarked, on behalf of the institution and himself, that they were very grateful to the authors of the papers for what they had done, and also to those who had attended in such large numbers that day. Theirs was a new institution, and it was somewhat striking that a new institution should be so much alive, and should, indeed, be the first engineering institution to take an active interest and part in matters connected with aerial navigation. The object, of course, of the papers was to bring home to the municipal engineer and the public in general the necessity for preventing unduly hasty and unnecessary legislation in regard to aviation. When any enterprise was in its infancy the first man who was on the pounce for golden sovereigns was the lawyer. He was sorry if there were any lawyers present, but if there were they must, he thought, recognise that if there was one class of the community who put a spoke upon the progress of the future it was the legal gentlemen. They saw this in the Board of Trade regulations, and in their general government, so much so that if things went on as they were going on they would have to set aside certain hours for eating, and eating only. After referring in terms of regret to the death of Mr. Wilbur Wright, the speaker said he quite agreed with Mr. Wyand when he stated that a first consideration was the protection of life, but he did not agree with him when he suggested that the whole of the telegraph

and other wires should be placed underground. The chief objection to that would be the enormous expense involved. They might as a result of such a suggested law have to give up tramways. When aviation became a commercial industry then would be the time to consider the removal of telephone, tramway and telegraph wires. The question of advertising, which was touched upon in Mr. Wyand's paper, was important. He would suggest that rather than avoid advertising they might propose to the Government the expediency of taxing it, and thus benefiting the revenue. There was one point he would like to raise, and that was the question of accidents. He could not help feeling that a large number of the accidents that had happened to aviators could have been prevented if the engine power had been duplicated. In a case of four or six cylinder engines, two engines could be arranged to work independently of the others, so that if one set failed the aviator was not dashed to death, probably at the same time causing an accident to others. That was a matter which no doubt the people interested in aviation would give attention to. Many people who read Mr. Wyand's paper might imagine he was a Socialist, but he (the speaker) could assure them he was nothing of the sort. He was a very progressive man. If they read his paper carefully and analysed his statements they would find that, while some of his doctrines seemed to be Socialistic, they would also notice that he denounced the enormous growth of officialism, so that they saw he was not a Socialist after all.

Mr. Cubitt, in reply, said Mr. Martin laid stress on the contention that persons erecting structures ought to consider their position seriously, so as not to cause any risk to aviators. He (Mr. Cubitt) did not think they need worry about that. He would like to suggest to aviators that if they took the care in building their machines that people took in building structures they would be safer up in the air than they were at present. An accident to an aviator was caused by the wing of the aeroplane breaking. They did not hear of an accident to a house by the whole floor breaking through at the basement. He thought, therefore, it was desirable to increase the strength of the machines. As to the remark about collapsible aeroplanes, he would suggest that they were already too collapsible. However, the question of whether a machine should be collapsible or fixed would soon be settled so far as the financial aspect was concerned.

Mr. Wyand observed that he should like to have seen his paper torn to pieces by the critics, who, he added, had been too indulgent. His suggestion, he might remind them, was for temporary measures to be passed for a period of say, 7 [illegible] years, and to avoid the passing of Acts that might be used to the injury of the public for all time. The question of expense of removing telegraph wires alluded to by Mr. [illegible] was one that placed property before life. He (Mr. Wyand) contended that life was more important than the expense of placing wires underground. Then he should explain that tramway wires would not come under the head of telegraph and telephone wires. As to accidents, he thought they must trust to the good sense of the aviator, for [illegible] suffer from an accident quite as much as the public. Mr. Adams said that if anything fell from a machine it would fall straight to earth, and the "policeman" would be able to locate it. But suppose it hit the policeman? He thoroughly agreed with what Mr. Boot had said about legal gentlemen. He (Mr. Wyand) had had some experience, and did not like it. As to taxing advertising, he believed in direct taxation, and naturally he did not agree with Mr. Boot's proposition. He would lessen rather than add to the sources of revenue from taxation. With [illegible] occasion arose. Any man with sense must keep on altering his opinion. He would not remain of one opinion always.

Mr. Pearson, in a subsequent address referred to [illegible] with regard to the importance of [illegible] the engine to continue its life [illegible] the passengers were [illegible] He would, as a matter of fact, [illegible] certain radius. Then there was the question of weight [illegible] which was [illegible] important [illegible] The materials and [illegible] the machine [illegible] of the [illegible]

After tea, when the weather had considerably improved, a tour of inspection was made of the extensive hangars, workshops, and other buildings within the aerodrome, and subsequently several exhibition flights were given by Messrs. C. Grahame-White, Noel and H. Turner. As a fitting conclusion of the programme, the president, Mr. Stickland, and the secretary, Mr. Wyand, were taken up as passengers, the former by Mr. Turner, and the latter by Mr. Grahame-White.

## SOME RECENT PUBLICATIONS.*

Modern Destructor Practice. By W. F. Goodrich. Price 15s. nett. London: Charles Griffin & Co., Limited.

It is now some eight years since Mr. Goodrich's former work on this subject was published, and engineers will welcome the present volume in which the author discusses the progress that has been made and the many improvements that have been introduced in the meantime. In a preliminary chapter the author deals with certain alternative methods of refuse disposal, and rightly condemns in strong terms the practice of accumulating large quantities of refuse on the outskirts of a town. Then follows a well illustrated description of the leading types of British destructors. In discussing the various systems of charging destructors, a full comparison is given of the merits of the front, back and top feeds; while mechanical charging is also dealt with—and its disadvantages are clearly manifested. The 4th and 5th chapters deal with destructors in combination with sewage works and electricity works respectively, and in each case statistics of the various installations are given in tabular form. In the chapter on Refuse Destructors in the United Kingdom, descriptions and illustrations are given of a few of the most recent installations. A separate chapter is devoted to the important matter of the selection of a site, and the author then proceeds to deal with destructor specifications, pointing out the necessity for clearness of expression. The chapters on destructor design and operation, and the utilisation of residuals contain a mass of information with regard to the details of destructor installations. The book concludes with an account of the practice in the colonies and foreign countries. The whole is well illustrated and thoroughly up to date, and, coming from the pen of such an expert as Mr. Goodrich, it is hardly necessary to say that this book should be in the hands of every engineer who is responsible for destructor design or maintenance.

The Cheap Cottage and Small House. By J. Gordon Allen, A.R.I.B.A. Price 1s. 6d. nett. Letchworth: Garden City Press, Limited.

From all parts of the United Kingdom there is a continuous stream of reports relating to what would be little exaggeration to call a "cottage famine." Everywhere, both in town and country, the demand for small houses has long exceeded the supply. At last, however, there is every prospect of this unwholesome state of affairs being improved. For this book appears at a time when legislation has given local authorities wide powers in the way of cottage building, and when the subject is being discussed more than ever before.

The book has been written in non-technical language by a practising architect for those who are thinking of building—and building economically. The subject is dealt with right from the beginning—from the selection of the site, and such questions as planning, drainage, building materials, and especially cost, receive full treatment. Sanitary matters and building by-laws are explained, while some practical hints are given concerning town planning and cottage gardens. A feature has been made of a series of illustrations, which consist of plans, photographs, and drawings of cottages, costing £105 upwards. The price of building these dwellings has been included in all cases, and descriptions with diagrams of details are supplied.

The hand-book should interest the householder, landowner, estate agent, and those who have the carrying out of the Housing and Town Planning Act. In addition, the younger members of the building profession and students, as well as the social reformer, may find it of service.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

Laboratory Manual for Testing Materials of Construction. By L. A. Waterbury. Price 6s. 6d. nett. New York: John Wiley & Sons.

This book is really a series of notes intended for the use of students. They were originally prepared by the author, who is the Professor of Civil Engineering of the University of Arizona for students in the University of Illinois, where was formerly associated with Prof. Ira O. Baker. They relate chiefly to the testing of cement and concrete, but also include tests of other structural materials, such as iron and steel, wood, brick, asphalt, crushed stone, gravel and sand. They are elementary in character, but the problems appear to be well arranged. The book also includes eight appendices which relate to various reports on the testing of cement and other structural materials, taken from the "Proceedings" of the American Society of Civil Engineering, the American Society for Testing Materials, and other bodies.

A Simple Method of Water Analysis (Seventh Edition). By John C. Thresh, M.D., D.Sc., Department of Public Health, London. J. and A. Churchill.

Dr. Thresh's excellent little manual on "Water Analysis" has now reached its seventh edition. "Thresh's method," described in the publication, has been adopted both by the Admiralty and the War Office, and is largely used in civil practice both in this country and America. Dr. Thresh's book is a standard work, concise, thorough and reliable. It is well known to medical officers of health throughout the country, and, being slim enough to be slipped into the most crowded pocket, is particularly useful when making analyses at the source of water supply or when travelling.

The Effects of Errors in Surveying. By Henry Briggs, M.Sc. Price 5s. nett. London: Charles Griffin & Co., Limited.

In this book Mr. Briggs treats the theory of errors as applied to surveying chiefly from the mathematical standpoint. Nevertheless, his work has a great practical value, inasmuch as "the more a surveyor knows about the sources and nature of errors, the more likely he is to judge correctly of their relative importance." After an introductory chapter, and one dealing with the Analysis of Error, the author deals successively with the best shape of triangles, the propagation of error in traversing, the application of the methods of determining average error to certain problems in traversing, and the propagation of error in minor triangulation. The cost of the execution of any survey of considerable magnitude depends very largely on the degree of precision required, and, as Mr. Briggs observes, "no process of calculation which enables one to find out how time may be saved in the field without appreciable reduction of accuracy can be considered as being without value." The book is one of great mathematical and practical interest.

Messrs. Percival Marshall & Co., the publishers of "Meteorological Instruments and Weather Forecasts," by H. T. Davidge, B.Sc., M.I.E.E., ask us to state that the price of that book—a review of which appeared in our issue of the 31st ult.—is 6d.—"The Theory and Practice of Heating and Ventilation," by A. H. Barker, reviewed in last week's issue, is published by the Caxton Press.

**New Town Hall for Marylebone.**—The borrowing by Marylebone Borough Council of a sum of £70,000, repayable in thirty years, for the erection of a new town hall, has been sanctioned by the London County Council. The architect for the building has been instructed to proceed with the preparation of working drawings and specifications.

**Trees Along Highways.**—The New York State Department of Highways is to commence the systematic planting of trees along the improved highways under its jurisdiction. The department has bought recently 150,000 red oak seedlings and 15,000 Carolina white birch trees for the purpose. In taking this step the New York officials are following the excellent example set by the Massachusetts State Highway Commission. This commission for a number of years has been planting trees along its improved roads. It has had its own nursery and its own forester. Its tree planting has been done scientifically and systematically, and the results have been highly satisfactory. From *Engineering and Contracting*, Chicago.

## INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION.

### ANNUAL CONVENTION AT HARROGATE.

During the past week the annual convention of the Incorporated Municipal Electrical Association has been in progress, ending to-day. This year Harrogate has been the scene of operations, and in accordance with custom, the borough electrical engineer, Mr. George Wilkinson, has been appointed president of the association. The programme of papers is of considerable interest, attention having been directed particularly towards topics which are at present prominently before the eyes of central-station engineers and managers, such as the use of electricity for cooking, the propriety of relieving the rates out of the profits of municipal trading enterprises, and the efficient conduct of electricity works.

In his presidential address Mr. Wilkinson has covered a wide range of subjects, in each case putting forward interesting and instructive ideas. While he regards the position of electricity unassailable as the best illuminant indoors, and for main streets, he is not so positive as to its pre-eminence in side-street lighting, though in his own borough 650 out of 2,300 lamp-posts have been converted to electric lighting with tungsten lamps, costing, with renewals, the same amount per annum as gas lamps without renewals. He points out that the existing regulations for service cables are unnecessarily onerous, as by special permission of the Board of Trade smaller services have been employed in Harrogate with satisfactory results; another regulation against which he breaks a lance is that which limits the permissible variation of pressure to 4 per cent above or below the normal voltage, his argument being based upon the fact that, using metal-filament lamps, a variation of 7 or 7½ per cent produces less change in the light than 4 per cent did with carbon-filament lamps. Mr. Wilkinson advocates an increase of 50 per cent in the permissible variation, which would enable supply authorities to carry a correspondingly increased load without adding to their capital charges; but it may reasonably be replied that advantage should be taken of the good qualities of the tungsten lamp, not to increase the range of variation allowed, but to improve the lighting conditions by maintaining greater constancy of illumination. A passing reference to the benefits which contractors will derive from the "Further Powers" Bill of the I.M.E.A., to which they are bitterly opposed, is somewhat discounted by the fact that the Bill was dropped on Monday.

After pointing out a number of directions in which economy of fuel can be effected, the president concludes with a forecast of future practice in electricity supply, according to which the many small and therefore inefficient power stations now in operation will eventually be replaced by large works at the coalfields, from which electrical energy will be transmitted at high pressure to local sub-stations for all purposes. The address was a thoroughly practical one, and contained many valuable suggestions.

One of the first papers read was that of Mr. Frank Ayton, chief electrical engineer, Ipswich, forming the introduction to a useful discussion on the means to be adopted for securing reliability and maintaining continuity of supply—perhaps the most important question to which a supply engineer can devote his attention. Two papers on electric cooking were also read on Tuesday, an illustration of the interest which has been aroused in this subject. On Wednesday Mr. S. L. Pearce, chief electrical engineer to the Manchester Corporation, dealt with the question of rate reduction, and Mr. C. M. Shaw, of Worcester, with that of organisation; yesterday Mr. S. Watson, of Bury, discussed pressure regulators, and to-day the business meeting will be held, as the wind-up of an exceptionally interesting convention.

**Town Planning in Walthamstow.**—An application of Walthamstow Urban District Council for permission to prepare a scheme under the Town Planning Act was the subject of a Local Government Board inquiry held recently by Mr. T. Adams. The clerk to the council, Mr. C. S. Watson, explained that it was proposed to deal with nearly all the undeveloped land in the district, the greater part of which is in the Northern Ward. No estimate of cost had been made, but the council would act reasonably and would negotiate with the owners.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President*—Mr. Albert D. Greatorex, M.Inst.C.E., Borough Engineer and Surveyor of West Bromwich.

### EASTERN DISTRICT MEETING AT LOWESTOFT.

The programme of the Eastern District meeting to be held at the Town Hall, Lowestoft, to-morrow (Saturday), is as follows:—

11 a.m. Reception by the mayor, Mr. T. E. Thirtle, at the town hall.

11.45 a.m. Proceed from town hall by special car to view electric works, car sheds, destructor, corporation stables, and isolation hospital.

1.30 p.m.—Lunch at Royal Hotel, kindly provided by the mayor.

2.15 p.m.—Discussion on papers (which will be taken as read) entitled "Twenty-five Years' Municipal Work at Lowestoft" and "Lowestoft Sea Defences," by Geo. H. Hamby, borough engineer.

3 to 5 p.m.—View sea defence works, piers, esplanade, and parks, by brakes from Royal Hotel.

E. J. Elford,
*Hon. District Secretary.*

Southend.

### NORTH-EASTERN DISTRICT MEETING AT BRIDLINGTON.

A North-Eastern District meeting will be held at Bridlington on Saturday, June 29th.

PROGRAMME.

10.30 a.m.—Assemble at the town hall, Garrison-street, where members will be received by his Worship the Mayor (Alderman L. Mainprize, J.P.). District business, minutes, &c., papers by the borough surveyor, Mr. E. R. Matthews, Assoc.M.Inst.C.E., "Bridlington and Some of its Municipal Works and Undertakings," and Mr. Councillor Charlesworth, "Bridlington Waterworks."

11 a.m.—Discussion on papers (which will be taken as read).

12.15 p.m.—Visit Royal Prince's Parade, Victoria sea defences, Beaconsfield lavatories, and foreshore.

1.15 p.m.—Lunch at the Britannia Hotel, kindly provided by Mr. Frank Massie, M.Inst.C.E., district chairman.

2.30 p.m. (sharp).—Drive to the Marine Drive lavatories and shelter, Pembroke Gardens, fish stand, depot, nurseries, electricity works, and waterworks.

Tea will be provided at the waterworks by his Worship the Mayor.

5 p.m.—Arrive Bridlington.

The Property Committee of the Bridlington Corporation have kindly granted complimentary tickets for admission to the Royal Prince's Parade and Grand Pavilion during the week-end to those attending the meeting.

J. P. Wakeford, Assoc.M.Inst.C.E.,
*Hon. District Secretary.*

City Surveyor,
Wakefield.

### WEST MIDLAND DISTRICT MEETING AT STOURBRIDGE.

A West Midland District meeting is to be held at the Town Hall, Stourbridge, on Saturday, July 6th.

PROGRAMME.

10.30 a.m.—Assemble at the council chamber, town hall, where members will be received by the chairman of the urban district council.

District business, minutes, &c.

The following papers (which will be taken as read) will be discussed: "Some Municipal Works at Stourbridge," by Mr. F. Woodward, surveyor to the urban district council. "New Boring Operations for the Stourbridge and District Water Board, by Mr. W. Feldkan, consulting engineer to the board. "Description of Stourbridge Gas-works and Tar Plant," by Mr. C. H. Webb, engineer and manager Stourbridge gas-works.

12 noon.—Inspect the engineering works of Messrs. Jones & Attwood, and oil gas plant, and tar distillation plant at Stourbridge gas-works.

1.30 p.m.—Lunch at the Talbot Hotel, by kind invitation of the urban district council.

2.30 p.m (prompt).—A trip on the Kinver light railway, by kind invitation from the Dudley and District Tramway Company (destructor works and sewage pumping station can be seen *en route*).

3.15 p.m.—Start from Stewpony Hotel (by brake) and drive through the sewage farms belonging to the Stourbridge and Upper Stour Valley Boards.

4.30 p.m.—Inspect as many of the following as time will permit: Public baths, Rocmac road, free library, and secondary school buildings, and tar-macadam plant.

5.30 p.m.—Tea at the town hall, by invitation of Mr. Woodward.

H. Richardson, Assoc.M.Inst.C.E.,
*Hon. District Secretary.*

Council House,
Handsworth,
Birmingham.

### PRELIMINARY PROGRAMME OF ANNUAL MEETING.

*Thursday, July 11th.*

General meeting of the subscribers to the Orphan Fund.
Council meeting.
Annual general meeting.
Annual report of council.
Presentation of premiums.
Presidential address.
Adjournment for lunch.
Papers on municipal engineering work generally.
Evening. Dinner at the Hotel Cecil (ladies are especially invited to be present).

*Friday, July 12th.*

Papers on roads, &c.
Adjournment for lunch.
Alternative visits:—
Sidcup roads tests,
Hampstead Garden City,
The works of the London County Hall.

*Saturday, July 13th.*

Reception by Buckinghamshire County Council at County Hall, Aylesbury.
Local papers on roads.
Proceed by motor cars to Wendover and Halton to inspect the Chiltern Hills waterworks.
On return journey:—
Visit the Hon. W. Rothschild's museum at Tring.

Thomas Cole,
11 Victoria-street, S.W. *Secretary.*

## INSTITUTION OF MUNICIPAL ENGINEERS.

*President*—Mr. E. A. Stickland, Assoc.M.Inst.C.E., Borough Surveyor, Windsor.

### MEETING AT PETERBOROUGH.

A North-Eastern and Eastern Districts joint meeting will be held at Peterborough on Wednesday, July 3rd.

PROGRAMME.

12.15 p.m. Meet at Peterborough Station (G.N.R.).
12.56 p.m.—Leave Peterborough Station for Yaxley.
1.3 p.m.—Arrive at Yaxley Station and proceed to the Fletton Brick-making Work of Messrs. Eastwood & Co., Limited. An inspection will here be made of all the processes of brick manufacture, including grinding and screening of the raw material, moulding, pressing, drying and burning.
3 p.m.—A short business meeting will be held, at which the officers for the year 1912-13 will be elected.
4.13 p.m. Leave Yaxley Station.
4.20 p.m.—Arrive at Peterborough, where visits will be paid to places of interest in the town, to a programme now being arranged.

Members intending to be present are requested to notify their district secretary to that effect as early as possible.

### COUNCIL MEETING.

The next meeting will be held to-morrow (Saturday) at 3 o'clock.

B. Wyand,
39 Victoria-street, S.W. *Secretary.*

## ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

### JOINT MEETING AT SOUTHALL-NORWOOD AND HANWELL.

By kind permission of the Southall-Norwood and Hanwell Urban District Councils the members will have the privilege of visiting and inspecting the local sewage disposal works to-morrow (Saturday). Mr. S. W. Barnes, ASSOC.M.INST.C.E., will give a description of the Hanwell works, and Mr. Reginald Brown, ASSOC.M.INST.C.E., F.S.I., &c., will give a description of the Southall-Norwood works.

PROGRAMME.

2.30 p.m.—Meet at Boston-road entrance to sewage works, Hanwell, where the party will be met by Mr. Barnes and Mr. Brown, and proceed to visit works. After inspection of the works the party will adjourn to the town hall, Southall, where tea and light refreshments will be provided, and a paper will be given by Mr. Reginald Brown, ASSOC.M.INST.C.E., F.S.I., &c., engineer to the Southall-Norwood Urban District Council, on "Fixed Sprays *versus* Revolving and Travelling Sprinklers."

## ROYAL SANITARY INSTITUTE.

### ANNUAL CONGRESS AND EXHIBITION AT YORK.

The annual congress of the Royal Sanitary Institute, which is to take place this year at York, will open on July 29th. The proceedings will commence with a reception of the members and delegates in the Mansion House by the Lord Mayor, a public luncheon following, and in the evening the inaugural address to the congress will be delivered by the Archbishop of York.

On Tuesday, July 30th, a conference of municipal representatives and of engineers and surveyors will be held in the Exhibition Buildings, and on Friday, August 2nd, and the following day, the Engineering and Architecture Section will meet in the Museum. Mr. A. D. Greatorex, M.INST.C.E., borough engineer and surveyor of West Bromwich, will preside at the conference of engineers and surveyors, and the section devoted to engineering and architecture will have as its chairman Mr. J. Walker Smith, M.INST.C.E., chief engineering inspector to the Local Government Board for Scotland.

At the conference of engineers and surveyors discussions will take place on, among others, the subjects of Housing and Town Planning Progress, to be opened by Mr. H. Gilbert Whyatt, ASSOC.M.INST.C.E., borough engineer and surveyor, Grimsby, and Sewage Disposal in Rural Districts, to be opened by Mr. Ascough Rodwell, surveyor to the Skipton Rural District Council. The question of the modification of the Model Building By-laws from the rural point of view will be considered in the Engineering and Architecture Section.

The opening of the Health Exhibition arranged in connection with the congress has been fixed for Saturday, July 27th.

**Munificent Gift to Bacup.**—A handsome legacy has been bequeathed the Bacup Corporation (Lancs) by the late Mr. Edwin Hoyle, consisting of 26,000 sq yds. of land on the Moorland estate for a public park and recreation ground and a site for a new school. The value of the gift, which has been accepted, is £10,000.

**Road Schemes in the Lake District.**—The Executive Committee of the Lake District Association met at Windermere recently to discuss a project for the proposed coach road to connect the Westmorland portion of the Lake District with the south-west of Cumberland. The scheme comprises the reconstruction of the almost derelict road leading from Little Langdale over Wrynose Pass to Cockley Beck in Upper Duddondale; and thence over Hardknott Pass into Upper Eskdale; a total length of 7½ miles. There is also proposed a branch road, now a mere cart track, from Cockley Beck down Duddondale to Hinning House, a distance of 1¼ miles. The estimated cost of the scheme is £20,191.

## APPOINTMENTS VACANT.

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STEAM TRACTOR DRIVER.—June 22nd.—Cornwall County Council. 27s.—30s. per week.—Mr. Albert E. Brookes, county surveyor.

SURVEYOR AND INSPECTOR.—June 22nd.—Newmarket Urban District Council. £210 per annum.—Mr. S. J. Ennion, clerk.

WORKING ROAD FOREMAN.—June 22nd.—Cornwall County Council. 26s.—30s. per week.—Mr. Albert E. Brookes, county surveyor.

SURVEYOR.—June 24th.—Wetherby Rural District Council. £180.—Mr. E. H. Coates, clerk.

ARCHITECTURAL ASSISTANT. — June 24th.—West Riding County Council. £120 per annum.—Mr. J. Stuart, education architect, County Hall, Wakefield.

SURVEYOR'S ASSISTANT.—June 24th.—Corporation of Luton. £80 per annum.—Mr. Bruce Penny, town clerk.

ASSISTANT INSPECTOR OF NUISANCES.—June 24th.—Finchley Urban District Council. £120 per annum.—Mr. E. H. Lister, clerk.

ROAD FOREMAN.—June 24th.—Corporation of Coventry. £2 5s. per week.—Mr. J. E. Swindlehurst, city engineer and surveyor.

GENERAL FOREMAN.—June 25th.—Bethnal Green Borough Council. £200—£250 per annum.—Mr. C. G. E. Fletcher, town clerk.

ARCHITECTURAL ASSISTANT.—June 25th.—Corporation of St. Helens. £120—£150 per annum.—Mr. W. H. Andrew, town clerk.

ENGINEERING ASSISTANT.—June 25th.—Corporation of St. Helens. £2 per week.—Mr. W. H. Andrew, town clerk.

CLERK OF WORKS.—June 26th.—Rivers Committee of the Corporation of Manchester. £3 3s. per week.—Mr. Thomas Hudson, clerk.

SURVEYOR'S CHIEF ASSISTANT.—June 26th.—Esher and the Dittons Urban District Council. £120—£150.—Mr. E. A. Everett, clerk.

SURVEYOR'S ASSISTANT. — June 26th. — Llantrisant and Llantwit Fardre Rural District Council. £2 per week.—Mr. T. Saunders, surveyor, School-street, Pontyclun.

ASSISTANT TO COUNTY SURVEYOR.—June 29th. East Sussex County Council. £180 per annum.—Mr. F. J. Wood, county surveyor, Lewes.

HIGHWAYS FOREMAN. — July 1st. — Deptford Borough Council. £2 2s. per week.—Mr. V. Orchard, town clerk.

SURVEYING ASSISTANT.—July 1st.—Corporation of Manchester. £2 10s. per week.—Mr. Thomas Hudson, town clerk.

ASSISTANT SANITARY INSPECTOR.—July 1st.—Aberdare Urban District Council. £90 per annum.—Mr. Thos. Phillips, clerk.

BUILDING INSPECTOR.—July 4th.—Corporation of Warrington. £125 per annum.—Borough Engineer and Surveyor.

## MUNICIPAL COMPETITIONS OPEN.

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HALE.—June 28th.—Designs for a town planning scheme for the urban district council. Premiums of £50 and £25 are offered.—The Clerk.

REIGATE.—June 29th.—Plans and schemes for laying out and developing part of the Reigate Lodge estate, belonging to the town council. Premiums of 30 and 10 guineas.—Mr. Alfred Smith, town clerk.

PADIHAM.—June 30th.—Designs for town hall and baths. Premiums £40 and £20.—Mr. J. Gregson, surveyor.

DUSSELDORF.—July 1st.—Plan for the extension of the city. Premiums of £1,000 and £375 are offered. —The Chief Burgomaster.

CARDIFF.—August 6th.—Designs and estimates for fire station.—The Town Clerk.

GOOLE.—September 1st.—Competitive designs and estimates for municipal offices, for the urban district council. Two premiums (£30 and £15).—Mr. R. Tyson, clerk.

## MUNICIPAL CONTRACTS OPEN.

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### Buildings.

COLCHESTER.—June 22nd.—For the erection of a coal store, for the corporation.—Water Supply Committee.

HYDE.—June 22nd.—For the erection of public hall, police courts and offices, for the corporation.—Mr. Thos. Brownson, town clerk.

COVENTRY.—June 24th.—For the erection of a public mortuary, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

KEIGHLEY.—June 24th.—For alteration at public baths, for the corporation.—Town Clerk.

ESSEX.—June 24th.—For repairs and alterations to schools, for the Education Committee.—Mr. D. T. Williams, clerk.

MANCHESTER.—June 25th.—For the erection of conveniences, for the Parks Committee.—City Architect, Town Hall.

EDINBURGH.—June 25th.—For the installation of heating plant, alterations to boundary wall and railing, and fencing work, for the corporation.—Mr. T. Hunter, W.S., town clerk.

BIRSTALL.—June 25th—28th.—For the erection of public conveniences, for the urban district council.—Mr. Horace Gray, clerk.

WALTHAMSTOW.—June 25th.—For alterations and additions to two schools, for the Education Committee.—Mr. T. W. Liddiard, secretary, Education Committee Offices, High-street.

WEST SUSSEX.—June 25th.—For additions to cloak-rooms and other improvements, for the Education Committee.—Mr. Lionel Thompson, secretary, Thurloe House, High-street, Worthing.

WATFORD.—June 25th.—For the construction of a public convenience, for the urban district council.—Mr. W. Hudson, clerk.

KINGSTON-UPON-THAMES.—June 26th.—For additions to the electricity works, for the corporation.—Mr. Harold A. Winser, town clerk.

EDMONTON.—June 26th.—For repairs and painting works at the town hall, for the urban district council. —Mr. H. W. Dobb, architect.

BLACKBURN.—June 26th.—For extensions to administrative block at fever hospital, for the corporation.—Mr. William Stubbs, borough engineer.

NORFOLK.—June 26th—July 10th.—For enlarging and improving two schools, for the Education Committee.—Mr. Thos. A. Cox, secretary, Education Office, Shirehall, Norwich.

SOUTHAMPTON.—June 27th.—For the erection of corrugated-iron temporary school, for the county council.—Mr. H. Barber, clerk.

WINCHESTER.—June 27th.—For the erection of a lodge, conveniences, pavilion and band-stand, for the corporation.—Mr. T. Holt, town clerk.

LONGFORD (Leinster).—June 28th.—For the erection of forty dwellings, for the urban district council. —Town Clerk.

NEWBURN.—June 28th—July 1st.—For the erection of forty-eight houses at Walbottle, for the urban district council.—Mr. T. Gregory, surveyor.

STRATFORD-UPON-AVON.—July 1st.—For the erection of workmen's cottages, for the corporation.—Mr. R. Lunn, town clerk.

WORKINGTON.—July 1st.—For the execution of alterations to Carnegie Hall, for the corporation.—Mr. H. B. Williams, borough engineer and surveyor.

HENDON.—July 1st.—For the erection of a public mortuary and other buildings, for the urban district council.—Mr. S. S. Grimley, engineer and surveyor.

NORTH RIDING.—July 2nd.—For alterations at a public school, for the Education Committee.—Mr. J. C. Wrigley, secretary, Education Offices, Northallerton.

LUTON.—July 2nd.—For extensions at a public school, for the corporation.—Mr. B. Penny, town clerk.

EALING.—July 2nd.—Rebuilding footbridge over the Brent at Perivale, for the corporation.—Mr. Geo. E. Brydges, town clerk.

STEPNEY.—July 3rd.—For the erection of a bacteriological laboratory, for the borough council.—Mr. Geo. W. Clarke, town clerk.

EAST RIDING.—July 5th.—For the removal of existing bridge across the river Hull, near Beverley, and the construction of a new bridge, for the county council.—Mr. John Bickersteth, clerk.

WEST RIDING.—July 5th.—For the erection of caretaker's house at a public school, for the Education Committee.—The Clerk, County Council, County Hall, Wakefield.

THORNEY.—July 5th.—For the erection of cottages, for the rural district council.—Mr. W. Bell, surveyor.

ELLESMERE.—July 6th.—For the erection of cemetery chapel and convenience, and laying pipe sewer, for the urban district council.—Mr. T. W. Francis, clerk, Ellesmere Park.

BRIGHOUSE.—July 6th.—For the erection of public baths, for the corporation.—Mr. Jas. H. Rothwell, town clerk.

EAST SUFFOLK.—July 8th.—For the erection of schools at Stowmarket and Pakefield, for the county council.—Mr. W. E. Watkins, secretary, County Hall, Ipswich.

HACKNEY.—July 11th.—For the erection of a branch library, for the borough council.—Mr. W. A. Williams, town clerk.

### Iron and Steel.

BECKENHAM.—June 24th.—For the supply of wrought-iron railings and gates, for the urban district council.—Mr. F. Stevens, clerk.

LONDON.—June 25th.—For the supply of 7½ miles of low-tension cables and 3 miles of telephone cables, for the county council.—The Clerk.

ILFORD.—June 25th.—For the supply of tramway feeder cable, for the urban district council.—Mr. A. Partington, clerk.

DUBLIN.—June 27th.—For the supply of extra high-pressure and low-pressure cables, for the corporation.—City Electrical Engineer, Fleet-street, Dublin.

STEPNEY.—July 1st.—For the supply of ampere-hour meters, demand indicators, time switches, and arc lamp carbons, for the borough council.—Mr. W. C. P. Tapper, borough electrical engineer, 27 Osborne-street, Whitechapel.

DEWSBURY.—July 4th.—For the supply of one 1,000-kw. turbine, two 500-kw. direct-current generators, and jet-condensing plant, for the corporation. Mr. H. Ellis, town clerk.

ISLINGTON.—July 24th.—For the supply of 3,000-kw. steam turbine alternator, exciter, condensing plant, switch gear, and circulating and steam piping, for the borough council.—Mr. W. F. Dewey, town clerk.

### Roads.

CLECKHEATON.—June 22nd.—For making up a portion of Union-street, for the urban district council.—Mr. J. H. Linfield, clerk.

LEWES.—June 22nd.—For scarifying and steam rolling, for the corporation.—Mr. Montague S. Blaker, town clerk.

BIRMINGHAM.—June 22nd.—For the reconstruction of a road, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

EARSDON.—June 22nd.—For carrying out street work, for the urban district council.—Mr. J. R. MacMillen, Council Offices, Shire Moor, Northumberland.

NORTH WALSHAM.—June 22nd.—For the supply of broken granite, granite chippings and granite setts, for the urban district council.—Mr. E. J. Simpson, surveyor.

BEXHILL.—June 22nd.—For making up a new road, for the corporation.—Mr. T. E. Rodgers, Town Hall.

BARNSLEY.—June 24th.—For paving works, for the corporation.—Mr. Jas. H. Rothwell, town clerk.

WEST SUFFOLK.—June 24th.—For the supply of broken material for the main roads, for the county council.—Mr. W. Lionel Jenkins, county surveyor.

BRIGHOUSE.—June 24th.—For work of paving, for the corporation.—Mr. S. S. Haywood, borough engineer and surveyor.

ROMFORD.—June 24th.—For the supply of Norwegian kerb, for the rural district council.—Mr. T. W. A. Greenhalgh, clerk.

MERTHYR.—June 25th.—For the supply of limestone macadam, gravel and chippings, grey grit stone and chippings, basalt or basalt-macadam and chippings, and tar-macadam and chippings, for the corporation.—Borough Surveyor.

WIMBLEDON.—June 25th.—For making up certain streets, for the corporation.—Borough Surveyor.

WEST HARTLEPOOL.—June 25th.—For the construction of a roadway, for the corporation.—Mr. N. F. Dennis, borough engineer and surveyor.

SALFORD.—June 25th.—For sewering, paving and flagging, for the corporation.—Borough Engineer.

WANDSWORTH.—June 25th.—For wood paving and other works, for the borough council.—Mr. P. Dodd, borough engineer.

LEWISHAM.—June 25th.—For paving with granite setts, for the borough council.—The Surveyor.

MIDDLESBROUGH.—June 26th.—For making up a back street, for the corporation.—Borough Engineer.

CHELMSFORD.—June 26th.—For the retopping of footpaths, for the corporation. Mr. W. Smith, town clerk.

SCUNTHORPE.—June 27th.—For making up certain streets, for the urban district council.—Mr. Henry Metcalfe Hett, clerk.

GREENWICH.—June 27th.—For making up Kidbrooke-gardens, for the borough council.—Mr. F. Robinson, town clerk.

SURBITON.—June 27th.—For private street works, for the urban district council.—The Surveyor.

WATH-UPON-DEARNE.—June 27th.—For the supply of macadam, tar-macadam, kerbs, flags and setts, for the urban district council.—Mr. J. H. Drew, engineer and surveyor.

HARROW.—June 29th.—For the supply of broken granite, granite chippings and gravel, for the urban district council.—Mr. P. Bennetts, surveyor.

LURGAN.—June 29th.—For the supply of concrete flags, for the town council.—Mr. F. W. Pollock, clerk.

HENDON.—July 1st.—For making up certain streets, for the urban district council.—Mr. S. S. Grimley, engineer.

HIPPERHOLME.—July 1st.—For the supply of macadam, for the urban district council.—Mr. G. W. Thompson, engineer and surveyor.

EAST BARNET.—July 2nd.—For making up and sewering several streets, for the urban district council.—Mr. T. A. Buckley, clerk.

GOOLE.—July 3rd.—For making up Humber-street, for the urban district council.—Mr. Robert Tyson, clerk.

HOVE.—July 3rd.—For paving and other works, for the corporation.—Mr. H. Endacott, town clerk.

NORTH DARLEY.—July 4th.—For the supply of granite, for the urban district council.—Mr. E. F. Lowe, surveyor, Darley Dale, Matlock.

GOOLE.—July 15th.—Making up a street, for the urban district council.—Mr. Robert Tyson, clerk.

## Sanitary.

LAURENCEKIRK.—June 24th.—For the construction of sewage purification works, for the corporation.—Mr. J. Craig, town clerk.

DENTON.—June 24th.—For the construction of stoneware pipe sewer and other works, for the urban district council.—The Surveyor.

SOUTH STONEHAM.—June 24th.—For the construction of main sewerage and sewage disposal works, for the rural district council. Mr. E. T. Westlake, clerk.

ALNWICK.—June 24th.—For laying cast-iron socket pipes and fittings, for the rural district council.—Mr. M. Temple Wilson, inspector and surveyor.

WATFORD.—June 25th.—For the supply of sanitary fittings to a public convenience, for the urban district council.—Mr. D. Waterhouse, engineer.

NEWPORT PAGNELL.—June 25th.—For laying cast-iron and stoneware sewers, and the construction of sewage disposal works, for the rural district council.—Mr. Charles W. Powell, clerk.

ASHTON-UPON-MERSEY.—June 25th.—For carrying out privy conversions, for the urban district council.—Mr. J. W. L. Foulkes, clerk.

ST. HELENS.—June 25th.—For the construction of semi-circular brick culvert and manholes, for the corporation.—Mr. A. W. Bradley, borough engineer.

SEDGEFIELD.—June 26th.—For work of scavenging, for the rural district council.—Mr. J. W. Lodge, clerk.

EASINGTON.—June 26th.—For laying stoneware pipe sewers, manholes and ventilating shafts, for the rural district council.—Mr. J. M. Longden, clerk.

ST. AUSTELL.—June 26th.—For the supply of glazed stoneware socket drain pipes, for the rural district council.—Mr. A. J. Blight, highway surveyor, Trelowth, St. Austell.

GREENWICH.—June 27th.—For the construction of stoneware pipe sewer, for the borough council.—Borough Engineer.

PETERBOROUGH.—June 29th—July 20th.—For the construction of sewerage works and pumping machinery, for the rural district council.—Mr. J. W. Buckle, clerk.

SOUTH MOLTON.—June 29th.—For laying 3,560 yds. of service mains, connection of house services, provision of valves and hydrants, and laying gas mains, for the corporation.—Mr. R. Louis Riccard, town clerk.

BLEAN.—July 2nd.—For the construction of about 12,689 yds. of stoneware and cast-iron pipe sewers, cast-iron rising and air mains, manholes and ejector chambers, for the rural district council.—Mr. J. E. Burch, clerk.

WILTON.—July 2nd.—For constructing cast-iron sewers, manholes and flushing chamber, for the corporation.—Town Clerk.

WOODFORD.—July 2nd.—For sewage works extension, for the urban district council.—Mr. W. Farrington, engineer and surveyor.

HOVE.—July 3rd.—For constructing new sewer, for the corporation.—Mr. H. Endacott, town clerk.

LYMM.—July 4th.—For the construction of outfall works and laying three miles of stoneware pipe sewers and manholes, for the urban district council.—Mr. W. Mullard, clerk.

DENTON.—July 6th.—For the erection of a gas engine, suction-gas plant, air compressor, ejectors, lime and sludge mixers, sludge presses, pipes and valves, for the urban district council.—Mr. W. Richards, clerk.

WALSINGHAM.—July 9th.—For the construction of sewerage and sewage disposal works, for the rural district council.—Mr. R. S. Butcher, clerk.

LONDON.—July 9th.—For the construction of egg-shaped sewer and cast-iron pipe sewer, for the county council.—Sir Maurice Fitzmaurice, chief engineer.

SEISDON.—July 10th.—For the construction of sedimentation tanks, filters, and other works at the sewage outfall site, for the rural district council.—Mr. H. Taylor, clerk.

## Stores.

LEEDS.—June 22nd.—For the supply of iron, steel, gas and pipe hooks, bolts, nuts, tin plates, tin ingots, shovels, coke forks, and oils, for the Gas Committee.—Town Clerk.

BIRMINGHAM.—June 24th.—For the supply of general and engineering stores, for the electricity department.—Mr. R. A. Chattock, city electrical engineer and manager, 14 Dale-end.

WELLINGBOROUGH.—June 25th.—For the supply of Leicester granite, granite kerb, best granite chippings, anthracite beams and nuts, stoneware pipes and gullies, patent paving slabs, coal, cobbles and lime, for the urban district council.—Mr. J. T. Parker, clerk.

ROTHERHAM.—July 8th.—For the supply of materials for the tramway department. — Tramways Manager.

## TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

ANERLEY.—For providing a parlour and storeroom at the Anerley Residential School for the deaf, for the London County Council:—

| | |
|---|---|
| L. Kazak, Belvedere | £510 |
| W. Johnson & Co., Limited, Wandsworth-common | 479 |
| W. Akers & Co., Limited, South Norwood | 456 |
| F. & G. Foster, Norwood Junction | 447 |
| J. Garrett & Son, Balham-hill | 425 |
| W. J. Mitchell & Son, Dulwich Village | 415 |
| J. Grover & Son, New North-road | 412 |
| J. & C. Bowyer, Limited, Upper Norwood | 395 |
| F. W. Fletcher, Tooting | 391 |
| H. Leney & Son, Penge† | 377 |

Architect's estimate, £389.

BLACKWALL.—For the renewal of the electrical installation at Blackwall Tunnel, for the London County Council: -

| | |
|---|---|
| Duncan Watson & Co., Berners-street | £4,464 |
| Drake & Gorham, Limited, Victoria-street | 4,304 |
| Pinching & Walton, Cannon-street | 3,604 |
| Tilley Brothers, Kingsland-road | 3,536 |
| G. E. Taylor & Co., Bush-lane* | 3,485 |

Estimate of the chief engineer, £3,560.

BLAYDON-ON-TYNE.—For scavenging work, for the urban district council:—

CHOPWELL DISTRICT.

| | |
|---|---|
| J. Bell, Chopwell | £590 |
| J. Howie, Ryton-on-Tyne | 550 |

BLACKHALL MILL DISTRICT.

| | |
|---|---|
| V. Charlton, Ebchester | £98 |
| J. B. Richardson, Ebchester* | 95 |
| W. Liddle, Ebchester | 81 |

BLYTH.—For new streets and sewerage works, for the urban district council.—Mr. R. Grieves, surveyor:—

| | |
|---|---|
| Brims & Co., Newcastle-on-Tyne | £8,992 |
| J. W. Henderson, Newcastle-on-Tyne | 8,351 |
| R. Hudson & Sons, Sunderland | 8,200 |
| J. McLaren, Junr., Gosforth | 7,335 |
| G. Armstrong, Whitley Bay | 7,252 |
| J. Lant, Newcastle-on-Tyne | 6,901 |
| R. Baxter, Blyth | 6,560 |
| J. Robson, Newcastle-on-Tyne | 6,499 |
| Walton & Moscrop, Gateshead | 6,280 |
| G. E. Simpson, Newcastle-on-Tyne* | 5,858 |
| A. Stark & Sons, Limited, Glasgow | 5,843 |

EAST GRINSTEAD.—For the construction of sewage disposal works, for the rural district council.—Mr. C. Turton, surveyor:—

| | |
|---|---|
| A. G. Osenton, West Horsley | £2,603 |
| F. H. Bingham, Groombridge | 1,761 |
| G. Wills, Turners Hill | 1,704 |
| Hutchinson & Co., St. Leonards-on-Sea* | 1,644 |
| E. Iles, Senr., Croydon | 1,614 |
| H. M. Blaker, Leatherhead | 1,607 |

Engineer's estimate, £1,669.

EVESHAM.—Tenders had been invited for two schemes, Scheme No. 1, for the erection of 30 cottages, and Scheme No. 2, for the erection of the whole 60. For the purpose of considering the tenders the council resolved themselves into committee. Twelve tenders were received as follows, the first sum mentioned after each name being for the erection of 30 cottages and the second sum for the erection of 60: -

G. Lough & Co., Birmingham, £5,079 and £10,111.
R. Bowen, Cheltenham, £5,900 and £11,600.
G. Field, Blackheath, Staffs*, £4,667 16s. 8d. and £9,325 13s. 4d
Tilt Brothers, Bromsgrove, £6,127 10s. and £12,242 10s.
J. Bridgwater & Sons, Cradley, £4,775 11s. 6d. and £9,422 13s.
A. H. James, Sutton Coldfield, £6,175 and £11,636 19s. 4d.
J. W. Smith, Erdington, £5,923 and £11,837.
Kirk and Randall, Woolwich, £5,475 and £10,838
H. Morgan, Birmingham, £6,354 11s. and £12,709 10s.
G. Henson & Son, Wellingborough, £5,642 and £11,269.
Epsley & Co., Limited, Evesham, £5,200 and £10,350.
Cliff & Co., Evesham, £5,490 and £10,850.

GOSFORTH.—For constructing rain-water sewer, for the urban district council.—Mr. G. Nelson, engineer and surveyor: -

| | |
|---|---|
| W. Turner, Benwell | £76 |
| H. G. Pullar, Hemsworth | 39 |
| W. C. Fleck, Gosforth | 38 |
| T. C. Usher & Co., Byker | 37 |
| Walton & Moscrop, Gateshead | 35 |
| G. E. Simpson, Newcastle | 30 |
| J. W. Henderson, Gosforth* | 28 |

LONDON.—For the laying of stoneware ducts, repairing, &c., in connection with the London County Council's tramways:—

| | |
|---|---|
| J. Mowlem & Co., Limited, Westminster | £2,369 |
| Reid Brothers, Engineers, Limited, City road | 2,077 |
| Aird, Limited, Westminster | 1,939 |
| J. A. Ewart, Westminster* | 1,818 |

These prices include a provisional sum of £200 for extra works, if required. Estimate of the chief officer of tramways, £1,800.

LONDON.—For the supply of overhead poles required in connection with the extension of the tramways in East India Dock road:—

| | |
|---|---|
| Dick, Kerr & Co., Limited, Abchurch yard | £168 |
| J. Spencer, Limited, Wednesbury | 162 |
| V. Walworth & Co., Limited, Moorgate station chambers | 161 |
| Clough, Smith & Co., Limited, South place* | 157 |
| British Mannesmann Tube Company, Limited, Salisbury-house (incomplete tender) | 140 |
| British Mannesmann Tube Company, Limited, Salisbury house (incomplete tender) | 137 |

Estimate of the chief officer of tramways, £146.

MALDENS AND COOMBE.—For the improvement of Kingston-road the following tenders have been accepted:—

Kerbing, channelling, forming carriageway, footway foundations, and surface-water sewer.—Iles, Wimbledon, £1,235.
Paving the footway with artificial stone slabs.—Atlas Stone Company, Limited, Cambridge, £218.
Paving carriageway margin with tar-macadam.—J. Wainwright & Co., Limited, Shepton Mallet, £273.
New deal fencing and gates, and alterations to existing fencing. G. Blay, New Malden, £98.

It was pointed out that the total amount of these tenders was £1,824, and the estimate of the surveyor, Mr. R. H. Jeffes, as near as £1,841.

STEWARTON.—For carrying out a sewerage scheme, for the corporation.—Messrs. Elliott & Brown, engineers:—

| | |
|---|---|
| R. C. Brebner & Co., Edinburgh | £5,877 |
| Boyd & Forrest, Kilmarnock | 5,801 |
| D. Gibson, Glasgow | 5,700 |
| J. Urquhart, Uddingston | 5,569 |
| Shanks & McEwan, Glasgow | 4,895 |
| H. M. Murray & Co., Glasgow | 4,838 |
| W. Chambers & Sons, Motherwell | 4,736 |
| Crawford Brothers, Burnmouth | 4,714 |
| G. Chalmers, Rigg of Gretna | 4,623 |
| I. Crank, Glasgow* | 4,702 |

WALWORTH. For the formation of a hall for the girls' department of the Mina-road School, for the London County Council:—

| | |
|---|---|
| J. Appleby & Sons, Southwark-park | £1,152 |
| W. V. Goad, Camberwell-road | 1,022 |
| E. A. Roome & Co., Basinghall-street | 950 |
| J. Garrett & Son, Balham-hill | 908 |
| Woodward & Co., Wilson-street | 904 |
| T. D. Long, Deptford | 896 |
| Rice & Son, Stockwell-road | 895 |
| J. & C. Bowyer, Limited, Upper Norwood | 865 |
| Triggs & Co., Clapham | 859 |
| J. Marsland & Sons, Walworth† | 850 |

Architect's estimate, £775

WANDSWORTH.—For the conversion of the "Elliott" school into a central school, for the London County Council; part of the work consists of adapting and fitting up two practical workrooms adjoining the manual training and cookery centres:—

| | Alterations to buildings. | Fittings. |
|---|---|---|
| R. S. Ronald, Wandsworth | £208 | £480 |
| Triggs & Co., Clapham | 237 | 409 |
| J. Garrett & Son, Balham-hill | 200 | 437 |
| Pasterfield & English, Sunnyhill-road | 196 | 437 |
| F. & G. Foster, Norwood-junction | 195 | 389 |
| Lole & Co., Chelsea† | 191 | 389 |

Architect's estimates are £196 for the alterations and £389 for the fittings.

WARE.—For the erection of a brick urinal, for the urban district council:—

| | |
|---|---|
| F. Hitch & Co., Ware | £53 |
| E. D. Everard & Son, Ware | 51 |
| E. Dewbury & Son, Ware | 49 |
| G. T. Crook, Ware* | 48 |

## MEETINGS.

***Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.***

JUNE.

21.—Conference on Standardisation of Road Materials. Surveyors' Institution, Great George-street, S.W. 11.30 a.m.
21-24.—Junior Institution of Engineers: Visit to Sheffield.
22.—Association of Managers of Sewage Disposal Works: Metropolitan District Meeting, Southall-Norwood and Hanwell.
22.—Institution of Municipal and County Engineers: Meeting at Lowestoft.
22.—Institution of Municipal Engineers: Council Meeting, 39 Victoria-street, S.W. 3 p.m.
24.—Royal Institute of British Architects: Presentation of Royal Gold Medal. 8.30 p.m.
29.—Institution of Municipal and County Engineers: Meeting at Bridlington.

JULY.

3.—Institution of Municipal Engineers: North Eastern and Eastern Districts Joint Meeting at Peterborough.
6.—Institution of Municipal and County Engineers: Meeting at Stourbridge.
11-13.—Institution of Municipal and County Engineers: Annual Meeting, London.
13.—Institution of Municipal Engineers: North-Western District Meeting at Clitheroe.
25-30.—Royal Institution of Public Health: Congress in Berlin.
29.—Royal Sanitary Institute: Congress at York opens.

## APPOINTMENTS OPEN.

BOROUGH OF CHEPPING WYCOMBE

The Town Council invite applications for the appointment of Clerk in the Borough Surveyor's Department.

Candidates should be shorthand writers and typists and have good knowledge of accounts as kept in a Municipal Surveyor's Office. Salary £78 per annum.

Applications, stating age and qualifications, with not more than three recent testimonials endorsed "Surveyor's Clerk," must be delivered to the undersigned not later than noon on Wednesday, the 3rd July, 1912. Canvassing will be considered a disqualification.

T. J. RUSHBROOKE,
Borough Surveyor.

77 Easton-street,
High Wycombe.

# The Surveyor

And Municipal and County Engineer.

Vol. XLI. JUNE 28, 1912. No. 1,067.

## Minutes of Proceedings.

**The Manufacture of Road Dust (2).**

In our issue of May 3rd, p. 648, we remarked: "It is difficult to find any ground upon which the manufacture of dust on main roads or important secondary roads can be defended." We then alluded to things done on untarred roads, or previous to tarring, and intended either to keep the crust from ravelling or to maintain it in a condition fit for tarring. A practice which is in some respects worse is the manufacture of dust upon roads which have been tarred. If the tarring has been carried out partly on the understanding that the roads are to be made as nearly dustless as possible, it is very exasperating to the ratepayers and to the users of these roads to find that they are being deliberately kept dusty. Sometimes all that is done is to sweep back over the whole carriage-way the dust which has been driven to the sides by wind and by swift vehicles. One result of this operation, especially if repeated several times with the same material between heavy rains, is to produce dust which is much finer than that produced naturally. The practice is, of course, quite justifiable for a few days after tarring, the object then being to maintain a parting layer between freshly "rawed" surfaces of tar and the traffic. As soon, however, as the tar-film has properly set the extent of any advantage gained is small indeed, and, apart from the dusting, sanding, or gritting of actual wounds in the tar-film, we can find no excuse for the extension of this practice for weeks after the road has been tarred.

In some cases the tarred road is strewn with sand at intervals after tarring, the sand, mixed with dust and horse-droppings, being swept back from the margins over the carriageway from time to time. The fineness of the dust produced depends, of course, upon how many times the operation of sweeping back is repeated between heavy rains which remove the material, as well as upon the strength and direction of the winds. If it is intended by this means to force a little of the sand into the tar film we can only say that in so far as the suitable proportion of hard solids has not been incorporated with the tar when the road was tarred, the additional material may reasonably be added by strewing sand within the next few days, or, should they be cool and wet, on the first really hot day after tarring. Very soon, however, the condition of the tar and the rate at which the sand is scattered are such that very little of the material is forced into the tar, especially in the middle of the road. When the wind is strong, or when swift motor-cars pass, the partly ground sand is raised as an irritating gritty dust, and later on the ground sand, the natural dust, and the powdered horse-droppings form an unpleasant addition to the atmosphere of the roads and an unwelcome pervading film in wayside houses. We have not failed to notice that in some cases the roadmen take care to remove the coarser part of the horse-droppings, but the finer part is mixed with the dust and returned to the carriageway. After light showers much of the worse part of this manure is washed off the coarser particles in the strip of dust at the edges of the road, and, the surface being tarred, it does not escape as a liquid absorbed by the crust and septically destroyed therein, but it continues to play a part in the manufactured road dust.

We have not missed the point that by maintaining a layer of a sandy or dusty nature on the surface of the road the actual wear of the road-crust itself is reduced. This soon leads us, however, to a *reductio ad absurdum*. Man was not made for the road, but the road for man. In a report of the Massachusetts Highway Commission (quoted on p. 49 of *The King's Highway*), the average wear on about 32 miles of road for one year is given as 0·92 lb. per square yard. On one length the wear was only 0·06 lb. per square yard, the road having been "at all times kept covered with sand." But this type of road has not been accepted as a leading type in Massachusetts or in this country. Under the conditions of English main and secondary roads to-day the expense entailed by the occasional strewing of fresh sand and the sweeping back of dust from the sides is by no means inconsiderable; but the worst feature in such a case is not the cost nor the increase in tractive effort, which is quickly reduced again by the scattering of the sand, but is the resulting dustiness of the road, and the very evil nature of the dust formed by repeated sweepings and the long-continued action of traffic. It is simply not good enough to see clouds of artificially-produced dust raised by motor-cars on roads which were tarred some six weeks ago, and ought long since to have been in the dustless summer stage.

* * *

**A New By-law at Chelmsford.**

Steel construction has made such progress in this country during the past ten years that the steel-frame building seems likely to become a general feature in all our larger towns. Although the policy of consenting to the erection of buildings of this class under by-laws of the ordinary "model" type is not unusual on the part of local authorities, its regularity is very much open to question, and authorities will do well to extend their by-laws so as to cover this new form of construction. Such policy has already been adopted by the local authority at Chelmsford, a district which, once merely an agricultural centre, is now the headquarters of several large manufacturing concerns. A by-law framed by the council in regard to steel-frame buildings has been provisionally approved by the Local Government Board. It enacts that public and warehouse buildings may be formed of steel skeleton construction on the conditions that—(*a*) the framework shall be of sufficient strength to secure due stability, and shall be properly put together; (*b*) the framework shall be filled in with bricks, stone, good cement concrete, or other hard and incombustible material properly and solidly put together, and of such thickness as shall be necessary to secure due stability to such filling.

While the Chelmsford Corporation are to be congratulated on their attitude of thus preparing to deal in proper form with buildings of steel-frame construction, the terms of the by-law are rather

open to criticism. Shorn of all legal phraseology the by-law simply enacts that steel-frame buildings may be constructed provided that they are strong enough for their purpose—a provision which, however sound in theory, rather leaves matters up in the air. Presumably the local authority, acting under the advice of their surveyor, are to be the judges of whether or not the construction of any proposed steel-frame building is of sufficient strength. Local authorities, however, being rather too amenable sometimes to pressure from political sources, should hardly be given such *carte blanche* in regard to matters of construction. Our readers will doubtless shudder with us at the thought of what buildings might occasionally have been inflicted on unoffending neighbourhoods if the model code of by-laws, instead of containing very sound and detailed rules as to character of materials, thickness of walls, sizes of drains, pipes, and so forth, had merely consisted of a provision that every building should be constructed to the satisfaction of the local authority. It will be remembered that the provisions as to steel-frame buildings which are contained in the London County Council General Powers Act, 1909, and apply throughout the county of London, contain very detailed requirements as to loads to be allowed, safe stresses of materials, and thickness of panel walls, and so on. It would further appear that the Chelmsford by-law is intended to apply only in regard to the strength of the construction of steel-frame buildings, and that it will not be possible, under its provisions, to require the steel work to be encased. This is a further point in which the by-law appears rather open to criticism. The effectual encasing of steelwork with some fire-resisting material, such as concrete, is an expensive matter, and if not necessitated by the local regulations, it will probably not be done. But a lofty steel-frame building with the steelwork unencased will constitute a source of danger if it stands in the midst of other buildings. For in the event of a serious fire occurring in the steel-frame building, the steel, being unprotected, would undoubtedly twist and collapse, bringing down the whole building, and the fall of a lofty building in a crowded neighbourhood can hardly take place without the immediately adjoining buildings being involved in the catastrophe. The drafting of suitable by-laws in regard to steel-frame buildings in the less important towns is certainly rather a difficult matter. It is obviously undesirable to make such by-laws of too complex and extensive a character. On the other hand, it is possible to sacrifice too much to simplicity and conciseness.

* * *

**Municipal Engineering in Khartoum.**

To those who are in any way familiar with the present flourishing condition of the capital of the Sudan it is difficult to realise that Khartoum as it now stands has so short a history that it only began with the reconquest of the province in 1898, when the ruins of Gordon's old town were to a large extent removed and a new and modern city was laid out. The construction and rapid development of the new Khartoum have naturally provided a series of problems for its municipal engineer and his staff, which are discussed in a paper by Messrs. W. H. M'Lean and G. E. Hunt, ASSOC.M.M.INST.C.E., the municipal engineer and assistant municipal engineer respectively, published as part of the fourth report of the Wellcome Tropical Research Laboratories at the Gordon Memorial College. The first questions that arose were naturally connected with town planning. The general scheme was initiated by Lord Kitchener, the most striking feature being the diagonal streets, which appear to have been introduced primarily for military purposes. The new Khartoum has now almost extended to the limits of the original scheme of planning, and with the construction of the railway it became necessary to consider the lines of future development. The determination of these has been greatly facilitated by the fact that the greater part of the land surrounding the present town is Government property. The lines of future extension were laid down in consultation with Lord Kitchener at the time of his recent visit to Khartoum, and he has therefore been able to complete the scheme initiated by him in 1898.

The proper width of the streets is one of the first problems that presents itself in the development of a tropical city. Under certain conditions it may be permissible and even desirable to adopt somewhat narrow streets, but in Khartoum a liberal width has been allowed, especially in the main avenues. Thus the wind has free access to the houses, which is so necessary in the hot weather, when "air movement" must be obtained either naturally or artificially. On the other hand, there are certain disadvantages attaching to the wide streets, such as the increased cost of construction and maintenance, and the greater area of land required and the consequent spreading out of the city. The former difficulty is partly overcome by only macadamising the middle third of the wide avenues, leaving the sides as soft going for horses. Owing to the periodical heavy rains which occur in the tropics a special rain-water drainage system has to be provided, consisting of open trenches, except at street crossings, where steel pipes are used. In regard to buildings, the authors of the paper point out that much may be learnt from a study of the native type of dwelling, and although it may be necessary to modify it considerably to suit the European mode of life, many of the underlying principles should be maintained. In any case for Europeans adequate protection must be secured against both heat and light rays, and the rooms should be arranged as far as possible so that each gets a share of the prevailing winds.

The water supply and sanitation of a tropical city are obviously of the first importance, and it is interesting to learn that prior to the introduction of the present water supply in 1909 the needs of the population, both native and European, were provided for by water taken from the Nile and distributed by means of water bags slung on the backs of donkeys, or by water drawn from shallow wells. Khartoum is now supplied from deep wells, the pumping installation in connection with which is combined with the electric light power station. The development of Khartoum since 1898 has proceeded with considerable rapidity on thoroughly sound lines, and reflects great credit upon those who have been responsible for initiating and carrying out the various works and improvements which have been completed during the past fourteen years.

* * *

**The Standardising or Specification of Road Materials.**

Early in the year 1910 we sent to every road authority's surveyor and to every quarry owner in the United Kingdom a form of memorial in favour of the institution of a system of standardising materials used in highway work, and in a covering letter we explained the reasons for the memorial and its objects. This memorial and the letter will be found on the first page of our Special Roads Issue of April 22, 1910. We there stated that the intention in sending out the circulars was that a representative committee should be formed to put the matter forward and to appoint sectional committees to discuss the scheme in detail. There followed, on page 524, a short but very pertinent article by Mr. W. Howard-Smith, ASSOC.M.INST.C.E., containing a reference to a paper read by Mr. E. J. Lovegrove, M.INST.C.E., before THE SURVEYOR Conference of "Road Engineers and Road Users" held in 1907. In our issue of October 27, 1911, page 485, we dealt editorially with that part of the subject relating to the standardisation of sizes of quarry materials, and we endorsed the view of the United Kingdom and Whinstone Quarry Masters' Association that the best authority to carry out such standardising would be the British Standards Committee. Our efforts have been

successful, and the matter was taken up last Friday by a conference convened by the Standards Committee under the chairmanship of Sir John Wolfe Barry. Our readers will be somewhat surprised to learn from the official report of the conference, which will be found an another page, that the chairman stated that the Conference had *its origin* in an interview between himself and Sir George Gibb, chairman of the Road Board. Possibly some of the shiftless poor of London believe that the London water supply has *its* origin at the Water Board's office; but that does not matter, because they are not concerned with the collection and storage of the water. The collection and storage of opinions and facts with regard to the standardising of road materials is, however, a matter with which the members of the sectional committee now to be formed are specially concerned, and we think that the collection and storing already done by ourselves and in our pages, and involving the co-operation of competent authorities on the subject, is worth the attention of the delegates now officially convened.

As regards the scope of the investigation now to be undertaken, our readers will find that, as suggested by our remarks on page 546 of our issue of November 10, 1911, we regard the matter largely as one of specification of materials, both as regards sizes and as regards their composition, and we do not think that there is much to be gained by straining after standard methods or standard construction. The object should be to simplify the work of the responsible engineer, not to fetter his judgment. The most important part of the work should be the establishment of definite relations between names and things, especially as regards quarry materials. This applies not only to sizes, but also to specific gravity and mineral composition. The engineer, when buying road metal, should be able to rely upon a definite meaning being attached to such an expression as "$1\frac{1}{4}$ inch," he should know within definite limits the specific gravity of the single stone, as well as the volume of a ton of broken stone, and he should be provided with a specification, within definite limits of deviation, of the mineral constituents of the rock. If this is done well the committee will have justified its existence even if it does nothing else.

* * *

**A Generation's Record.**

The publications of the Surveyors' Institution are recognised as being of very considerable value, not only to members of the Institution, but to all persons who are concerned in any way with that extremely wide subject—surveying. The "Professional Notes," which appear at the rate of about three or four volumes a year, are of rather more interest than the "Transactions," which consist solely of papers read at general meetings, and reported, more or less fully, in the technical Press. The "Notes," which consist of short papers, numerous replies by members to queries on professional subjects, and reports of law cases, are not quoted in any other publication, and thus constitute a unique contribution to knowledge. But the surveyor nowadays is expected to keep in touch with so many subjects, and there is consequently so much literature which he feels he ought to read, that there is a tendency for him to give the matter up as a bad job, and restrict his reading to the news of the cricket-field and the latest national strike. Certainly it is a practical impossibility for even the most omnivorous reader to be fully conversant with all that it is to his advantage to know. Hence the very great value of all publications which attempt in any way to consolidate and co-ordinate the great mass of available information.

The latest volume of "Professional Notes" may thus be reckoned as by far the most important ever issued, as it consists, throughout the whole of its 300 odd pages, of nothing more nor less than an index of the "Notes" for the preceding twenty-five years. Persons unacquainted with literary work can have no idea of the labour which such a publication has necessarily involved. Very great praise is due to the staff of the Institution for undertaking such a work, and carrying it through to a successful conclusion. Any one possessing a copy of the book can, by turning to such headings as "Street," "Sewer," "Drain," and so forth, be directed to the whole of the information dealing with his subject, which the Surveyors' Institution, throughout the past twenty-five years—from 1886 to 1911—has thought of sufficient importance to make public for the benefit of its members. Or, if he desires to look up the law cases which have been contested by any particular person or body, he will find them all given in alphabetical order, and indexed under the headings of both plaintiff and defendant. Members of the Surveyors' Institution may consider themselves fortunate in possessing such a valuable record, and persons who do not belong to the Institution, but have a friend in easy reach who does, and who possesses the back volumes for a good many years, should bear this index-volume in mind as one to which, at some future time, when in search of information, they may be glad to have recourse.

* * *

**Mutual Aid and Protection: The Colwyn Bay Case.**

It will be remembered that at the recent meeting of the Institution of Municipal and County Engineers at East Ham, the president of that body, Mr. A. D. Greatorex, made allusion to the case of Mr. William Jones, engineer and surveyor to the Colwyn Bay U.D.C., who, as a result of the action which he took to clear himself from charges brought against him by a local newspaper, has been obliged to meet law costs amounting to about £240, having been unable to recover even the damages which were awarded him by the jury. In the annual report of the Council of the Institution, which will be presented at the forthcoming annual meeting, reference is made to the Mutual Defence Fund which it is proposed to establish for the protection of members in circumstances such as these. A complete scheme is in course of preparation, and will shortly be laid before the members for their approval; but in the meantime the council have started the fund with about £30, and are making an earnest appeal to members for their help. In the case above referred to they have already made a grant from the fund to assist Mr. Jones, and it is to be hoped that an immediate and cordial response will enable them to render further assistance. Donations, we may state, should be sent to, and will be duly acknowledged by, the secretary of the Institution, Mr. Thomas Cole.

* * *

**The Institution of Municipal and County Engineers.**

We print on another page of this issue the full programme of the thirty-ninth annual general meeting of the Institution of Municipal and County Engineers, which opens on Thursday, July 11th. As will be seen, the greater part of the business proceedings will be transacted in the Metropolis on the first two days, the programme on the Thursday and Friday including, in addition to the installation of Mr. R. J. Thomas as president, the reading of ten of the eleven papers which are to be submitted for discussion. On the evening of the first day the annual dinner will take place at the Hotel Cecil, and the afternoon of the following day will be devoted to visits in and around London, among the inspections of works arranged being one of the sections of road between Eltham and Sidcup undergoing test by the Kent County Council on behalf of the Road Board. Aylesbury, the county town of Bucks, and the home of the new president, will be visited on the third day. Those members of the Institution who belong to the Craft will be interested in the announcement which the retiring president makes of the arrangements for holding on the second evening a meeting of the Ædile Lodge of Freemasons, but all who intend to be present are requested to notify Mr. Greatorex without delay.

# Institution of Municipal and County Engineers.

## EASTERN DISTRICT MEETING AT LOWESTOFT.

Delightful weather favoured the meeting of the Institution of Municipal and County Engineers which took place at Lowestoft on Saturday last. The proceedings opened in the morning with an official reception at the town hall, following which the members made a tour of the electricity works, car sheds, corporation stables and isolation hospital. Two papers, "Twenty-five Years' Municipal Work at Lowestoft," and "Lowestoft Sea Defences," had been prepared by Mr. George H. Hamby, the borough engineer, for consideration, and the discussion of these was taken immediately after lunch at the Royal Hotel, the remainder of the day being devoted to an inspection of the interesting works of sea defence, the piers, the esplanade and the parks. Those present at the meeting included Messrs. J. Birch (East Ham), J. W. Cockrill (Great Yarmouth), H. J. Coleby (Atherstone), A. E. Collins (Norwich), H. Collins (Norwich), R. Croome (Cromer), E. J. Elford (Southend-on-Sea), A. D. Greatorex (West Bromwich), C. L. Hamby (Beccles), G. H. Hamby (Lowestoft), G. F. P. Harrison (Stowmarket), T. W. A. Hayward (Battersea), C. Herbert (Norwich), W. Jones (Colwyn Bay), W. Jones (Thetford), L. Leeper (Great Yarmouth), G. W. Lingwood (Stowmarket), P. MacQueen (Beccles), W. G. Powell (Norwich), W. H. Prescott (Tottenham), N. Scorgie (Hackney), E. Spurrell (Holborn), O. E. Winter (Hampstead) and H. Wood (Norwich).

In the course of his welcome to the members the Mayor (Mr. T. E. Thirtle) said he hoped that what they saw and heard and the air they breathed would give them some very happy impressions of his native town. In his experience some very large works had been carried out in Lowestoft. Sometimes they had taken the advice of outside experts, but he really thought they had now got into a different channel, and they were perfectly satisfied with their own engineer and his staff. He only hoped all the members would find that their councils had the same confidence in them as they put in their officials. He bid them a very hearty welcome.

The President thanked the Mayor for his very cordial welcome to the members of the institution. The institution visited many towns, not only in England, but in Scotland and Ireland, and always received a most cordial welcome from the towns they visited. It was very gratifying to the members of the institution to hear the mayor speak so highly of the borough surveyor. They were looking forward to visiting the works he had carried out, and from the drawings exhibited he was sure they would see works carried out in a thoroughly good engineering manner. He again thanked the mayor heartily for the very kind reception he had given them, and was assured they would carry away many happy recollections of the town and district.

The following papers were then submitted to the meeting:—

### TWENTY-FIVE YEARS' MUNICIPAL WORK AT LOWESTOFT.

By G. H. Hamby, assoc.m.inst.c.e., Borough Engineer.

Lowestoft is pleasantly situated on the coast of the North Sea, in the county of Suffolk, about 116 miles from London *via* Ipswich and East Suffolk branch of the Great Eastern Railway, 10 miles south of Yarmouth, and 23 miles south-east of Norwich. The town stands upon the most easterly point of England, and commands an extensive view of the sea. Lowestoft can claim antiquity, as it is said to have been a fishing station as early as the time of the Romans, but the ancient town was washed away at an early period by the ocean, for there was to be seen till 1534 the remains of a blockhouse, left dry at low water, about half a mile from the present beach. The origin of its name has given rise to various guesses not worth notice. In a Charter of Edward III. it is written Loystoft and Lowystofte. Being an ancient demesne of the Crown, it obtained from several monarchs various privileges, which were confirmed by Elizabeth and Charles I.; but they are now obsolete. The Lowestoft Improvement Act was passed in the year 1854, entitled, "An Act for the improvement and regulation of the town of Lowestoft and the parishes of Lowestoft and Kirkley, and for other purposes." Its powers were entrusted to twenty-seven commissioners. The Public Health Act, 1875, constituted the commissioners a sanitary authority. In 1795, 1801, and 1805 certain lands containing about 42 acres, called the Lamp Lands, were vested with trustees for paving and lighting the town. The original trustees of the Lamp Lands obtained an Act in 1810 for paving and lighting the town under a body of twenty-four commissioners, who were called the Town Commissioners, and when they surrendered their trust to the Commissioners of the New Improvement Act in August, 1854, their debts amounted to about £1,800. In 1885 the town obtained a Charter of Incorporation, the borough being divided into four wards—north, south, east, and west—with six councillors and two aldermen for each ward, making a council of thirty-two members.

#### GENERAL STATISTICS.

The town is about 3 miles in length from north to south, and 2 miles wide from east to west. The surface level of the lowest street or road is 6 ft. above ordnance datum, and the level of the highest street is 92 ft. above ordnance datum. The subsoil is boulder clay in the west part of the town and sand and gravel generally in the other portions of the town, except a small area of boulder clay south of Kirkley church. The area of the borough is 2,574 acres (including land covered by water). The following table shows the growth of the borough during the last fifty years:—

#### RATEABLE VALUE.

| Year. | Population. | Poor rate. £ | General district rate. £ | Number of houses. |
|---|---|---|---|---|
| 1861 ... | 10,663 | — | — | 2,290 |
| 1871 ... | 15,249 | 38,930 | 38,930 | 3,070 |
| 1881 ... | 19,696 | 69,097 | 55,203 | 4,360 |
| 1891 ... | 23,347 | 86,372 | 84,977 | 5,241 |
| 1901 ... | 29,850 | 127,565 | 118,175 | 6,557 |
| 1910 ... | 33,514 | 147,286 | 136,494 | 8,965 |

The rates during the last twelve years have been as follows:—

| | 1900 | 1901 | 1902 | 1903 | 1904 | 1905 | 1906 | 1907 | 1908 | 1909 | 1910 | 1911 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| General district rate .. ... | 4/- | 4/2 | 4/10 | 5/1 | 5/9 | 5/7 | 5/2 | 6/7 | 5/- | 5/- | 4/10 | 4/10 |
| Poor rate ... | 3/- | 2/10 | 2/10 | 3/- | 4/- | 4/- | 4/2 | 4/1 | 4/4 | 4/7 | 4/8 | 4/10 |

*Vital Statistics.*—The average birth and death rate per 1,000 of population for 1911 and ten previous years are as follows:—

| | 1901 | 1902 | 1903 | 1904 | 1905 | 1906 | 1907 | 1908 | 1909 | 1910 | 1911 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total births ... | 954 | 959 | 967 | 966 | 934 | 979 | 927 | 1,035 | 985 | 940 | 904 |
| Birth rate ... | 31·7 | 31·0 | 30·6 | 29·8 | 28·2 | 28·8 | 26·6 | 29·0 | 26·9 | *25·1 | 29·5 |
| Total deaths .. | 451 | 441 | 432 | 463 | 399 | 475 | 441 | 438 | 425 | 380 | 439 |
| Death rate ... | 15·0 | 14·3 | 14·0 | 13·3 | 12·0 | 13·9 | 12·6 | 12·2 | 11·6 | *9·7 | 12·9 |

* Calculations made upon a larger estimated population than the Census figures produced.

#### FINANCIAL STATEMENT.

*Borough Fund.*

| | Loans sanctioned. | Amount now owing. |
|---|---|---|
| Town hall ... ... | £6,150 | £4,958 |
| Lowestoft Burial Board | 7,500 | 5,412 |
| Tramways ... ... | 84,230 | 68,933 |
| | £97,880 | £79,303 |

*General District Fund.*

| | Loans sanctioned. | Amount owing. |
|---|---|---|
| Sewerage works ... ... | £33,070 | £14,700 |
| Street improvements ... | 85,241 | 39,547 |
| Sanatorium... ... ... | 9,453 | 5,490 |
| Sea defence works ... | 78,013 | 26,683 |
| Fire brigade ... ... | 621 | 244 |
| Destructor ... ... ... | 7,160 | 4,320 |
| Public walks and pleasure grounds ... . | 9,014 | 5,760 |
| New store ... ... ... | 240 | 132 |
| Public conveniences ... | 1,243 | 413 |
| Lowestoft Burial Board ... | 994 | 994 |
| Electricity undertaking ... | 99,318 | 78,030 |
| | £324,367 | £176,313 |

#### STREETS AND ROADS.

The total length of highways repairable by the council in 1885 was 19m. 7f. 4p., and the length of private streets and roads was 9m. 0f. 6p., making a total mileage of streets and roads within the borough at that period of 28m. 7f. 10p.

In 1911 the length of highways repairable by the council had increased to 36m. 5f. 18p., to which must be added 2m. 7f. 32p. of backways from 9 ft. to 15 ft.

wide; the length of private streets at this time was 4m. 0f. 3p., giving a total mileage of streets and roads within the borough at the present time of 43m. 5f. 13p. All the roads are macadamised with the exception of the tram track. The principal streets and roads are repaired with Guernsey granite, and all other roads with broken flint. The kerbing generally used is 12-in. by 3-in. tooled York, or 10-in. by 6-in. granite on edge, the channels being paved with granite setts or scoria blocks 15 in. by 18 in. wide. A 10-ton steam roller by Aveling & Porter is used for consolidating the macadam roads, and has been in use since 1887. We have not done much in the matter of tarring the surface of roadways, but last year we did a length in Kirkley of about a mile, containing 17,000 super. yds., which came out at 0·87d. per yard. For this work the author used one of Johnson's boilers (80 gallons), with Waithman's reservoir brooms. The Esplanade from Royal Plain to Claremont Pier, formerly in gravel, was reconstructed and improved in 1908 at a cost of £1,467; this worked out at 3s. 1d. per yard. The channels were paved with concrete, and the surface was laid with tarred furnace slag; bottom formed with 1½-in. slag rolled to 2½in. thick, and topped with a finished thickness of ¾ in. of ⅝-in. slag. There were no main roads in the borough when the Local Government Act was passed, but in the year 1889 the town council applied to the county council to declare 10 miles of roads within the borough to be main roads; this the county council refused to do, and made a contribution of £300 towards the cost of maintaining 7 miles. This was increased in the year 1892 to £771, and again in the year 1906 to £985, and finally in the year 1908 the contribution was increased to £1,200. One of the first acts of the County Council of East Suffolk was to pass a resolution on November 7, 1889: "That no street in a town be accepted as a main road." This resolution has been acted upon ever since. The county council determined, instead of declaring roads in towns to be main roads, to make a contribution towards the cost of such roads as would otherwise become main roads. The county council thereby evaded the obligation to wholly maintain and repair such roads, the contribution under sec. 11 of the Local Government Act, 1888, being a voluntary payment. The county council has, however, recently rescinded this resolution, and the town council has made application for about 10 miles of roads to be mained. Our total expenditure on streets and highways for the year ending September 29, 1911, was £5,587; for scavenging, £1,967; and for watering, £1,083. For the year ending September 29, 1886, the cost was as follows: Highways, £2,045; scavenging and refuse removal, £1,581; watering, £366.

PRIVATE STREET WORKS.

All this work has been carried out under sec. 150 of the Public Health Act, 1875. The total mileage of private streets made up from 1885 to 1911 amounts to 11m. 4f. 32p., at a total cost of £40,076. This would give an average cost per yard run of the road of £1 19s. 10d. In 1885 and 1886 private streets were being made up under contract amounting to about £8,936, at an average cost of £2 10s. 4d. per yard run. All streets since that date have been carried out by direct labour at an average cost of £1 17s. 3d. per yard.

General specification for making up private streets used as ordinary residential streets:—

Carriageway: 6 in. hard core, consisting of clinker of broken bricks, 4 in. broken flint, and 1 in. of binding, with 15-in. scoria sett channels.

Footpaths: 12-in. by 3-in. tooled York kerb, 3-in. Portland cement concrete mixed 6 to 1, and the top finished with sharp grit and cement in the proportion of 1 to 1; 36-ft. roads have carriageways 24 ft. wide and 6-ft. paths; 42-ft. roads have carriageways 28 ft. wide and 7-ft. paths.

Sewers: 9-in. and 12-in. best stoneware pipes, jointed with cement.

Streets or roads subject to heavy traffic, such as Commercial-road, are made up as follows:—

Carriageway: 9 in. hard core, 5 in. of 1¾ Guernsey granite, rolled down to 4 in. thick and 1-in. granite chippings for binding, and 18-in. granite sett channels on 3-in. concrete bed.

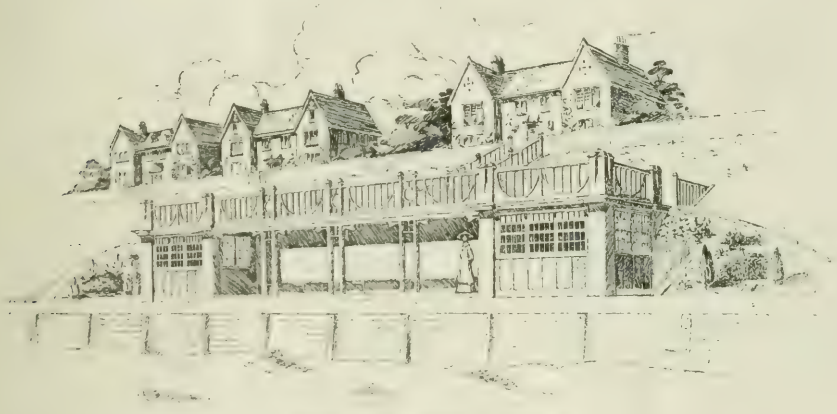
Footpaths: 10-in. by 5-in. granite kerb on edge set on concrete bed, and concrete paths as before mentioned.

Commercial-road averages 42 ft. wide, and the cost per foot frontage in this case was 15s. 1d.

MAIN SEWERS.

The main intercepting sewer for the town north of the harbour with new sewer outfall into the sea was constructed about thirty years ago. The sewer was 4 ft. diameter constructed in brick and concrete with blue Staffordshire brick invert. It extended from Rotterdam-road in the west, and ran in an easterly direction to the Battery-green, and from there was taken across the Denes and beach to valve-chamber. From this chamber were two rows of 36-in. cast-iron pipes carried on 12-in. by 12-in. timber piling into the sea, the invert of the pipes being about low-water level. The length of this sewer was 2,223 yds. and cost £7,000. The new outfall cost £5,000. The next large sewer, for the drainage of the St. Peter's-street district, was constructed in 1886, this being a 24-in. brick sewer connected with intercepting sewer near Old Nelson-street. The length of sewer was 934 yds., and cost £1,700. The drainage of the town south of the harbour occupied especial attention during 1885 and 1886, when what was known as the southern drainage scheme was carried out by Mr. Frank Stileman. This consisted of a 15-in. pipe sewer from Pakefield-street at the south boundary of the borough to a chamber on the south side of the harbour, syphoned under the harbour with two rows of 12-in. iron pipes to the ejector-chamber on the north side of the harbour, the sewage coming to this point by gravitation, and is then lifted by ejectors and carried by 12-in. iron pipes to the valve-chamber of main outfall sewer at the Ness Point. The entire cost of these works was £13,500. The length of the sewer to ejector chamber is 2,700 yds., and the length of iron rising main to valve-chamber 1,333 yds.

The drainage of the Lorne Park district was carried



SOUTH CLIFF SHELTER, LOWESTOFT.

out in 1894 at a cost of £860; length of 9-in. by 12-in. sewers laid, about 1,890 yds. In 1894 the Gun-lane district was re-sewered with 9-in., 12-in., 15-in., and 18-in. pipes at a cost of £905. Length, 1,230 yds.

In 1904 the Beach district was redrained with pipes of 9 in. and 12 in. diameter, at a cost of £1,364. In 1904 new sewers in Denmark-road were laid, consisting of 9-in., 12-in., and 15-in. pipes; total length, 1,215 yds.; cost, £917. A new 18-in. pipe sewer was laid in Whapload-road and carried north to a point near Model Yacht Pond for the drainage of the Gunton Cliff Estate; the length of this sewer was 1,397 yds., and the cost, £1,550. Another 12-in. pipe sewer was laid in 1902 from the Ravine running north on Yarmouth-road, for the drainage of new estates in that district; length of sewer 515 yds.; cost, £1,394. In 1893, by the encroachment of the sea, we lost our outfall pipes and valve-chamber at the Ness Point, which necessitated the diversion of the 4-ft. main sewer round to the west of the gasworks, with new valve-chamber and outfall. This was placed 30 ft. further north of the old outlet, and consisted of two rows of 36-in. diameter cast-iron pipes carried on cast-iron

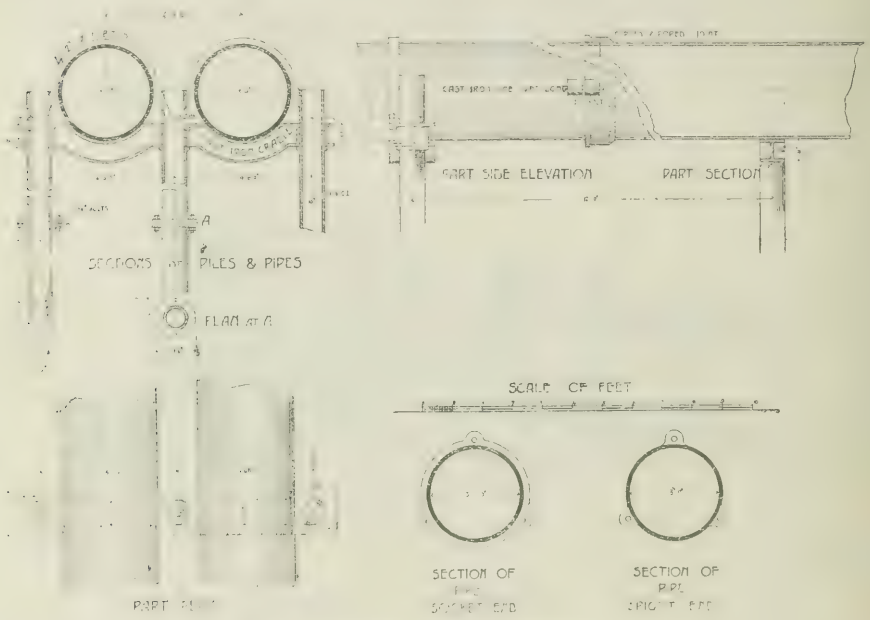
house drains are constructed of 4-in. and 6-in. best stoneware socketed pipes jointed in cement, and when under buildings embedded in and covered over with 6 in. of Portland concrete, turning chambers built at all changes of direction, and all house drains are disconnected from sewer by intercepting trap in chamber, with 4-in. iron vent shafts fixed at summit levels.

VENTILATION OF SEWERS.

Many years ago the sewers were ventilated at the street surface with open covers at all manholes and lampholes with a few shafts. These open gratings have been gradually closed and vertical shafts substituted. The shafts consist of 6-in. by 4-in. and 9-in. by 6-in. cast-iron pipes with moulded caps and rust pits at foot of shafts, and are fixed in many cases on gable ends of houses where suitable positions could be found, and in other cases 6-in. and 8-in. steel shafts, 25 ft. to 23 ft. high, have been erected. Total number of shafts erected about 130.

STREET IMPROVEMENTS.

Many street improvements or road widenings have been carried out since 1886, as the main streets of




DETAILS OF MAIN OUTFALL, LOWESTOFT.

cradles with three rows of 10-in. cast-iron piles. These works cost £9 292.

STORM-WATER RELIEF SEWERS.

A storm-water 12-in. relief sewer was constructed in 1898, at a cost of £163, to relieve the London-road South sewer at Parade-road South. A new 12-in. storm-water sewer was constructed in Pakefield-street in 1904; length, 440 yds.; cost, £242. The following storm-water relief sewers are in course of construction and nearly completed: 30-in. pipe sewer, 454 yds. long, across Smith's marsh to harbour, at a cost of £698, overflow direct off main intercepting sewer Rotterdam-road. 24-in. pipe sewer from Bevan-street to dock in place of a 15-in. pipe previously existing; length, 342 yds.; cost, £325. 24-in. pipe sewer across Battery-Green to Herring Dock; length, 110 yds.; cost, £180. Overflow from main sewer. 24-in. pipe sewer from end of Pakefield-street to watercourse; length, 182 yds.; cost, £168 (in place of an existing 9-in. pipe).

HOUSE DRAINAGE.

A considerable amount of work has been carried out under this heading in fact the bulk of the houses have been redrained. In 1886 we had about 3,500 common privies and middens in the town. At the present time we have but few, and these are in the outlying parts of the town. Nearly all privies have been converted into water-closets with approved pans and proper flushing cisterns; middens done away with and replaced by galvanised iron bins for garbage. All

Lowestoft were in many cases very narrow. High-street was improved by widening at the junction with London-road in 1888, at a cost of £10,400. This dealt with about 480 ft. of frontage, from 3 ft. to 10 ft. wide, the north part of High-street. This widening was carried out in 1897 at a cost of £13,300, the houses were demolished, and from 12 ft. to 20 ft. were added to the width of the street for a length of 670 ft.

Clapham-road: The north end was widened in 1888 at a cost of £484. This included the purchase and pulling down of a cottage and adding 196 super. yds. into the street; further improvement was made immediately south of this in 1888, throwing 6 ft. into the roadway for a length of 300 ft.

St. Margaret's-road Improvement: Roadway widened on an average of about 15 ft. for a length of 1,744 ft. at a cost of £918.

Carlton-road improvement, carried out in 1898 at a cost of £1,198, widened on an average of 13 ft. for a length of 907 ft.

North Parade improvement, carried out in 1899. This consisted of widening the road, constructing retaining wall, paving concrete footway and kerbing and channelling at a cost of £2,900. Further widening of the same road in 1900 cost £1,034.

Beccles-road improvement, carried out in 1909 at a cost of £452. This consisted of taking off about 10 ft. from allotments and adding to the roadway for a length of 1,316 ft.

Under the Local Act of 1901 many other street

widenings were carried out during the construction of the tramways at a cost of £24,073.

PARKS AND PLEASURE GROUNDS.

Belle Vue Park, at the north end of High-street, abutting on the Yarmouth-road, was originally an open heath covered with gorse. This was enclosed, laid out, planted with shrubs and trees, and opened in 1874. At the foot of the cliffs is a fountain, the water of which has medicinal qualities. The ravine bridge from the park to North Parade was presented to the town by the late Wm. Youngman, Esq., and opened in 1887. A meteorological station has been established in the park. Sparrow's Nest, near the above, was purchased by the corporation for a public pleasure ground in 1897, since which time it has been greatly enlarged and improved with bowling green and tennis courts. The Sparrow's Nest House was formerly the residence of Baron Alderson and his daughter, the late Marchioness of Salisbury. The North Denes were purchased from the Lord of the Manor in 1890 for the sum of £2 570, containing about 85 acres, and additional land with the slopes were further acquired in 1891, containing 20 acres, at a cost of £750, and remains an open space and pleasure ground for the public, upon part of which was formed a model yacht pond which has been much appreciated by the public and visitors. Kirkley Recreation Ground, situate near London-road South, containing about 7½ acres, was purchased by the corporation in 1908 for the sum of £1,600. These grounds have been greatly improved, bowling green and tennis courts provided, and public conveniences and waiting-rooms erected by an additional expenditure of £650.

PUBLIC CONVENIENCES.

In 1893 a public underground lavatory and convenience was erected on Royal Plain, at a cost of £843. The accommodation includes four-stall urinal, four water-closets, and five-basin lavatory for males; for females four water-closets and seven-basin lavatory, constructed of brick and concrete, and the inside walls faced with glazed bricks, the joiners' work of pitch pine. In 1907 an underground convenience for men only was erected on Blue Anchor Plain, High-street, at a cost of £193; accommodation, five-stall urinal. In 1899 a public convenience was erected at road level near the park, at a cost of £270; accommodation, five-stall urinal and two water-closets for men, and three water-closets for females; built in brickwork, lined inside with glazed bricks, and finished outside next street with half timber and rough cast. Besides the above we have several ordinary conveniences for men.

TOWN DEPOT AND STABLES.

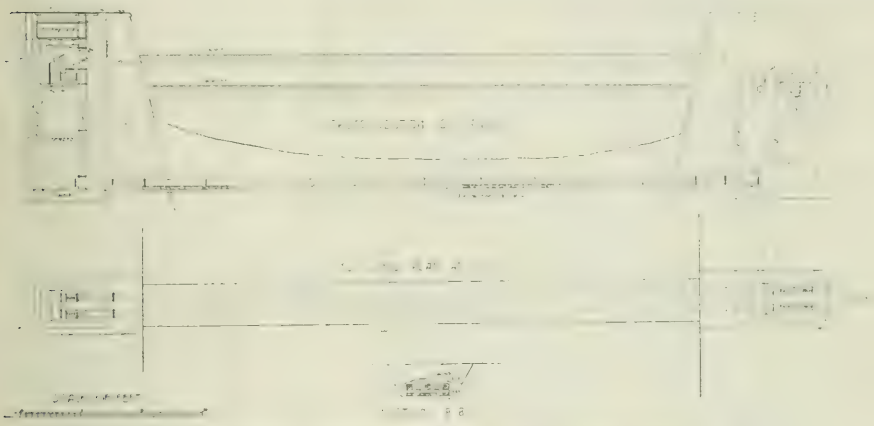
This establishment was started in a small way some thirty years ago, and there is now stabling for twenty-four horses and shed accommodation for all carts and vans. All hay is cut and corn crushed on the premises by use of a gas engine. There has also of recent years been added painters' shop, carpenters' shop, and wheelwrights' and blacksmiths' shops for the purpose of carrying on corporation work.

REFUSE REMOVAL AND DESTRUCTOR

The house refuse removal has been carried out by contract for labour for the past twenty-five years, the present cost being £16 17s. 6d. per week. The contractor finds all labour, the corporation supplying the necessary horses, carts, and plant. The refuse is collected daily in all the main streets and twice a week in other parts of the town, and carted to and dealt with at the destructor. In 1899 great difficulty was experienced in obtaining depots for the deposit of nightsoil, and also for the sale thereof, and as the result the corporation decided to erect a destructor. A four-cell Horsfall destructor was erected on land known as Smith's Marsh on Rotterdam-road at a cost of £4,709. The furnace adopted is of the back-feed type, with steam forced draught, grate area 30 ft. per cell; shaft 120 ft. high; Babcock & Wilcox's boiler with Green's economiser. The corporation did not provide at the first to make full use of the steam, as we had no electric works at that time, and therefore only put in a boiler of half the proper capacity for full steam raising, it being intended only to provide steam for the blast and for driving the mortar mill; but preparation was made for a second boiler the same size—*viz.*, 1,619 sq. ft. of heating surface. The economiser was provided large enough to serve two boilers.

For some time difficulty was experienced in getting rid of the old tins, &c., but they are now disposed of at the prices: Old tins, 14s. per ton; old iron scrap, 8s. 6d. per ton; old enamelled iron, 5s. per ton.

In 1902 and 1907 an additional boiler and two additional up-to-date cells were added by the Horsfall Company for the sum of £2 451. We deal with about 36 tons of refuse per day; some of the clinker is ground into mortar, for which we find a sale at 5s. per cube yard; the greater part of the clinker, however, we use ourselves in the making up of private streets, &c., as core; what is not required by the corporation we sell at 9d. per load. The surplus steam is passed on to the electric light works, which are situated on the adjoining land, for which they pay £80 per annum, and for the sale of mortar and clinkers we received last year £176. The cost of collecting refuse is 2s. 3d. per ton and of burning 1s. 3d. per ton.



SOUTHERN DRAINAGE, LOWESTOFT: SYPHON UNDER RIVER.

GAS AND WATER.

The supply of gas and water are in the hands of a private company known as the Lowestoft Water and Gas Company. The waterworks are at Lound, about 5 miles from Lowestoft, and the supply is derived from springs in the lake, and after filtration is pumped to Lowestoft, either direct into the mains or to a reservoir on St. Margaret's-road. The charge to the corporation for water is 1s. per 1,000 gallons. The gasworks are on the Whapload-road at Lowestoft. Gas is charged to the private consumer at 3s. 10d. per 1,000, less a rebate of 3d. per 1,000 ft. The charge to the corporation is 3s. per 1,000 ft. for power, and for the public lamps, of which we still have about 386 incandescent lamps, a charge of 50s. each per year is made—that is to say, £1 10s. for gas and £1 for lighting and maintenance, &c., the total cost for the year being £978. All public lamps are now fitted with incandescent inverted burners.

ELECTRIC LIGHTING.

This is provided by the Corporation Electricity Supply, and is used throughout all our main streets, and

at present there are 83 arc and incandescent lamps, 26 16-candle power lamps, 187 25-candle power lamps, 187 32-candle power lamps. The cost last year was £2,266.

ELECTRICITY WORKS.

These works were opened in February, 1901, and are situated at the junction of Norwich and Rotterdam roads, the system of supply being continuous current on the three-wire system, giving a pressure to the consumers at 230 volts. The feeders are mostly paper insulated lead covered and double steel, taped, and laid direct in the ground. The distributing cables are for the main street on the solid system—that is, laid in earthenware troughing and filled solid with bitumen. The public lighting cables are mostly laid direct in the ground. The service cables into the consumers' premises are also armoured and laid direct in the ground. The boiler-house plant consists of the following, which is used both for the tramways department and the electric light department: Two water-tube boilers capable of evaporating 5,000 lb. of steam per hour, fitted with chain grate stokers; two water-tube boilers capable of evaporating 5,000 lb. of steam per hour, fitted with underfed stokers and superheaters; dry back marine boiler capable of evaporating 10,000 lb. of steam per hour, with superheater; one water-tube boiler capable of evaporating 10,000 lb. of steam per hour, with chain grate stokers and superheater; three steam pumps for boiler feed; one electric pump for boiler feed; six injectors for boiler feed.

*Engine Room.*—The generating sets were so arranged when the machinery was put in that any one set could be used for lighting or traction, the generators being compound wound with a switch on each machine to cut out the series winding if used for lighting.

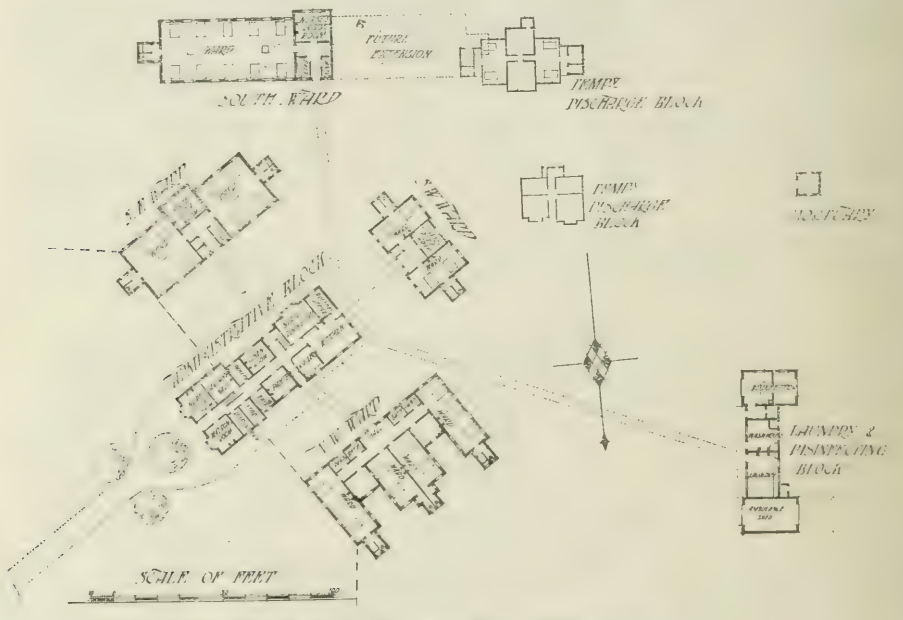
The offices for the electricity department are in the same building as the tramways department, and adjoin the engine-room. Here all accounts are kept for each department.

*Statistics.*—Number of units generated in one year, 1,408,237. Total number of consumers on the supply, 1,446. Number of consumers connected in one year, 202. Total cost of construction, £95,349, amount repaid, £22,845. Total receipts for one year, £16,244.

TRAMWAYS.

The history of tramways for Lowestoft commences in August, 1898, when a letter was received by the town council from a firm of London engineers containing proposals for the construction of "The East Anglian Light Railways," which were to commence at Carlton, to the north of Great Yarmouth, and terminate at Southwold, passing, of course, through Lowestoft in the course of their route. In 1901 the Lowestoft Town Council obtained powers under the Lowestoft Corporation Act, 1901, for the construction and working of the present tramway system. Having found it impossible to carry out the terms of the agreement with the company, the council decided to construct and work the tramway itself. Since then the council has purchased the powers possessed by the company for the construction of the line to Kessingland, so that in the future electric tramways, worked from the Lowestoft Corporation works, may run from the borough boundary, Yarmouth-road, through the borough to Kessingland, a distance of 7¼ miles in all.

*The System.*—The system of traction is the overhead trolley, the line extending throughout the main street from the north boundary, Yarmouth-road, to the south boundary, Pakefield, from which point the extension is contemplated to Kessingland, a distance further south of about 3½ miles. The gradients are not severe at any place in the town, the route, except for the branch to the depot, consisting of practically one long, straight street, 3⅝ miles in length. The curves are few, the sharpest being at the junction of Denmark-road and Suffolk-road. While the construction of the line was in hand various street improvements were




BLOCK PLAN OF ISOLATION HOSPITAL, LOWESTOFT.

carried out, some of which were compulsory to give the requisite space, but most of which were for the town improvement. The total route length is approximately 5½ miles, there being 3¼ miles single track, 1½ mile double track or the equivalent of 6½ miles of single track with loops for passing. One great obstacle to successful running is due to the main line being divided by the harbour and crossed by a swing bridge, making it almost impossible to run the cars to a time-table. Owing to the large amount of shipping, especially during the fishing season, a considerable amount of unavoidable delay may be caused. A serious difficulty was encountered in the construction of the undertaking by reason of the swing bridge across the harbour, situated almost exactly in the middle of the town. The whole of the work on and in the neighbourhood of the swing bridge has been especially designed, and has had to meet with the approval of the Board of Trade as well as of the Great Eastern Railway Company, who control the bridge and harbour. The special work applies to the permanent way and also to the electrical equipment. A shallow section of rail has been employed for the bridge track fixed to the ironwork of the bridge and electrically bonded thereto, and the greatest care has been taken to secure alignment of the bridge rails with the track on either side. In this connection a

mechanical device is employed, interlocking with the hydraulic levers operating the bridge.

The maintenance of the electrical circuit is secured in the following manner: Six light steel standards are mounted on the bridge and these carry by means of overhead wires with special ears. This is further supported by stay wires. With this form of construction no undue strain is put on the bridge. A device is employed on the overhead line at either end to connect the trolley wire with the special work when the bridge is closed. The overhead line on the bridge and the approaches is fed by a separate underground cable connected through a switch placed on the bridge and operating with the movement of the bridge. When the bridge is tilted before swinging, current is completely cut off in this section and *vice versâ*. The rail circuit is maintained under the harbour by means of a cable. Some difficulty was experienced in arranging for the carrying of the feeder cables under the harbour, but this work was eventually taken in hand by the corporation themselves. The cables are drawn into a steel pipe and are connected to a switch and testing-board on either side of the harbour.

*Overhead Equipment.*—A double trolley wire is employed of hard drawn copper (3/0 S.W.G., 0·372 in. in diameter). This wire weighs approximately 1,260 lb. per 1,000 yds., and is supported 21 ft. above the track on steel brackets and arm poles with ornamental cast-iron bases.

*Car Depot and Electrical Works.*—The car depot joins the electricity and refuse works in Rotterdam-road. The line to it branches off from the main line at the railway station in Denmark-road, and terminates at present at the depot. Accommodation is provided for nineteen cars and a track sweeper. Nearly the whole of the track in the shed is supported on pillars, thus allowing any car to be examined and repaired from beneath. There are excellent facilities for repairs, carpenters, machine fitters, paint shops, and smithy being provided at the car depot.

*Feeder Cables.*—The traction cables are drawn through stoneware ducts laid in the centre of the track. The cables are led to section pillars from which the overhead line is fed.

*Permanent Way.*—The track gauge is of 3 ft. 6 in., and is constructed as follows: The ground being excavated for a depth of 12 in. and a concrete bed of 6 in. placed under the rails except at the anchor joints, where the ground is excavated for a further depth of 12 in. Anchors are placed every 15 ft. along the rail, the anchor consisting of, for the intermediate anchors, about 15 in. of old inverted rails riveted to the flange of the rail, and for the anchor at the rail joint a piece of inverted rail 2 ft. long is riveted on to the flange of the rail.

All joints are bonded with No. 4/0 S.W.G., and cross-bonded every 50 ft. The section of rail used is of No. 3 British Standard Section, weighing 100 lb. to the yard. The paving originally was basaltic lava, but this is now being replaced by Jarrah wood blocks in the centre portion of the town.

The offices of the tramway department are in the same building as the electricity department, and adjoin the electricity works. Here all accounts for both departments are kept.

*Tramway Statistics.*—Passengers carried in one year, 2,644,845; average miles run in one year, 334,473; total receipts for one year, £11,973; total cost of construction, £79,235; average daily receipts summer months, £57; average daily receipts winter months, £25.

For this information and also that referring to the electricity department the author is indebted to the manager, Mr. G. A. Bruce, M.I.E.E.

TOWN HALL AND PUBLIC OFFICES.

The original town hall was erected in 1857 by the late J. L. Clemence, Esq., architect, and in 1876 was considerably altered. It only contained at that time council chamber, surveyor's office, inspector's office, and caretaker's apartments. In 1899 High-street was widened, and plans were then prepared to provide for the following accommodation: Mayor's parlour, surveyor's offices, accountant's offices, rate collector's office, sanitary inspector's office, medical officer's room, inquiry office, committee-room, lavatories, and stores; these plans were adopted and the works carried out at a cost of £5,124.

In 1904 further additional offices were built to accommodate the town clerk and the education department at a cost of £1,000.

CEMETERIES.

Kirkley Cemetery, on the London-road South, established in 1879, with mortuary, chapels and lodge; cost, £3,300; area, 5½ acres. It is now necessary we should acquire additional land for this cemetery. Lowestoft Cemetery, situate on the Beccles-road, established in 1886, containing about 15 acres, with mortuary, chapel and lodges, at a cost of £7,500. In 1906 3¾ acres of land were purchased by the Burial Board and added to the grounds, laid out and fenced in at a cost of £94.

ISOLATION HOSPITAL.

The old wooden infectious hospital stood on a small site near the Rotterdam-road, and in 1887 the council considered the desirability of purchasing further land adjoining the same and to erect a new permanent isolation hospital. The council eventually purchased about 2½ acres of land, and plans were prepared and approved for building administrative block, north-west pavilion for ten beds, and south-west pavilion for four beds, at a cost of £3,373. Then the laundry, ambulance shed, and disinfecting chamber, with fencing and entrance gates, were erected, costing £829. In 1898 the south-east pavilion was added for eight beds, at a cost of £1,414, and the administrative block was added to at a cost of £524; and in 1909 a new south pavilion was built for ten beds, and additional bedrooms, kitchen, &c., were added to the administrative block, costing in all £2,278, bringing the total cost of the isolation hospital up to £8,418. All the buildings are constructed of brick with slated roofs, and the inside of all wards faced with glazed bricks, pitch pine floors, and joinery, and the south ward floor is laid with Jarrah blocks on concrete, and the floors are wax-polished. All the old buildings were taken down and burnt.

FIRE BRIGADE.

The brigade consists of twenty-three members: chief officer (honorary); superintendent (£10 per annum); secretary (£5 per annum); engineer (£13 per annum); assistant engineer (£8 per annum); caretaker for each station (£6 each per annum); superintendent No. 2 section (£5 per annum).

*Stations.*—Chief fire station at St. Peter's-street. Sub-fire station at Colville-road, Kirkley.

*Appliances.*—No. 1 Station: One 300-gallon horsed steamer; one 400-gallon horsed steamer; one manual; one hose cart; one hose reel; one 65-ft. escape (hand) with shute.

No. 2 Station: One manual; one hose barrow; one hand curricle escape and hose-box combined with shute.

*Hose.*—3,000 ft. at the two stations.

Average cost of brigade, £350 per annum, which includes salaries, horse hire, telephone rentals, hydrants, uniforms, hose, repairs to buildings, repairs to engines, &c., rates, taxes, and insurance.

## LOWESTOFT SEA DEFENCES.

By G. H. HAMBY, ASSOC.M.INST.C.E.,
Borough Engineer.

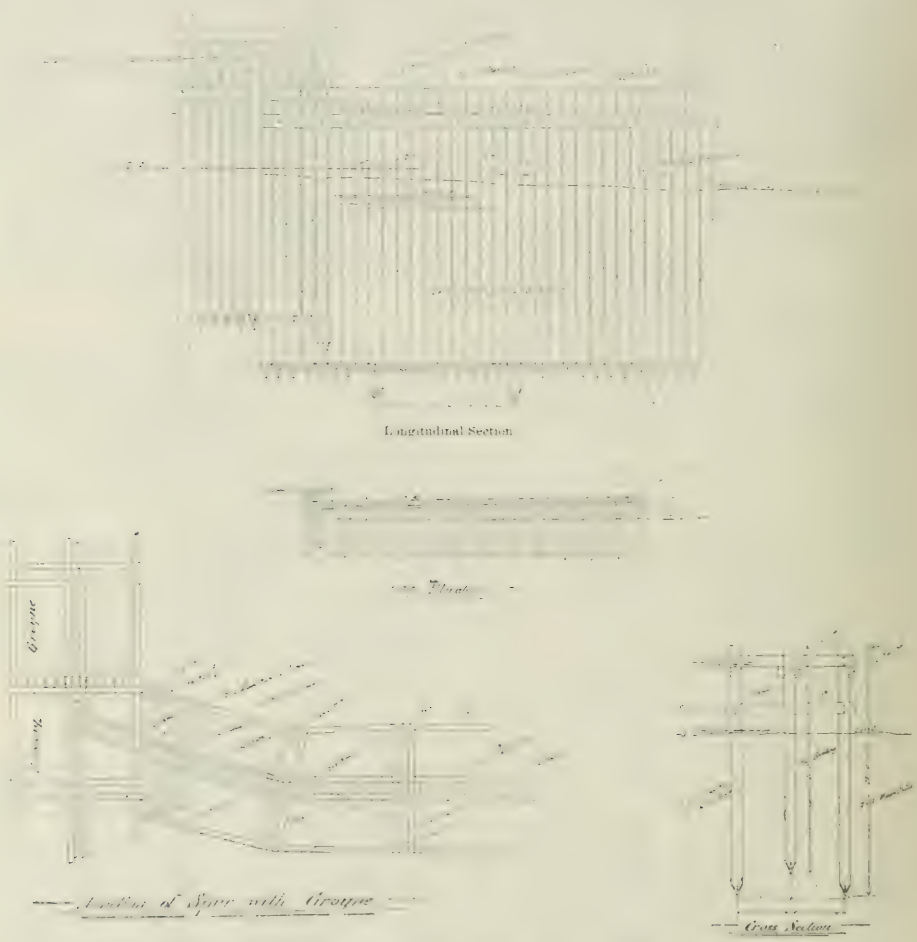
The object of this paper is to give a brief description of the troubles experienced on this part of the coast during the last twenty-five years, and what the corporation has done and expended to combat with this difficult question. Erosion has evidently being going on for many years; the beach consists of sand and shingle and a small amount of pebbles or larger stones, which twenty years ago were taken from the beach in large quantities, and, in the author's opinion, was a great mistake. This was partially stopped some years ago, and is now stopped altogether. Lowestoft's coast-line is now far more exposed than in years gone by, when it was entirely protected by sandbanks, which were dry at low water, and the "Pakefield Gat" was further south. Now the outer banks—*viz.*, the "Newcome," "Holm," and "Corton" sands—have two and three fathoms of water over them at low water, with the exception of a few small patches. The littoral drift on this coast is of sand and shingle, and travels from north to south, and doubtless the waste of the cliffs between Yarmouth and Corton has been forming the supply for Lowestoft. Jetties were constructed at the entrance to the harbour in 1832, and this caused the beach to extend seaward, as will be seen from the plan submitted showing the coast-line. The erosion of Lowestoft was more acute after the erection of the groynes at Corton in about 1871, which partially stopped the supply of beach material travelling in a southerly direction to Lowestoft. From 1894 to 1897 the sandhills, covered with marrum grass, the only natural barrier protecting the Denes at that time from high tides, were greatly damaged, and during

this period temporary measures alone were adopted for protection by faggots and placing two old smacks' hulls as groynes.

In 1897 twelve groynes were placed on the beach to the north of the Ness Point, formed of 4-in. planking; these at first were effective, and the beach accreted to the top of many of them, but for the want of something behind them more substantial than the low sandhills, the gales and high tides in 1898 swept round the land ends of the groynes and scoured the beach away; and in March, 1901, during a severe north-east gale and heavy sea, the marrum hills protecting the Denes were almost entirely demolished, and the groynes became useless, and were afterwards removed.

The old sewer outfall occupied a position at the Ness Point, with valve-chamber well above high-water line; these gradually became so severely damaged that the corporation decided to abandon the old outfall and construct a new one. The old jetties carrying the outfall pipes were close piled on the north side, and, so long as they lasted, formed a groyne and held the beach up; but in 1895 these were all washed away, the Ness Point practically disappeared, the coast-line straightened, and the material went south to help the accretion north of the harbour.

Referring to the south beach: At the South Pier the beach sets back from the north side about 480 yds. Going south from the pier the coast-line is low to Claremont Pier, when the cliffs gradually rise to the borough boundary; they consist generally of sand. Sea erosion along the whole length of this part of the coast has been gradual and very considerable. In [illegible] a great fall [illegible] took place. A [illegible] looking [illegible] the beach at the [illegible] to the top of Pakefield-street was swept away, and the beach was lowered some 3 ft. or 4 ft.; and later, in March, 1901, heavy north-east gales and spring tides caused alarming damage to Kirkley cliffs. The author has no doubt that the cause of the denudation of this beach has been principally caused by the supply of littoral drift being stopped, to a great extent, by the protective works erected at the north side of the harbour by the Great Eastern Railway Company. In July, 1898, a contract, extending over a period of three years, was made with the Case Syndicate for the erection of sixty groynes on the south beach for £5,000. Towards the end of 1900, two years after commencement, the council considered the accretion unsatisfactory, as, during a gale, several of the groynes washed out, and in December, 1900, 200 ft. had been washed away and one groyne completely disappeared, with the result that this contract was terminated.




SEE GROYNE FROM GROYNE "A," NORTH BEACH, LOWESTOFT.

PROTECTION SCHEME.

This brings the author's remarks on both beaches to the same period when matters looked so serious that the corporation could see they would have to expend a considerable sum of money, and decided to call in Mr. W. T. Douglass, M.INST.C.E., with the result that in 1901 an extensive scheme of protection for both north and south beaches was adopted in accordance with a report made by him. This work consisted of a spur groyne from the South Pier, 240 ft. long, and another groyne of the same length at the south boundary; on the north beach a sea wall from the Ness Point to the north boundary, to be protected by four main groynes and sixteen intermediate groynes. These works were carried out in their entirety in 1902

and 1903. In 1902 four groynes were constructed, after the loss of the Case groynes, for the protection of the sea wall in front of Kirkley Slopes. Further considerable damage then took place to the cliffs between Rectory-road and Claremont Pier, and in 1903 a timber close-piled revetment was constructed from Rectory-road to Claremont Pier, the above-mentioned groynes were extended 50 ft., and three small intermediate ones constructed, and four new small ones added immediately south of Claremont Pier. In 1904 a spur groyne was added to the south of the Pakefield groyne, and also in the same year a spur was carried to the south of the Ness Point groyne, and also 100 ft. extension was made to the spur groyne at the south pier. In 1905 a small spur was added on the south side of the groyne near the Empire Hotel. In 1904 a great scour took place in front of the Esplanade (north of the Claremont Pier), and, under the advice of Lieut. Williams, of Aldeborough, three acute-angle planked groynes were constructed as an experiment, running in a N.N.E. direction. In 1905 toe-piling and planking were constructed at the foot of the slopes between Claremont Pier and Rectory-road, to prevent the sea washing the slopes down. In 1905 and 1906 a timber revetment was constructed south of Pakefield groyne to prevent the erosion of the cliffs south of the borough boundary, and the revetment on the north side was extended northwards to the Grand Hotel wall. In 1910 a sea wall was constructed from the Ness Point southwards to Hamilton-road, a distance of 610 yds., protected by six timber groynes. The length of sea frontage on the north beach is 2,964 yds., and on the south beach 2,033 yds., making a total frontage of 4,997 yds., all of which is now protected.

From the borough boundary at the north to a point where accretion starts, opposite the south boundary of the gasworks, an average encroachment has taken place of 412 ft. to H.W.O.T. and 427 ft. to L.W.O.T., which represen's a lost area of beach between high-water marks of 1884 to 1911, a period of twenty-seven years, of about 62 acres.

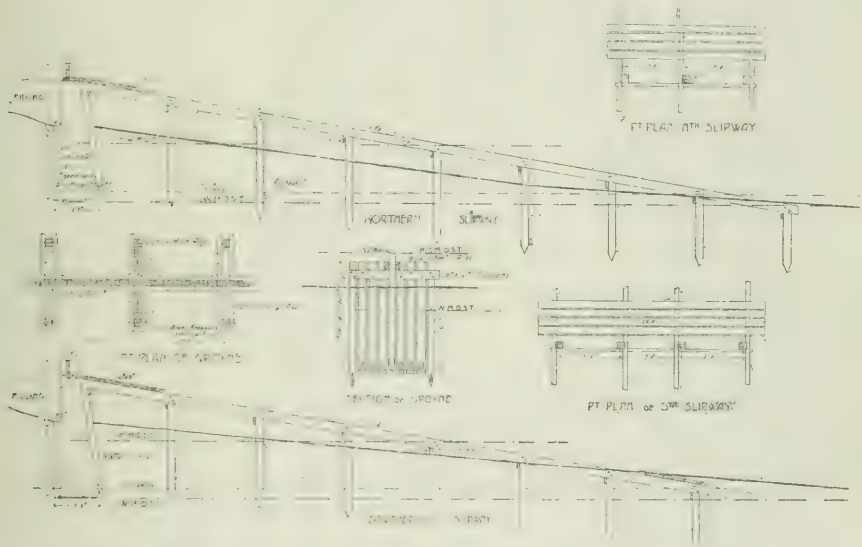
From the gasworks to the north pier extension an accretion has taken place of about 6 acres to high-water mark and 9½ acres to low-water mark; and high and low water have been driven back an average distance of 123 ft. and 190 ft.

In the case of the beach on the south side of the harbour from the South Pier to the Claremont Pier the sea has encroached on an average of 130 ft. at high water mark and 175 ft. at low-water mark since 1884, except a small portion next the south pier inside the spur groyne, where low-water mark has been driven back about 150 ft. From the Claremont Pier to Pakefield, the encroachment of both high and low water marks since 1884 has been 180 ft. and 230 ft. This gives for the entire length of sea front, from South Pier to Pakefield-street, a loss of beach between high-water marks of 1884 and 1911 of about 22 acres.

The author has pleasure in exhibiting drawings, some of which are reproduced herewith, of various sea defence works as carried out at Lowestoft, and the actual cost of the same.

| | Cost. |
|---|---|
| Sea wall, North Beach ... ... ... | £11,200 |
| Main groynes ... ... ... | 12,050 |
| Small ,, ,, ... ... ... | 6,673 |
| Spur groyne (at Ness Point groyne) | 1,106 |
| Sea wall, path and apron to South Slopes (Rectory-road to Kensington-road) ... | 11,826 |
| Spur groyne (at South Pier) ... ... | 3,400 |
| Main groyne (Pakefield-street) ... ... | 4,000 |
| Smaller groynes in front of South Slopes wall | 2,000 |
| Timber revetment (from Claremont Pier to Rectory-road), including four small groynes and extending four others ... | 8,115 |
| Spur groyne (to Pakefield groyne) ... ... | 1,253 |
| Acute angle groynes (South Beach) ... | 650 |
| Piling and planking foot of South Slopes ... | 636 |
| Pakefield revetment ... ... ... ... | 1, 01 |
| Grand Hotel revetment ... ... ... | 933 |
| Sea wall, steps and slipways (from Ness Point to Hamilton-road) ... ... | 3,870 |
| Six groynes to protect same... ... ... | 4,415 |
| Revetment (opposite Esplanade) ... ... | 696 |
| ,, (opposite Empire Hotel) ... | 670 |
| Map showing high-water marks of 1836, 1844, 1884, and 1911. | |

The total cost of our sea defence works since 1896 has been £79,000.




Details of Slipways and Groynes, North Beach, Lowestoft.

After the completion of the sea wall, North Beach, and main and small groynes above referred to, a considerable scour occurred on the south or lee side of the groyne at the Ness Point, leaving the piling and sea wall exposed about 11 ft.; and it was then that the spur to the south of this groyne was constructed with splendid results, the beach having lifted several feet, and driven back low water to the eastward of the new spur. Exactly the same conditions happened at Pakefield-street, and a similar accretion of beach followed the erection of the spur groyne in that locality. After the erection of the spur groyne at the south pier an increased amount of denudation of beach took place north of the Claremont Pier, and, for the purpose of securing the effects of this spur further southwards, this groyne was extended 100 ft. with better results.

Since the completion of all the works, we certainly have experienced a more reliable position, as the beach has gradually accreted and no coast line has been lost for several years, and the beaches are in a better condition than they have been for many years.

## DISCUSSION OF MR. HAMBY'S PAPERS.

Mr. Norman Scorgie (Hackney), in proposing a vote of thanks to Mr. Hamby for his paper, said he regretted he was unable to congratulate the town of Lowestoft on the lowness of its rates. A rate of 9s. 8d. in the £ was one which could not be con-

sidered low: at the same time he was quite prepared to admit that the works which Mr. Hamby had carried out were most extensive and very expensive, and it might be possible to recuperate these expenses by means of an increased rateable value. As regarded roads and streets, he thought they were suffering under a disability in the treatment they received from the county council. He was not prepared to say they were treating them other than unfairly, and if they could succeed in getting them to be reasonable in the matter, it would be an advantage to Lowestoft and beneficial to the district. With respect to the private street works, he wished to refer to the flagging of the footpaths with concrete. He could quite understand that that at the moment meant a reduced assessment for the householders, but he would point out to the engineer that while he was succeeding in saving expense to the frontagers, he was adding to the expense in the future, for probably while they were getting their footpaths for 3s. 6d. or 4s. in the first instance, the cost to the inhabitants and ratepayers at large would be very considerable when the paths came to be opened for gas, electricity and water mains. If they paved them with slabs, which would probably cost 1s. per square yard more, the cost would only be 1s. 6d. instead of the 7s. which would be the expense of making good these small openings in the footpaths. He considered they were very well treated by the gas company in the matter of the charges for public lighting. He found they were paying only 50s. each for incandescent lamps, which, assuming each lamp consumed 3½ cub. ft. of gas per hour, worked out at 46s. per annum as the cost to the company. They were only charging the town 30s. per annum for the gas, and he suggested that this decreased charge was the explanation for the relatively high cost to the private consumer. In regard to the character of the roads adjoining the tramways, his view was that the cross-falls of the roads were too great for the safety of the traffic, and only that morning, in the course of his walk to the town hall, he had seen two cases of cyclists sideslipping, without doubt owing to the excessive fall of the road over which they were travelling. It was of course too late to remedy these defects, but if the point had been borne in mind in laying the tramways, they would not be suffering as they were doing now. As a London engineer he had little to say on the matter of the town's sea-defence works, preferring to leave it to his friend Mr. Cockrill, who was better able to deal with the subject.

Mr. J. Elford (Southend) seconded the vote of thanks to Mr. Hamby. He knew what a labour was the preparation of papers of that kind, and their hearty thanks were due to Mr. Hamby for the trouble he had taken in the matter. He had specially prepared a paper on sea defence work, because it was of interest to their members, and he had no doubt they would appreciate the paper he had given them. He did not quite agree with Mr. Scorgie in criticising the rates of Lowestoft. He thought it was very misleading unless they knew the basis of the assessment. Whether Lowestoft had a high assessment or not, he did not know, but before expressing an opinion he would like to know. There were many towns which appeared to be heavily rated, which really paid less per house than other towns which appeared to have low rates. One thing which had struck him was the very economical way in which the work in the borough was carried out. He thought, having regard to the fact that Lowestoft had very heavy burdens which other towns escaped, and which were unremunerative, they had done very well. He agreed with Mr. Scorgie to some extent as to the public paving. He did not think the cost would be as much as 3s. 6d. or 4s. per year; he would be much surprised if it was. There was one matter with which he had a very warm fellow feeling with Mr. Hamby, and that was with reference to the basalt lava paving of the tramways. He had had to take up a very large area of that paving. He was rather surprised to see that the labour for the collection of house refuse was obtained by contract, the corporation supplying horses, carts and plant. He did feel under ordinary circumstances that the corporation should have control of the men who had to collect the house refuse. These men had to go into people's premises and be trusted to a very great extent, and he therefore thought the local authority should have direct control. He did not think Mr. Hamby stated what allowance was made for steam raised by the burning of the refuse from the electricity department. In regard to the collection and burning of refuse, he would like to ask whether the 1s. 3d. per ton for burning was the nett cost after allowance for steam and so on.

Mr. J. W. Cockrill (Great Yarmouth) congratulated Mr. Hamby on having so large a meeting. Twenty-five years ago the first Eastern Counties district meeting was held in Yarmouth, and they had six members present. Perhaps the quality made up for the quantity. (Laughter.) He did not agree with Mr. Scorgie as to the concrete footpaths. He did not think those footpaths would cost 4s. Footpaths which were laid under his superintendence at Gorlesfon in 1874 were as good to-day as when laid. They cost him 2s. 2d. per yard, and to-day he was laying the same footpaths at 1s. 10d. per yard. If they laid footpaths which lasted forty years they were the cheapest that could be laid. He was glad to hear the mayor's remarks that they were trusting to their officials, and he was sure in that way they would be able to get the work done cheaper and better than by calling in outsiders.

Mr. W. Jones (Colwyn Bay) supported the vote of thanks. He came from a seaside resort on the opposite side of Britain, and he could realise the difficulties Mr. Hamby had to overcome. His sea defence works had cost his council £70 000, but he had not to do anything like Mr. Hamby had. Their wave action and force of sea was 200 per cent more than Colwyn Bay. That showed the responsibility of a council which happened to be placed on the sea coast. He was pleased with the protective measures which Mr. Hamby had carried out. He was sure, if left to himself and not interfered with, Mr. Hamby would be able to defend that coast from erosion. He was out very early that morning and walked a considerable distance along the coast, and he had seen the provision which had been made to defend the coast. He was sorry Mr. Hamby had not put a little more detail in his paper on sea defences.

Mr. A. E. Collins (Norwich), while expressing a hope that the sea defence works at Lowestoft would prove successful, said he felt obliged to criticise one point in the paper dealing with the question. He might be wrong, but there appeared to him to be one defect in the Williams groyne to which reference had been made. The idea of the slope was all right, and the force of the waves was dissipated, but the groynes were not carried deep enough into the beach. Whenever that happened, instead of having a vertical toe, the slope of the groyne should be carried on. Any excavating action should be avoided, and that could be accomplished in the manner he had indicated. He quite agreed with Mr. Elford in his remarks as to the rates. In Norwich the rateable value was very low—less than £4 per head—but the people expected as much done for them as in towns where the rateable value was double the amount. In Bournemouth the rateable value was double what it was there, so that the authorities could spend twice as much on the yield of a 1d. rate. It was obvious, therefore, that they could not make comparisons between different towns. Having regard to the difficulties which confronted the council, the rates of Lowestoft were not high. In regard to basalt lava, a great many of the difficulties encountered in connection with that were due to the manner in which it was used, and his view was that there were many places in which the material could not be beaten.

Mr. R. Croome (Cromer) asked why Mr. Hamby used Yorkshire kerbs. The kerbs which he had seen seemed very much worn, and not a good kerb. He would have thought that concrete kerbs would have stood as well and been much cheaper. The cost of collecting and destroying house refuse at 2s. 2d. per ton seemed very low. Could Mr. Hamby tell him the cost of keeping horses? He was interested, because his council was proposing to purchase horses at the present moment. They were following the opposite way to most councils in contracting for labour and owning horses. The usual practice was to employ their own labour and hire horses. He would like to add how much he had enjoyed his visit to Lowestoft that day.

Mr. T. W. A. Hayward (Battersea) said there was one point which most of the speakers had missed. They had been talking about the high rates and so forth. His friend from North London spoke very emphatically about the high rates, but they all seemed to forget the splendid health statistics they had. For a place like Lowestoft he thought that the first consideration. There was no doubt Mr. Hamby had done his work in Lowestoft as well as it was possible to do it. The mistakes had been made when they called in people from outside who thought they

knew better than Mr. Hamby, but the town had found to their cost that they did not know. If Mr. Hamby had been given a free hand, and they had not called in these experts from outside Lowestoft, they would have been very much better off. It was only due to Mr. Hamby that he should know they appreciated his good work and the good health statistics of the borough.

The vote of thanks was carried.

MR. HAMBY, in reply, said the concrete paving cost something like 2s. 6d. per yard super. The bulk of that put down was in third-rate streets or outlying thoroughfares, and had not broken up to the extent they might have imagined. The pavements, which had been down twenty years, had cost very little in the direction spoken of by Mr. Scorgie. Footpaths in the main streets had been laid in panels four to the yard, and costing 7d. each—the present price of cement—and this system of paving had been adopted for all streets which were likely to be broken up or in any way disturbed for cable work. He should have liked to lay them in all the streets, but he only had a certain number of moulds—which cost about 10s. per pair—and with the large amount of work which he had on hand he was prevented from manufacturing any large quantity. He quite accepted what had been said about the gradient of the roads from the margin of the tramway setts to the channels, but it was not his doing. He was, however, now engaged in lowering the crown of the road and lifting the kerb channels and footways, and he hoped that the trouble would in time be overcome. With respect to the contract for labour, it had been the practice for years to contract, but the arrangements were in charge of an inspector, and no difficulty had been experienced at any time. He quite agreed, however, that if a contractor was able to do the work for a certain price the corporation could do likewise, and probably at the end of the contract in October next they would take over the work. In regard to the allowance of steam for the electricity works, it had been contended by their electrical friends that they did not produce much steam, but that was not correct. They received a payment of £80 a year, but the amount of steam generated was, of course, worth more than that. The electricity works were only just turning the corner; otherwise the amount would be larger. He quite understood what was meant by Mr. Jones. His paper as submitted to the secretary contained a great deal of other information, but it had been found necessary considerably to reduce the length of it, with the result that a number of details had been omitted. With regard to Mr. Collins' remarks as to acute angle groynes, these were put down as an experiment through the influence of certain members of the council. His own opinion in regard to groyne work was that the structures should be put down somewhat at right angles to the foreshore. Replying to Mr. Croome, why he used Yorkshire kerb was that he got it as cheaply as anything, and one had to recollect that at Lowestoft they had no quarries from which they could obtain stones to manufacture kerbing; but then, as he had said, there was the difficulty of getting the necessary moulds and labour. In the main streets he used 10-in. by 6-in. granite kerbs, but in the private streets he could show them some Yorkshire kerbs that had been there twenty years, and were as good now as ever. With reference to Mr. Hayward's remarks, they had to take their rates as they were. He knew the council were very anxious to keep down the rates, and he could conscientiously say that everything he had done or carried out had been undertaken with the interests of the ratepayers in mind. As he had pointed out to the council from time to time, it was as much to his interest as to the council's that he should do his best to assist in keeping down the rates.

## LUNCHEON.

The members of the institution were entertained to luncheon at the Royal Hotel. His Worship the Mayor (Mr. T. E. Thirtle) presided, the company including Councillor Spashett (chairman of the Tramways Committee), Alderman Notley (chairman of the Roads Committee), Mr. R. B. Nicholson (town clerk), and R. Robertson (borough accountant).

THE MAYOR proposed the loyal toasts from the chair.

THE PRESIDENT proposed "The health of the Mayor of Lowestoft." He felt after the bracing and exhilarating air, and their walk inspecting the works which the corporation had carried out, this hospitality had been very well received. He trusted the Corporation of Lowestoft would long continue to cater not only for the inhabitants, but for the visitors who came there to enjoy the invigorating air of the town. They had also to thank Mr. Hamby for taking them round many of the works, and they must not forget the medical officer of health, and Mr. May, a son of one of their esteemed past-presidents. The works they had seen did credit to the enterprise of the town. It had not been his pleasure to visit Lowestoft before, and he was much surprised at what he had seen; he had no idea that they catered so well for visitors as they did.

The toast having been heartily honoured,

THE MAYOR, in responding, said the council did their very best for the progress of the town.

THE TOWN CLERK proposed "The health of the President, and Prosperity to the Institution of Municipal and County Engineers." He hoped they had enjoyed their peregrinations through the borough of Lowestoft that morning, and would still more enjoy the delightful afternoon that was before them. He hoped the discussion of Mr. Hamby's paper would be helpful and profitable to the institution.

THE PRESIDENT, in reply, said he considered it was a great honour to be president of the institution, which comprised most of the chief and assistant municipal engineers throughout the country. They visited from time to time many towns, not only seaside, but manufacturing towns, both large and small, and they always received the kindness they had received that morning. They were only too delighted at any time to assist their brother engineers who were serving corporations in other towns, and through them the corporations who were governing those towns. It was a very great assistance to the corporations that their engineers should visit other towns, because they often saw little things which they could carry away in their memory and use for the benefit of their own town. The council had lately had under consideration the formation of a legal defence fund for the benefit of members of the institution, and would submit proposals to the annual meeting.

During the luncheon a collection was made for the Orphan Fund, and a sum of £1 13s. realised.

Mr. A. D. Greatorex, the president (W.M. Ædile Lodge), writing from Grove-crescent, West Bromwich, says:—

"In connection with the annual meeting it has been arranged on the second evening, Friday, July 12th, to hold a meeting of the Ædile Lodge of Freemasons at the Liverpool-street Hotel at 7 o'clock.

"The lodge is composed of local government officers, including many municipal engineers, and it is felt that it will afford a good opportunity for bringing together those engineers and surveyors who are concerned with the craft.

"To enable the necessary arrangements to be made, the names of those who wish to be present should be known at an early date. Will those brethren, therefore, who are desirous of attending the lodge supper afterwards kindly communicate with me at the above address not later than July 1st?"

**Hull Water Profits.**—There was a gross profit on last year's working of the Hull water undertaking of £38 048. The Water Committee have agreed to recommend a contribution of £15,000 towards the relief of the rates.

**Mechanical Filters at Fraserburgh.** — Mechanical filters, constructed and installed by Messrs. Mather & Platt, Limited, of Manchester, have been installed at the new waterworks at Fraserburgh, the inauguration of which has already been recorded in our columns. The filters in question are capable of treating 500,000 gallons of water per twenty-four hours.

**The Roads Improvement Association.**—Colonel R. E. Crompton presided over a good attendance at the June monthly meeting of the council of the Roads Improvement Association held on the 20th inst., when a discussion took place in regard to the appointment of an expert by the association to make special inspections of certain roads. The matter is to be further considered at the next meeting of the council. It was reported that the Memorandum to Local Authorities, containing certain suggestions, from the road user's point of view, concerning the treatment of roads with tar, and also methods of removing splashes of tar from horses and vehicles, was nearing completion, and that it was hoped to issue it shortly.

# Association of Managers of Sewage Disposal Works.

## JOINT MEETING AT SOUTHALL-NORWOOD AND HANWELL.

In brilliant weather the members forming the Metropolitan District of this association paid visits on Saturday last to the sewage disposal works of the Southall-Norwood Urban District Council and the Hanwell Urban District Council. The company included Messrs. W. Fairley, M.INST.C.E., H. E. Wade (Southall), H. Harries (Southall), J. W. Harrison (Uxbridge), J. Lewis (Yiewsley), W. A. Rowe (Southall), J. Wood (Southall), J. B. Thomson (Southall), K. Phillips (Brentford), J. B. Croll (Richmond), W. Tanby (Richmond), J. T. Hall (Staines), R. Hall (Staines), W. Haywood (Brentford), E. J. Car (East Ham), C. Terry (Canterbury), Ed. Basley (Ealing), E. E. Morling (Teddington), J. W. Bibley (Biggleswade), T. Hughes (Hampton), W. A. Stenning (Twickenham), T. W. Abbott (Chiswick), J. Ellis (Woodford), C. Nickall (Barnet), H. Millest (East Barnet), J. J. Wilson (Southall), J. A. S. Craig (district secretary, Wanstead), H. C. Hanson (Southall), W. L. Stragham (Romford), W. Smith (Isleworth), G. Selvidge, T. Flucker (Romford), D. Howard (Upminster), B. Kirk (Winchfield), T. Money (Hanwell), H. Morecroft (Acton), C. E. H. Morecroft (Acton), C. C. Smith (Westminster) and R. Brown (Southall).

The Hanwell works were first inspected, and the visitors were welcomed by Mr. S. W. J. Barnes, the engineer and surveyor, who stated that the population of the district could be taken at 20,000. The dry-weather flow is between 400,000 and 450,000 gallons, and the greater part of the sewage gravitates to the works, approximately one-tenth having to be pumped. The great proportion comes through two sewers, a high-level and a low-level, and it passes through Smith's screen. The screen is worked by the flow of the sewage itself, there being no other motive power to keep it going. The sewage is chemically treated—the septic system having proved a failure—and the tanks will go about a month. The sludge is dried and mixed to a certain extent with ashes, and conveyed on to the land. The sprinklers have been in use for five years. There are four primary and four secondary filters, and the effluent is a highly satisfactory one. Mr. T. Money is the manager of the works.

At the Southall-Norwood works, which adjoin those of Hanwell, the two being separated by the canal, Mr. Reginald Brown, ASSOC.M.INST.C.E., F.S.I., engineer and surveyor, informed the visitors that the undertaking as originally constructed was very small, consisting of the engine-house, the small pump-house, lime-house, two very small tanks, and two small precipitation tanks. The two tanks, of 24,000 gallons capacity, are now used as detritus tanks. The two precipitation tanks as time went on were converted into contact beds. Two other tanks were constructed, and one was used as a precipitation tank, and the other as a sprinkler bed. Southall-Norwood was one of the first places to use Candy's revolving sprinkler. In addition, there were two other tanks at the low-level to receive the Hanwell Asylum sewage, which was dealt with at Southall. Before the sewage enters the works it passes through Smith's screen as at Hanwell. After passing through the screen the sewage has milk lime added to it. Ten to seven years ago the works were remodelled and reconstructed, four large precipitation tanks being built which hold 600,000 gallons. Four other tanks were afterwards added, and with the aid of aeration pipes there is quite a free current of air in the bed. The distribution of the sewage on the beds is by jet sprinklers, which are unique of their kind, and the results obtained are excellent. The action of the humus tank, and the work of pressing the sludge were described by Mr. Brown. Fifty tons of dry sludge are pressed every week and from the sale of this a sum of £25 per annum is obtained. After all, said Mr. Brown, the sale is better than having to pay to get rid of it. The cost of the eight beds, it ought to be stated was £5,500 and the cost of the precipitation tanks £3,965. The annual outlay, including interest and sinking fund, deducting the amount received for produce, which is not a big item, is about £1,000. Mr. G. Selvidge is the manager of the works.

Tea was served in a lecture hall adjoining the Southall-Norwood Town Hall, and the chairman of the committee, Mr. J. D. Watson, M.INST.C.E., who had now joined the party, was voted to the chair. He briefly moved a vote of thanks to the Hanwell and Southall-Norwood Councils for affording facilities for the inspection of their works, and to the engineers and managers, which was seconded by Mr. W. Fairley, and duly acknowledged by Mr. H. Harries (chairman of the Southall-Norwood Urban District Council) and Mr. H. C. Hanson ("father" of the council). The following paper was then read:—

### FIXED SPRAYS *VERSUS* REVOLVING AND TRAVELLING SPRINKLERS.

By REGINALD BROWN, ASSOC.M.INST.C.E., F.S.I.,
Westminster and Southall.

It is not the intention of the author in writing these notes to enter into a lengthy discourse on the merits and demerits of these types of distributor for sewage, but simply to bring before the members of the association a few facts on the comparative costs of each system. The author has often heard it stated that "fixed sprays" can be constructed very much cheaper than revolving sprinklers, and as he is not biased in favour of one or the other, he decided to work the question out for himself, and give the results to the association.

#### CONSTRUCTION OF A COMPARATIVE INSTALLATION.

The author decided to adopt a unit for comparison of eight 80-ft. diameter percolating filters, on which special revolving sprinklers were to be used, and an equal area of rectangular filters, on which "fixed sprays" were to be used, and to consider each installation to be working under the same conditions.

#### CONDITIONS OF WORKING.

One of the great advantages attaching to the use of "fixed sprays," and one which the author has always advocated, is the complete "breaking up" and "aëration" of the liquid before it reaches the surface of the bed, which, without going into the chemical point of view, must be advantageous not only to the ultimate purification, but also to the life and work of the bed itself; hence, if revolving sprinklers are to be compared with fixed sprays they must be so arranged as to give the same effect—*i.e.*, they must be subjected to a sufficient head and provided with a type of jet which will break up the liquid into a "fine spray."

#### HEAD NECESSARY

It is, of course, certain that the greater the head on the distributor the greater the distribution area per jet, but for economical purposes the author has adopted a head of 4 ft. at the point of distribution. In many cases this would necessitate the lifting of the effluent water in the fixed spray type, but as this would also be the case in the revolving-sprinkler type, it is fair to assume that, in both cases, sufficient head is obtained without pumping.

#### CONTROL OF UNITS

To give correct comparative results as to cost, each system of distribution should be provided with means of control into the same number of units—for the case under review this number would be 8.

#### CONSTRUCTION OF COMPARATIVE SYSTEMS—REVOLVING SPRINKLERS.

The unit under discussion is eight 80-ft. circular beds. The ground is assumed to be level with the top of the carrier surrounding the beds. It has therefore been considered necessary that 6 in. of ground must be excavated over the whole area of the beds themselves and 12 in. under the carrier. The base of the bed is constructed of cement concrete (6 and 1) 6 in. thick at the periphery and 9 in. in the centre, thus allowing a fall from centre to sides of 1 in 160; the carrier has walls and bottom of cement concrete 6 in. thick, the depth of the carrier at the weir being 6 in., while the depth at the opposite side of the circle is 3 in., thus allowing a fall of 3 in. in 1 in 504. The surface of the concrete over-side is rendered with Portland cement and sand in the proportion of 1 to 3, except for a width of 12 in. round the periphery, which is rendered with Portland cement, and ¼-in. granite chippings in like proportion. Similar rendering is also carried out to the vertical sides and bottom of the carrier, the top of the outer wall and for 4½ in. down the exterior face of such wall.

The beds are provided with 12-in. by 12-in. stoneware aërating and drainage tiles arranged as follows: A ring of tiles is placed all round the outer edge of the circle, another and concentric ring is placed 20 ft. from the centre, while a third concentric ring is placed at 2 ft. 6 in. from the centre. The outer circle is divided into 3-ft. spaces, and at every fourth space lines of tiles are run to the inner circle, while at the intermediate spaces tiles are laid to the intermediate circle only.

The total number of tiles required by this arrangement is 19 200 for the whole installation, and as the total area of the beds is 4,464 sq. yds., the number of tiles per yard super. is 43. The filtering medium is hard and well-burnt clinker, the outer walls being constructed of large lumps of clinker carefully bonded together and tied in to the "filling." The "filling" material is as follows: Over the drainage tiles a layer of large broken material is placed to a depth of 6 in. (not including that between the tiles), and the remainder for the whole height is filled with "graded" clinker and finished with a 3-in. layer of finer material over the whole surface. The depth of the bed is 5 ft. The following is a description of the distributing system: An 18-in. cast-iron pipe commences at the boundary of the land occupied by the beds, and is carried to a brick "control" chamber constructed at the centre of the area. In this control chamber there are nine 6-in. valves connected with the 18-in. main. From each of these valves 6-in. cast-iron pipes are carried under the beds, respectively controlled by such valves, and brought up through the concrete base by means of easy bends. It will be noticed that one extra 6-in. valve is provided in the control chamber, a 6-in. cast-iron pipe is carried from this valve outside the area covered by the beds for the purpose of emptying all the mains and branches, should such a procedure be necessary at any time.

Each distributor is bedded in a concrete block 2 ft. square and 12 in. thick. The distributor consists of a central standard, with "duck-bill" at second top to utilise the full pressure due to the head, and to prevent overflow the well known "mercury seal" has been adopted. The distributing arms, four in number, are supported by means of strained "guy" ropes attached to a central tube carried up from and connected with the central standard, the top of the tube being pierced to allow for the escape of air. Each arm is pierced with thirty-five holes, spaced so as to give equal distribution, and, to permit of the breaking up of the liquid into a fine spray, each hole is provided with a screw plug, pierced with two small holes inclined outwardly toward each other, so that two fine jets of water are discharged from each hole, and which meet at a short distance from "exit," thus giving the result aimed at—a fine spray.

COST OF SPRINKLER BEDS.

The figures below give, of course, only comparative costs, but are shown in detail, so that a fair comparison may be made:

| | £ | s. | d. |
|---|---|---|---|
| 1,012 cubic yards of excavation and spreading at 1s. | 50 | 12 | 0 |
| 5,044 yards super. ram foundation, at 1d. | 21 | 0 | 4 |
| 942 cubic yards cement concrete, at 15s. | 706 | 10 | 0 |
| 255 yards super use and waste on timber, at 9d. | 9 | 11 | 3 |
| 4,413 yards super horizontal rendering (cement and sand), at 1s. 9d. | 366 | 2 | 9 |
| 784 yards super. horizontal rendering (cement and granite chippings), at 2s. | 78 | 8 | 0 |
| 314 yards super. do., but vertical, at 2s. 3d. | 35 | 6 | 6 |
| 8 weirs, at £1 | 8 | 0 | 0 |
| 7,440 cubic yards filtering media, at 5s. | 1,860 | 0 | 0 |
| 1,118 yards super. extra on for building walls, at 1s. | 55 | 18 | 0 |
| 19,200 drainage tiles, at 3d. | 240 | 0 | 0 |
| 8 revolving sprinklers and 6-in. supply pipes from centre to edge of bed, at £57 | 456 | 0 | 0 |
| Fixing 8 sprinklers, at £1 | 8 | 0 | 0 |
| 63 feet run 18 in. c.i. pipe and laying, at 6s. 8d. | 21 | 0 | 0 |
| 1 18-in special pipe with 9 6-in. junctions | 15 | 0 | 0 |
| 9 6-in. valves, at £3 10s. | 31 | 10 | 0 |
| 577 feet run 6-in. c.i. pipes and laying at 4s. 3d. | 122 | 12 | 3 |
| 8 special bends and fixing, at £1 | 8 | 0 | 0 |
| 1 control chamber | 10 | 0 | 0 |
| | £4,103 | 11 | 1 |

The area of land required is 6,535½ super. yds., which at 9d. per yard (£21 per acre) is £163 7s. 10d. The actual area covered by the eight beds—5,044 sq. yds. The total external area of walls exposed to the air is 1,118 sq. yds.

FIXED SPRAYS.

To give a fair comparison, the area of the rectangular bed should be exactly similar to that of the eight circular beds, and, further, the means of distribution should be such as to control one-eighth of the whole area as a separate unit. The "clinker" area of the eight 80-ft. circular beds being 4,464 sq. yds., a square of 200-ft. sides has been selected, and a channel 3 ft. wide is constructed round the whole square. (In the case of the circular beds the surrounding channel is only 2 ft. wide, but each bed discharges into a 3-ft. channel constructed between the two lines of beds.) As in the case of the circular beds, the ground is assumed to be level with the top of the carrier. It has therefore been considered necessary that 6 in. of ground must be excavated over the whole area of the bed, and, to give about the same cross-fall to the concrete, the thickness of concrete at the centre will be 12 in. (this really gives a cross-fall of 1 in 200). The carrier is, as before mentioned, 3 ft. wide inside, and its highest point is on the side opposite the outlet; this length is 400 ft., and to give the same fall as in the circular channels, commencing at a depth of 3 in. at the highest point, the depth of the carrier at the outlet will be, say, 12 in. (this actually gives a fall of 1 in 533); thus the depth of excavation for the carrier will be 1 ft. 6 in. The carrier has walls and bottom of cement concrete, and the whole is rendered as in the circular beds. The bed is covered with drainage tiles, as previously described, arranged with a complete course round the exterior edge of the square, and straight lines of tiles are taken from this outer course towards the diagonals, drawn from each corner of the bed. The number of tiles per square yard is taken to be the same as in the circular beds—viz., 43—and the filtering media and external walls are also similar. The following is a description of the distributing system: An 18-in. cast-iron pipe commences at the boundary area, and at the centre of one of the sides of the square a brick control chamber is constructed, as for the circular beds, containing nine 6-in. valves, one used for emptying the whole system; 6-in. cast-iron pipes are taken from this control chamber to a point opposite to the centre of each unit, into which the whole bed is divided, and are continued upwards and over the drainage carrier, on to the edge of the bed; at the point where the vertical pipe turns into a horizontal position it is supported by means of a brick pier, 9 in. square. This 6-in. pipe, when reaching the bed, bifurcates into 6-in. branches, to which are attached 3-in. cast-iron pipes laid along the whole length of the bed, and provided with spraying nozzles fixed 8 ft. apart. The bed is thus divided into eight units—seven being 24 ft. wide and one being 32 ft. wide.

COST OF "FIXED-SPRAY" SYSTEM.

The figures given below are, of course, only comparative, but are shown in detail, so that a fair comparison may be made:

| | £ | s. | d. |
|---|---|---|---|
| 913 cubic yards excavation and spreading, at 1s. | 45 | 13 | 0 |
| 1,216 cubic yards of concrete, at 15s. | 912 | 0 | 0 |
| 142 yards super., use and waste of timber, at 9d. | 5 | 6 | 6 |
| 158 yards super. render in granite chippings and cement vertically, at 2s. 3d. | 17 | 4 | 3 |
| 338 yards super., all as last but horizontal, at 2s. | 33 | 16 | 0 |
| 4,422 yards super. all as last, but in cement and sand, at 1s. 9d. | 386 | 18 | 6 |
| 4,761 yards super, Ram bottom, at 1d. | 19 | 6 | 9 |
| 1 weir | 1 | 10 | 0 |
| 7,440 cubic yards clinker, at 5s. | 1,860 | 0 | 0 |
| 445 yards super. extra on for building walls, at 1s. | 22 | 5 | 0 |
| 19,200 drainage tiles, at 3d. | 240 | 0 | 0 |
| 3-ft. run of 18-in. c.i. pipe and laying, at 6s. 8d. | 1 | 0 | 0 |
| 1 control chamber | 10 | 0 | 0 |
| 9 6in. valves, at £3 10s. | 31 | 10 | 0 |
| 1 special 18-in. pipe with 9 junctions | 15 | 0 | 0 |
| 8 9-in. brick piers in cement, at 10s. | 4 | 0 | 0 |
| 144-ft. run 6-in. c.i. pipes laid on beds, at 4s. | 28 | 16 | 0 |
| 455-ft. run, do. do., but laid in ground, and vertically, at 4s. 3d., | 96 | 13 | 9 |
| 8 6-in. junctions (e o), at 5s. | 2 | 0 | 0 |
| 16 6-in. c.i. bends, at 10s. | 8 | 0 | 0 |
| 16 6-in. blank ends, at 3s. 6d. | 2 | 16 | 0 |
| 4,800-ft. run 3-in. c.i. pipes and laying on beds, at 1s. | 240 | 0 | 0 |
| 25 3-in. blank ends, at 1s. 6d. | 1 | 17 | 6 |
| 625 jets (or fixed sprays), at 2s. 6d. | 78 | 2 | 6 |
| | £4,663 | 15 | 9 |

The area of land required is 4,922 sq. yds., which, at 6d. per yard (£121 per acre) = £123 1s. The total external area of walls exposed to the air is 445 sq. yds.

ANNUAL COST.

The total annual cost is made up of repayment of principal and interest on land and constructional works, and cost of labour and maintenance. For the land, in both cases it may be assumed that a loan would be granted for sixty years, and for the constructional works thirty years, but for the revolving sprinklers—as machinery—the loan would be for fifteen years only. For calculation these periods are taken, and the interest to be paid is 3½ per cent.

ABSTRACT OF COSTS—REVOLVING SPRINKLERS.

*Capital Cost.*

| | £ | s. | d. |
|---|---|---|---|
| Land | 163 | 7 | 10 |
| Construction | 3,431 | 8 | 10 |
| Pipes | 280 | 2 | 3 |
| Sprinklers | 392 | 0 | 0 |
| | £4,266 | 18 | 11 |

Say £4,267.

*Cost per Annum.*

| | £ | s. | d. |
|---|---|---|---|
| On £163—land—loan for 60 years at 3½ per cent | 6 | 10 | 9 |
| On £3,712 construction and pipes—loan for 30 years at 3½ per cent | 201 | 16 | 10 |
| On £392—distributors—loan for 15 years at 3½ per cent | 33 | 19 | 2 |
| 1 man at 24s. per week | 62 | 8 | 0 |
| Repairs, say 8 sprinklers at £1 | 8 | 0 | 0 |
| | £312 | 14 | 9 |

FIXED SPRAYS.

*Capital Cost.*

| | £ | s. | d. |
|---|---|---|---|
| Land | 123 | 1 | 0 |
| Construction | 3,544 | 0 | 0 |
| Pipes (including sprays) | 519 | 15 | 9 |
| | £4,186 | 16 | 9 |

Say £4,187.

*Cost per Annum.*

| | £ | s. | d. |
|---|---|---|---|
| On £123—land—loan for 60 years at 3½ per cent | 4 | 18 | 8 |
| On £4,064—construction, pipes and sprays—loan for 30 years at 3½ per cent | 220 | 19 | 7 |
| 1 man at 24s. per week | 62 | 8 | 0 |
| Repairs | | | |
| | £288 | 6 | 3 |

EFFECT OF SPRAY.

In an 80-ft. revolving sprinkler the author has found that with a head of 4 ft. there is a travel—at the periphery of the circle—of 8·4 ft. per second; there is, therefore, an intervening period of 7½ seconds before any part of the circumference of the circle receives a second dose of liquid. With the "fixed sprays," however, the whole area of the bed is not, theoretically, covered by the spray, which takes a circular form. The area covered, however, depends upon the spacing of the jets—*i.e.*, whether they are spaced 8 ft. apart vertically and horizontally (on plan), or whether they are spaced with the centres in the form of an equilateral triangle, each side of the triangle being 8 ft. In both cases, with a head of 4 ft. at the nozzle, the maximum diameter of the circle covered by the spray may be taken to be 8 ft., and the area of such a circle would be 5·58 yds. super. If the "sprays" were spaced 8-ft. centres horizontally and vertically (on plan), the total area per nozzle would be 7·11 sq. yds.; hence an area of 1·53 yds. super. is not covered. If spaced in the form of a triangle the total area per nozzle would be 6·1 yds. super., an area of ·57 yds. super. would not be covered. Assuming the number of nozzles to be 625—arranged on the latter principle—the actual area covered by the nozzle would be 3,487½ yds. super., and as the area of the bed is 4,464 yds. super., the area not actually covered is 976½ yds. super., or about 22 per cent. If spaced in triangular form, the actual number of sprays which could be fixed on the bed is 726, and the area not covered by the spray would be reduced to 10 per cent of the whole area, but the cost of construction would be increased by £12 12s. 6d. for nozzles only.

The author thinks from the figures given that the members of the association will be able to judge for themselves the comparative values—all things being equal—of both systems, and concludes his paper with an abstract showing at a glance the various statements made therein:—

| | Revolving sprinklers. | Fixed sprays. |
|---|---|---|
| Head at nozzle | 4 ft. | 4 ft. |
| Area of beds | 4,464 sq. yds. | 4,464 sq. yds. |
| Depth of beds | 5 ft. | 5 ft. |
| Area of land required | 6,535⅝ sq. yds. | 4,922 sq. yds. |
| No. of aërating tiles per square yard | 4·3 | 4·3 |
| Cost of land | £163 7 10 | £123 1 0 |
| Area of external walls exposed to air in square yards | 1,118 | 445 |
| Capital cost of construction and distribution | £4,103 14 1 | £4,063 15 9 |
| Cost per annum, including repayment of principal and interest | £312 14 9 | £288 6 3 |
| Capital cost per unit (8), including land | £533 7 1 | £523 7 1 |
| Annual cost per unit | £39 1 10 | £36 0 9 |
| No. of jets or sprays | 1,120 | 625 |

From these figures it will be seen that a difference only of £24 8s. 6d. per annum is in favour of the "fixed-spray" principle, but it must be borne in mind that this is obtained by the sacrifice of 22 per cent area of bed not covered by sprays, no rest being given to the actual space covered by jet (if continually at work), and a very large reduction in area exposed to the air.

The chief reason for the excess of cost, although slight, of the revolving sprinklers over the cost of fixed sprays is due to the loan for the former being granted for fifteen years only. If the loan was for thirty years—as in the case of the fixed sprays—then the excess would be reduced to the infinitesimal sum of £5 15s. 7d. per annum. It will be seen that the unit of area selected is almost 1 acre. If the paper gives rise to an interesting discussion, the object of the author will have been attained.

## DISCUSSION ON MR. BROWN'S PAPER.

Mr. J. D. Watson said that Mr. Brown in his paper had given them a great deal of information which he thought the members would find very useful when printed in their minutes. The information was useful not only for the moment, but would be also when they came to look up for enlightenment upon things which somebody had actual experience of. They would first of all bear in mind that Mr. Brown had put a hypothetical case before them. Secondly, there was no comparison between one actual work and another. Those who had had to do with the construction of sewage works would bear him (Mr. Watson) out that each case must be considered on its own merits. When they had conditions like those Mr. Brown had laid down he was bound to join issue with that gentleman in suggesting that the comparison between the two methods of distribution could be altogether fair. Mr. Brown took a 4-ft. head as being applicable in both cases. His (Mr. Watson's) experience was that a 4-ft. head was no good at all for a fixed spray jet. He had never recommended the fixed spray jet to be laid down where the head was so low as 4 ft. On the other hand, 4 ft. was too much for a revolving sprinkler. When they came to deal with a rectangular bed with a moving sprinkler backwards and forwards they would find, as he had found at Leeds, it was necessary to have a head 3 ft. 9 in., but so far as he remembered that was the greatest head necessary on a travelling distributor of the Fiddian type. Mr. Brown was right in suggesting that all these cases should be brought down to an economical basis, because, unless the engineer could show the local authority that a certain work was not only good, but good for the money proposed to be spent, then he failed in setting out his case thoroughly. Mr. Brown had made a few points which he (Mr. Watson) would like to advert to. That gentleman would pardon him for saying that he thought he might save some money in his concrete floors. For instance, it was not necessary in order to get a slope from the centre of the periphery of the bed to increase the depth of the concrete in the middle. It was not necessary to do that on a rectangular bed. The usual practice, and the best, was to make the excavation so as to adapt the floor about to be laid to the depth of the concrete it was proposed to lay. But in reading over Mr. Brown's paper it occurred to him that that gentleman had made a curious mistake in estimating the walls. The walls were to be all clinker in his comparison, but he took it that before they could build a wall it was necessary to have it something like 2 ft.

thick. He (Mr. Watson) constructed a wall of iron-stone slag, and he found that at the bottom and the top it was necessary to put three iron bands round it to keep it in position. In building a wall of clinker he thought they must have a good a fair thickness in order to make a thoroughly good job. Mr. Brown failed so far as he must to limit to notice that the area of the cubical contents of the wall should not be included in the contents of the medium. There was a greater cubical space available for sewage purification in a square than in the circular sprinkler because of the space taken up by walls, which also made a difference of over £100 in the cost of the walls alone. With regard to the effluent channel, he considered that before an honest and fair comparison could be made it would be necessary to divide the channels rather differently to what had been suggested. The rectangular bed had channels all round it. Now, the thing to do, he took it, was to construct the channel right down in a particular direction (Mr. Watson illustrated his meaning by reference to the diagram used by Mr. Brown in the course of his paper), or across to the outlet. But with the channel right through, and the drains laid from the side to the centre, thorough aëration was obtained on both sides and in the middle, whereas by causing the beds to fall away towards the side there was not the means of crushing out any deposit that might lie on the floor. Therefore there was a benefit in having the channel right across, for it practically saved three-fourths of the bed. Then, again, if it was done in that way, instead of requiring an extra thickness of concrete in order to go right to the centre, the channel was brought right up, and you got from this side and that (Mr. Watson again resorted to the diagram) towards the centre. Consequently they got the same fall on a 6-in. as on a 12-in. if carried from end to end. Those little details had to be taken into account when they were making something like a comparison of the systems. The method of distribution was a point to which he would also like to refer. In taking the distribution in this way (Mr. Watson pointed to the diagram), they spent a great deal of money in getting the water on to the bed. He ventured to say that was not quite necessary, besides which it was a very great disadvantage. Each of the pipes had a terminus, and by the time you got down to the point the pressure had almost reached vanishing point, with the result that you got very little spraying in the proper sense. There ought to be a pipe on top as a supply pipe, so that all the pipes were connected right through and maintained an equal pressure over the beds. The case given by Mr. Brown reminded him of a curious instance. When he first began to put down sprays of this kind he asked for tenders for cast-iron pipes for distribution, and he found that while the lowest was £3,500, the highest for the same size of pipes was £9,000 odd. The reason he ascertained was that one, the high-priced pipe, was an ordinary waterworks pipe, and the contractors had tendered from their usual pattern. The other (the lowest tender) were for pipes used for water-heating. Those latter pipes enabled him to reduce the cost enormously, and if Mr. Brown took £150 instead of £420 for pipes he would have the same result as he had now. So that if he were acting as *ex parte* witness he should emphasise that particular point, and he should point out that it would be possible to save something like £520 on the estimate given. In addition, he might say that the cost of maintenance in the case of revolving sprinklers was considerably higher than the cost of spray jets. He was not an *ex parte* witness at the moment, and he said that Mr. Brown had not given himself or had not given the circular sprinkler that fair play which he might have given. For instance, he (Mr. Watson) did not think it was necessary to have the circles (pointing to the diagram) all the way round, for they meant a very great expense without being necessary. Then, he had more expensive tiles in laying them the way he did than if they adopted the style at Maidstone. Money might be saved by having the channel right across and drained from the side to the centre. After all, it was the specials that ran away with the money. If they could get plain tiles it was easier and better as regarded ordinary working. The question of spraying unequally had been very properly alluded to by Mr. Brown. With all methods of distribution it was a case of equalising good with bad effluents; but the wind was rarely in the same direction, and when it was strong the sprays were blown in all directions at different parts of the bed. As they all knew, it was necessary to give bacterial beds a rest, and when they were thus resting voluntarily the result was the same as when they were resting compulsorily. As to the question of the loan, he was not quite in favour of the long loan which some people favoured. He never asked Parliament to give a longer loan than thirty years for sewage works; that was a view he held, and he conscientiously maintained it. He considered that long loans were mischievous. He did not know a single revolving distributor that would last for fifteen years. The oldest one he had had gone continuously for eight years, and it was now being renewed—the arms were being replaced. But in ten years he had renewed one sprinkler, scrapped another, altogether changed the form of yet another, and he had several acres of moving sprinklers on rectangular beds, and he did not expect their life would be much longer than six or seven years, unless he was prepared to spend a large sum of money in keeping them in first-rate order. When considering the question of loans, he thought it was wiser, generally speaking, to be content with a short term. He had occupied their time too long, perhaps, considering he had on his right and left gentlemen well qualified to speak on this subject. He would like to say that that afternoon he had with him Mr. George Hart, engineer for the large scheme now going on at Leeds. The Leeds people obtained a loan for over £1,000,000 for the construction of the sewage works. The contracts were in hand, but until the last moment the question of distribution was not dealt with. Mr. Hart took his committee over a number of the chief places where sprinklers of various types were to be seen, and when he went back he wrote a report on the subject, in which he made definite recommendations. The resolution of the Leeds Corporation was to lay down 18 acres of bacteria beds in the meantime. Twelve were to have spray-jet distribution, and they were to have the Fiddian type of distributor. Probably the corporation would extend the area, but that at all events was what they had done in the meantime. In his report Mr. Hart gave capital charges, interest, sinking fund, reserve renewals—in fact, the total charges of 1 acre of bacteria beds. At Hampton the total capital charge for 1 acre he put at £113, and at Nuneaton £147, while Birmingham came in at £128, and Hanley at £105. The working charges he put as follows: Hampton, £89 18s.; Nuneaton, £55 15s.; Birmingham, £103; Hanley, £107. The totals for the 1-acre bed he gave thus: Hampton, £200 18s.; Nuneaton, £202 15s.; Birmingham, £131; Hanley, £212. Here was a case where the engineer of the largest scheme in the country at the present time, after very exhaustive investigation, placed these figures before his committee, and asked anybody to call them in question. He (Mr. Watson) might say that he did very much the same thing when he came to construct large storm-water bacterial filters. He maade up a statement and gave it to the various manufacturers of distributors, saying: "Tell me anything you can see wrong." He received back the statement with sundry criticisms, but after all was done, there was no comparison as far as cost was concerned with the fixed spray jet. Some people would say: "Your effluent is not so good as with another system." He might say that at Birmingham they had many moving filters on the works, and they found the effluent very much the same—*i.e.*, with the same sewage, depth of material, and the same arrangement, the results were very much the same; consequently, added the speaker in conclusion, when one had to advise a local authority one advised them to take the cost of their material into account.

Mr. W. Fairley observed that the paper was an excellent one, but it was a mass of comparative figures, and it was quite impossible for an ordinary individual like himself to carry them in his mind. With a great deal of what Mr. Brown said he was in agreement. Mr. Watson, he thought, had raised certain matters which were rather away from the main point, for after all the comparison Mr. Brown made between the two systems seemed to be a very fair one. There might, of course, be better ways of doing fixed spraying on the revolving process. There were a great many details which to his mind did not affect the point at issue at all, and after all the question whether one or the other system was to be put down was not entirely one of cost. Cost, of course, had to be taken into consideration, but efficiency was far more important, and one thing that governed the design was the amount of fall there was between the tanks and the surface of the building. He had seen works with 4 ft., 6 ft. and 8 ft. of fall between the tank and filter;

at Mr. Brown's works that afternoon he saw a matter of 15 ft. He thought the engineer who designed the tanks was a far-seeing man, and did not know it, and things had played very well into his hands. It was after all a matter of fall. He had gone into the matter often enough, but, unfortunately, in most cases the designer was tied down on matters of head. He had worked revolving and rectangular sprinklers with a headway of from 18 in. to 2 ft. 6 in. quite successfully. There was, however, one objection to the fixed spray: it had not the same elasticity as the revolving sprinkler. It was not possible to deal with twice or three times the dry-weather flow as with the revolving sprinkler. With the revolving sprinkler the flow could be increased, but if more water was passed with the other it seemed that the fixed spray lost a portion of its capacity in dry weather. He had always considered that the fixed spray was an eminently satisfactory process where the quantity passed through was within certain limits—not much larger than the dry-weather flow. There was no doubt that opinion was very much divided upon the question of the relative merits of the two processes. They all, however, claimed that they got good results, and he had no doubt they did.

Mr. C. Chambers Smith (London) said it was not an easy matter to discuss Mr. Brown's paper, for it was so full of figures, and after all the subject dealt with was one upon which it was difficult to dogmatise. His (the speaker's) experience was that when they got the percolating filter they got the subject of sewage treatment reduced to a science; it enabled them to know as near as was possible all that was to be known, assuming they got a decent tank effluent, and that was not difficult. As to which process was the most acceptable, the revolving sprinkler or the fixed spray jet, it seemed to him that Mr. Brown, and perhaps the president too, did not dwell sufficiently on the relative efficiency of purification as betwixt the two. He was inclined to think that the members of the association had had a good deal more experience of and pinned their faith more to the revolving sprinkler than to the fixed spray. With the revolving spray the sewage was well equalised, but with the fixed spray it was confined to a very narrow limit. The president had a wider experience of the fixed spray than he had, but at the same time that was his (the speaker's) opinion. It would be interesting to get an analysis of the sewage treated by the fixed spray, and the same quantity of sewage treated by the revolving sprinkler. After all, they had to consider not only the question of cost, but relative efficiency of the work.

Mr. C. Terry said they all believed that the greater the aëration sewage was subject to the better the ultimate result must be. Whether the revolving sprinkler had an advantage over the fixed spray did not appear, but it seemed to him beyond dispute that a considerable additional well aëration was obtained in the circular sprinkler compared with the rectangular bed. A tremendous additional well space must, he thought, give better results. In his case his council had practically decided to go in for the fixed spray, simply because they were rather carried away with what they saw at Birmingham and Hampton. After seeing the revolving sprinkler working, he was rather inclined to think there surely must be an advantage in the excellent way in which the beds were aërated by that system. He should like to ask whether the fixed spray was calculated to cause a greater nuisance by stench than the revolving sprinkler. He was a little disappointed to hear the president say he would not advise the fixed spray with less head than 4 ft. If so, his (the speaker's) scheme was, so to speak altogether defunct, because he would have to do with a head of 2 ft. They had been experimenting with 2 ft., and had got excellent results. In conclusion, he proposed a vote of thanks to Mr. Brown, the author of the paper which was seconded by Mr. Carpenter.

Mr. Lennard Brown, in reply, remarked that the [illegible] principle of the fixed spray was that [illegible] He thought they could say that they had [illegible] principle was perfected in the revolving sprinkler. The sprinkler at Southall were arranged on the principle of breaking up the whole sewage into rain-like drops and covering the whole area of the bed, and he claimed that this had exactly the same effect as the fixed spray, with the advantage of covering the whole of the bed. Mr. Watson dealt with the matter critically, as he should do, and suggested that there were many things in connection with the construction of the two systems where money might be saved. He (Mr. Brown) quite agreed. There were many items which might be amended so far as cost was concerned; but that was not the object of the paper. It was intended to give the comparative cost of the two systems, comparing them under exactly the same conditions. Mr. Watson referred to a 4-ft. head, but he (Mr. Brown) might say they were able to get as much as 8-ft. head on the spray, and that was not too much for the system of distribution at Southall. It was necessary, of course, to have a special type of sprinkler. The ordinary type was of about 18 in. of head, but if the top was sealed to prevent overflow the whole of the head was utilised. He might say that the tanks were at the particular height for the special reason of controlling the land of the farm, which lay some distance from the works. He did not agree with Mr. Watson in his remarks as to the thickness of the walls required. In his case he had had two beds of 40 ft. and 60 ft. for five years and three years, and no movement, not $\frac{1}{8}$ in., had taken place, which went to prove that you need not expect movement in a wall 12 in. to 6 in. thick. That also exploded the statement with respect to the cost. He might say he took the cost of the clinker in each case. He agreed that a centre channel along a rectangular bed would be an improvement, but even in that case it would not be possible to obtain the amount of aëration that would be desirable, as it would be necessary to keep it open upon all sides. He knew it was a wrong thing to run pipes to a dead end. It would certainly be advantageous to put a 6-in. pipe along the bottom of the beds so as to get action, but any increase in the cost of the distribution pipe would increase the cost of the fixed spray. In his paper he estimated the cost of 3-in. pipes to be 1s. 9d. per foot laid on the beds. The cost of the fixed spray was presented at £420, and Mr. Watson said it could be reduced to £120. He ought to explain that as a matter of fact he had altered that estimate in the meantime, and his estimate was £240, not £420. He took particular care to obtain information as to the cost of Mr. Watson's works, and he found the estimate he had given was very fair. But 1s. per foot run was very low, and as Mr. Watson said, an ordinary hot-water pipe was lighter and thinner. Was there not danger, however, in adopting a thinner material? The thinner the pipe was, it surely followed that its life would be shorter; consequently there must be a set-off in the cost against capital cost. It was asked which system were they to adopt? He would say the system to adopt should be that best suited to their own particular works. Where the revolving sprinkler might be too costly, then it would be desirable to use the fixed spray, and *vice versâ*. Each sewage works must be considered according to its respective conditions, and the works must be designed to meet the particular local conditions. They could not lay down any hard-and-fast rule. Mr. Terry had asked if the fixed spray was likely to give rise to a nuisance. He thought it was conclusively proved before the Royal Commission that the fine spray which arose from the fixed jet—and probably from the revolving sprinkler if arranged on the fine-jet principle—might give rise to serious nuisance. It might happen according to the direction of the wind. However, if they got a good tank effluent he did not think there was much fear from the aerial nuisance.

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**Business Announcement.** For the convenience of their customers in London and the Home Counties, and in order to cope with their increasing business, the (U.K.) "Winget" Concrete Machine Company, Limited, of 11 Star-buildings, Newcastle-on-Tyne, have opened a London office at 4, 5 and 6 East Indiaavenue, London, E.C. Mr Victor Kemp has been appointed manager.

**Trailer Tramcars.** The council of the Roads Improvement Association have decided to present to the House of Lords a petition against Clause 26 of the London County Council (Tramways and Improvement) Bill, in which the London County Council ask for powers to run trailer and coupled tramcars. Several of the constituent bodies of the association feel very strongly that trailer and coupled tramcars would add very considerably to the congestion and danger of the already thickly trafficked streets, and the association feel, after full consideration, that the matter is of such importance that it should make every effort to oppose the proposal of the county council.

# Institution of Water Engineers.

## SUMMER GENERAL MEETING AT CHELTENHAM.

At the third and last day's sitting of the Institution of Water Engineers on the occasion of the recent summer general meeting at Cheltenham, a discussion on the desirability of standardising the

GENERAL CONDITIONS OF CONTRACTS

was initiated by Mr. Harold W. Woodall, M.INST.C.E., water engineer, Bournemouth.

Following some preliminary remarks, Mr. WOODALL said the advantages of having standard clauses of contract when asking for tenders for the construction of engineering works would appear to be many. In the first place, it saved the engineer a considerable amount of trouble to have standard clauses, admittedly equitable to both parties, which he could incorporate as a whole, instead of having to consider and draft them for each specification he sent out. In the second place, both engineer and contractor knew exactly how they stood in relation to the contract, no arrangements having to be made as to the interpretation of clauses or the modification of those which the contractor might think unreasonable or capable of misinterpretation. Competition was so keen nowadays, and tenders were cut so fine, that it was more than ever essential that contractors should not only tender to the same specification, but that they should all interpret it in the same way. When one introduced various fancy clauses, there was a chance of something being omitted, and the engineer saying at the end of the contract that it was included under a certain clause. The contractor would reply that he did not interpret it so, and litigation usually followed, and the throwing away of money which should have been spent in useful, productive work. He did not claim that such troubles would be entirely removed by the adoption of standard clauses, but they would certainly be mitigated; and one of the results of their adoption would be to establish eventually standard legal rulings. No work could be satisfactory unless it was carried out in good faith and good fellowship by the various contracting parties. The employer wanted certain work done to suit the purpose of his business, and he was usually prepared to pay a fair price to get it. The engineer wished to secure for the employer the most suitable design or the most suitable materials at the lowest price consistent with the contractor securing a reasonable profit. The contractor, if only for the credit of his firm, wished to carry his contract to a successful conclusion, and so far as his (the speaker's) experience of established English firms was concerned, he was usually willing to accept a very reasonable margin of profit. Given an honourable employer, a just engineer, and an honest contractor, the interests of all parties concerned became practically identical, as they were all anxious to bring the contemplated work to a satisfactory conclusion at the lowest reasonable cost. He was inclined to think that a distrustful attitude, and a harsh, overbearing specification frequently counteracted the intention with which it was framed, and resulted in a considerably higher quotation from the contractor and consequent loss to his employer. For the foregoing reasons, he thought that when the introduction of standard clauses was contemplated they should be drawn up by a committee of engineers, and submitted for the consideration of a committee of contractors before being finally adopted. With a view to securing fair and satisfactory clauses in contracts, the Institution of Gas Engineers and the Society of British Gas Industries each recently appointed a committee to meet and draft standard clauses. In the result some were drafted which, in his opinion, were worthy of general adoption. Very careful consideration was given to the responsibilities of the various parties to the contract, and to the questions of penalties, payment, and arbitration, as it was felt that these had been in the past a fruitful source of friction and expense which were both unnecessary and contrary to the interests of all parties. He had used the clauses referred to for two large contracts, and they appeared to be clear, simple, and satisfactory to all concerned. They were equally applicable to the work of water engineers, and he suggested that they would form a useful guide. If the members felt that this matter was worthy of consideration, they would find a useful foundation for their labours in the work already accomplished by the kindred society.

Mr. WM. MATTHEWS (London) said he was quite in agreement that something in the nature of regulation and uniformity in the general conditions of contracts was very desirable. Personally, he had found it very useful, and he had with him a set of general conditions of contract which he had used for the past twenty years. He had experienced no difficulty in using them, and they had in no case led to litigation—from which he could only assume that contractors regarded them as reasonable, while being desirable from every point of view. Of course, the question had been mooted in the institution before, but the idea seemed to be that it was a set of conditions for well-sinking, and buildings, and so on, but coming to a description of materials, the standard specification was an utter impossibility. He had tried in drawing specifications for new buildings to see whether one could use any large amount of the clauses in old contracts, but on going into the question the necessity for new clauses was shown, and he thought it would be a pity to endeavour to deal with it in that way. The conditions of contract which he found it possible to standardise were as follows: (1) Interpretation; (2) basis of contract; (3) specification and drawings; (4) further instructions; (5) work to be carried out to satisfaction of engineer; (6) engineer's assistant and clerk of works to have authority; (7) engineer to set out work; (8) details of prices to be furnished; (9) additions, alterations and deductions; (10) extra work; (11) prices for extra work, additions and deductions; (12) account of extra work; (13) interim measurements and payments not to prejudice the final adjustment; (14) payments; (15) contractor not to assign or sublet; (16) personal supervision, employment of foreman and skilled workmen; (17) rates of wages; (18) contractor responsible for accidents; (19) employers' liability; (20) contractor to do as little damage as possible; (21) interference with drains, ditches, and other conduits; (22) fencing and protecting and watching; (23) insurance against fire; (24) contractor to supply all material, labour, plant, &c.; (25) materials and workmanship to be the best; (26) conditions precedent to issue of engineer's certificate of completion; (27) lien upon materials and plant; (28) signing contract and finding sureties; (29) commencing and carrying out of works; (30) time for completion; (31) engineer to have power to extend time; (32) removal of plant upon completion; (33) period of liability; (34) final certificate of engineer; (35) penalty for non-completion within time limit; (36) in case of failure to perform, contractor may be discharged; (37) re-letting; (38) arbitration; (39) heading notes. From twenty-five years' experience of that set of clauses he had found it possible to use the same thing over and over again, and in that he was in accord with Mr. Woodall, and he thought the matter might be referred to some small committee. He agreed that if they were to have this generally adopted following the procedure on the Engineering Standards Committee it was absolutely essential that they should have the approval of the contractors as a body on the specifications. Unless they did that they were not likely to get them carried out in a very hearty fashion. Of course, the main thing they had to do was to look after the interests of their clients, but unless the contractors thought they were going to be honourably dealt with there was sure to be friction. He supported the proposal, and hoped it would go to the council for further consideration.

Mr. H. ASHTON HILL (Birmingham) stated that he received some time ago the general conditions got out by the Institution of Gas Engineers—of which body he was still a member—and after looking through them he filed it away, because he found that the clauses were very much what he had been using for a great number of years. He agreed with the last two speakers inasmuch as it was worthy of trying to standardise as much as possible, but there was a difficulty in the matter. It had just occurred to him that when the Institution of Gas Engineers and the Society of British Gas Industries got together they were thinking mostly of ironwork and apparatus, which loomed larger in the business of gas engineering than in building. There was a distinct difference between building and machinery contracts. The clauses did not seem to fit in. Then, again, one had to remember that it was possible to have too much specification: fitting on a comparatively small job elaborate pen-

[illegible] and [illegible] drawings led to the contractors [illegible] engineer. Generally, this was a subject which [illegible] all and which [illegible] tion. Of course, if they had standard clauses it was not necessary to put them in every contract.

Mr. C. H. Priestley (Cardiff) said he considered it would be a very good idea for the council to take up the matter. But there were several difficulties, especially in connection with what had been mentioned by Mr. Ashton Hill. General specifications for engine houses and pumps would be very different to what was required for reservoirs, and the conditions could not be made analogous in the two cases.

Mr. A. Valon (London) said he did not altogether agree with the last speaker that it was impossible to frame conditions of contract equally applicable to different works. Perhaps there was a clause they wanted more in one case and less in another. On the whole he thought the general conditions of contract could be so drafted that they would be equally applicable to all sorts of work. He had used a set of certain definite conditions of contract for a good many years now, and he had found they applied very well to all kinds of work. But occasionally, as he said, there was a slight modification. The advantage of standard conditions was that a contractor knew what he was called upon to do, and the engineers knew to what extent they could call upon the contractors. He agreed that more difficulties arose owing to misconceptions on the part of contractors as to the conditions under which they worked than from any other cause. There was no question that one wanted as tight a specification as one could get conveniently, but if engineers made their conditions of contract too tight, the result was that contractors put on a large amount extra, unless he was a man who simply went in on the chance of getting through.

Mr. H. C. Head (Winchester), in supporting, remarked that the lawyers very much appreciated the value of having standard clauses which were well known to people. At Winchester, the headquarters of the Hampshire Law Society, most property was sold subject to the conditions of that body. That greatly facilitated the sale of property in the county, prospective buyers in that way not being made shy of arbitrary clauses.

The President (Mr. J. S. Pickering) said that probably the speakers had voiced the feelings of the meeting, and if that were so, he was sure the council would gladly take the matter into consideration. He felt very strongly there should be a standard set of conditions applicable to water engineering, if such conditions could be drawn to meet the approval of all concerned. He had been interested to hear of the conditions mentioned by Mr. Matthews and other speakers which had worked well for years. He thought it was especially desirable there should be a model standard, for in cases where a legal difficulty arose the position on the particular standard clause would be known to them all, and it could be altered to meet the objections raised to it.

It was finally agreed that the council should take [illegible] into consideration and frame a set of conditions for the approval of the members.

*(To be continued.)*

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**Big Road Contracts.**—The New York State Commission of Highways recently received tenders for some £2,500,000 worth of highway work. Those opened on June 4th were for 131 miles of work, for which the lowest of 181 tenders averaged an expenditure of over £2,840 a mile; those dealt with on the next day were [illegible] and the lowest tender of the remainder an average of about £2,320 per mile.

**How to Exterminate Rats.**—It has been proved with[illegible] that [illegible] in the majority of cases [illegible] Ratin, a [illegible] preparation [illegible] terminated. The vendors of this preparation, the Ratin Laboratory, have issued a small pamphlet entitled the "Scientific Extermination of Rats," which will be sent free to anyone applying to the Laboratory at Leo Buchanan-Street.

## ENGINEERING STANDARDS COMMITTEE.

### CONFERENCE ON STANDARDISATION OF ROAD MATERIAL.

A conference on the above subject, convened by the Engineering Standards Committee, was held on Friday last, June 21st, at the Surveyors' Institution, Sir John Wolfe Barry, K.C.B., chairman of the Engineering Standards Committee, being in the chair.

The following is a list of delegates present, and of the bodies nominating them: Sir John Wolfe Barry, K.C.B. (chairman); Road Board—Sir George Gibb and Colonel R. E. B. Crompton, C.B.; War Office—Captain B. H. O. Armstrong, R.E.; Local Government Board (London)—Mr. P. M. Crosthwaite; Local Government Board (Dublin)—Mr. P. C. Cowan; Geological Survey and Museum—Mr. J. Allan Howe; National Physical Laboratory—Dr. R. T. Glazebrook, C.B., and Dr. T. Stanton; Institution of Civil Engineers—Dr. W. Cawthorne Unwin; Surveyors' Institution—Mr. J. Willmot; Institution of Municipal and County Engineers—Mr. R. J. Thomas and Mr. E. J. Elford; Institution of Municipal and County Engineers (Scottish District)—Mr. R. Drummond; Institution of Municipal Engineers—Mr. A. E. Prescott; Roads Improvement Association—Mr. H. Howard Humphreys; Road Surveyors' Association (Scotland)—Mr. A. E. Stevenson; Convention of Royal Burghs (Scotland)—Right Hon. H. C. Munro Ferguson; County Councils Association—Mr. H. Hampton Copnall; Royal Automobile Club—Mr. W. Worby Beaumont; Automobile Association and Motor Union—Mr. Stenson Cooke; Commercial Motor Users' Association—Mr. G. Arnold and Mr. B. Humphrey; United Kingdom Granite and Whinstone Quarry Masters' Association—Mr. F. W. Manuelle (North of Scotland and Guernsey), Mr. J. Stark (West of Scotland), Mr. H. J. Grace and Mr. R. E. Martin (Midlands), Mr. G. H. Bragg (North of England), Mr. J. C. Mackay (West of England and Wales), Mr. W. M. Langford (South of England); Mr. W. J. Howard-Smith; Mr. H. Wettern; Mr. Leslie S. Robertson (secretary), and Mr. Charles Dresser (assistant secretary).

The following were prevented from being present: Mr. E. J. Lovegrove (nominated by the Road Board), Mr. H. T. Wakelam and Mr. T. H. B. Heslop (nominated by the County Surveyors' Society), Mr. H. Percy Boulnois (nominated by the Roads Improvement Association), and Mr. J. C. Mitchell (one of the representatives of the Commercial Motor Users' Association).

Sir John Wolfe Barry welcomed the delegates, and, after briefly explaining the constitution and objects of the Engineering Standards Committee, stated that the conference had its origin in an interview between himself and Sir George Gibb, chairman of the Road Board in which Sir George had brought to his notice the need for standardisation of certain methods of measurement and of materials used in the construction of roads. To this he had replied that, provided the Road Board were prepared to make a suitable grant from the funds placed at their disposal by the Government towards the expenses of carrying out such investigation, he was sure the Engineering Standards Committee would gladly co-operate with the Road Board in this direction. He was pleased to say that the Treasury had now indicated their willingness to make a grant for the purpose. In conclusion, he hoped that their deliberations that day would be successful and prove of practical utility to all those interested in the important subject under consideration.

Sir George Gibb, chairman of the Road Board, said he hoped it would be the general view of the conference that the standardisation of road material was desirable. When he became impressed with the need of such standardisation, he thought the most practical and best way to achieve this end was to approach the Engineering Standards Committee, which had behind it such a record of valuable and successful work, and he hoped, therefore, that a committee would be formed for the purpose they had in view.

The meeting then turned to the consideration of the matter before the conference, and Sir George Gibb proposed and Mr. Stenson Cooke seconded that the standardisation of road material was desirable.

Mr. R. E. Martin, speaking from the view point of a representative of the quarry masters, said that the quarry masters were not prepared to make a counter proposal to Sir George Gibb's motion, but

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they thought that the conference should bear in mind the possibility of standardisation somewhat diminishing the output, and therefore increasing the price of material. They thought there would be difficulties in the way of standardisation, but they were quite prepared to give their assistance to the careful consideration of the matter.

The CHAIRMAN pointed out that it had always been recognised by the Engineering Standards Committee that their committees should be representative of the manufacturers as well as of the engineers or users, and he was quite certain that the main committee would bear that in mind if a sectional committee was formed.

On the motion being put to the meeting, the standardisation of road material was agreed to *nem. con.*

A general discussion followed upon the matters to be included in the committee's reference, and Colonel R. E. CROMPTON put forward a plea that this should not be limited in any degree, but that the committee should have full discretion as to the matters into which they deemed it desirable to enter.

Many members spoke in support of Colonel Crompton's view, and it was resolved that the scope of the committee's enquiry should cover the standardisation of road stone and materials used in the construction of roads, these latter materials to include gravels and sands, tars, pitches and bitumens.

With regard to the best method of giving effect to the views of the conference, it was resolved to recommend to the main committee that those invited to attend the conference be formed into a sectional committee to deal with the subject with power to add to their numbers.

It was understood that the sectional committee would have power to form sub-committees and to co-opt members having expert knowledge of the particular branch of the subject to be dealt with.

Dr. W. CAWTHORNE UNWIN, president of the Institution of Civil Engineers, proposed a vote of thanks to Sir John Wolfe Barry for presiding at the conference, and this was seconded and carried with applause.

The CHAIRMAN, in returning thanks to the conference, expressed his pleasure at meeting such a representative gathering, and hoped that good would come of it. He desired to express the thanks of the conference to the Surveyors' Institution for kindly placing the meeting room at their disposal.

The meeting then adjourned.

## SOME RECENT PUBLICATIONS.*

PRINCIPLES AND PRACTICE OF ELECTRIC WIRING. By A. Bursill, A.M.I.E.E. Price 3s. nett. London: Longmans, Green & Co.

This book is intended mainly for the use of wiremen attending evening classes at technical schools, and contains, in addition to the matter covered by the title, a considerable amount of information on allied subjects, such as the relations between power and work, the measurement of heat, photometry, and so forth. First principles are dealt with in a concise and lucid manner, and a courageous attempt is made to impart a working knowledge of methods of calculation in a few pages. An impossible pump is depicted in an illustration on p. 11 of an hydraulic analogy to an electrical circuit. Passing on to the subject of wiring, the author treats this with clearness and practical knowledge, actual working details are given, with many useful hints and illustrative sketches. The instructions for making joints are particularly detailed, though, as the author points out, joints should be avoided if possible. Electric heating and cooking, the characteristics of arc and glow lamps, methods of testing, and meters are dealt with, and the wiring of a small house is described, with an estimate of cost. There are also short sections on bells and telephones, and dynamos and motors. The necessary tables are included, and the book appears to be admirably adapted for its purpose.

THE PRINCIPLES OF STRUCTURAL MECHANICS. By Percy J. Waldram. Price 7s. 6d. nett. London: B. T. Batsford.

This book deals with the principles which underlie the theory of structural design, and, while avoiding the use of higher mathematics, a clear explanation is given of processes which are frequently used without being understood. Such terms, for instance, as moment of inertia, radius of gyration, and others which are sometimes dealt with as incapable of other than mathematical expression, are defined with clearness. The pupil or practitioner who has studied this book will thus be able to bring to his work a more complete understanding of the nature of the processes used than heretofore. The scope of the book is wide, and includes graphic statics, beams and girders, walls and foundations, roofs, arches and domes, columns, and shoring. We have no hesitation in recommending it to students who may have found larger works too complex for them to grasp.

BUILDING STRUCTURES IN EARTHQUAKE COUNTRIES. By Ing. Alfredo Montel. Price 8s. 6d. nett. London: C. Griffin & Co., Limited.

The subject of the construction of buildings specially designed to resist the effects of earthquakes has been brought into prominence in recent years in consequence of the colossal disasters which have taken place from time to time in various localities. This book, which is translated from the Italian, was largely inspired by the disastrous earthquake in Calabria and Sicily. The author deals with the nature of seismic disturbances, the design of wooden and free wall houses and the necessary calculations. There is also an interesting chapter on the stability of an ordinary house during an earthquake. The information which the book contains is clearly presented, and there are several good illustrations. Mr. Montel's work should be in the hands of all who are interested in a subject the literature of which is somewhat meagre.

THE SOCIAL GUIDE, 1912. Edited by Mrs. Hugh Adams and Miss Edith A. Browne. Price 2s. 6d. nett (cloth) and 3s. 6d. nett (leather). London: A. and C. Black.

This is the third annual issue of the Social Guide, and the plan adopted is the same as that used before—namely, to deal in alphabetical order with every social function of note. The information contained in the Social Guide is not to be found collected in a readily accessible form elsewhere, and the book is taking its place as one of the regular "annuals" which are required for general reference.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Ltd., on receipt of published price.

# Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, assoc.m.inst.c.e.

*All communications in regard to this page must be addressed to* The Editor, St. Bride's House, 21 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

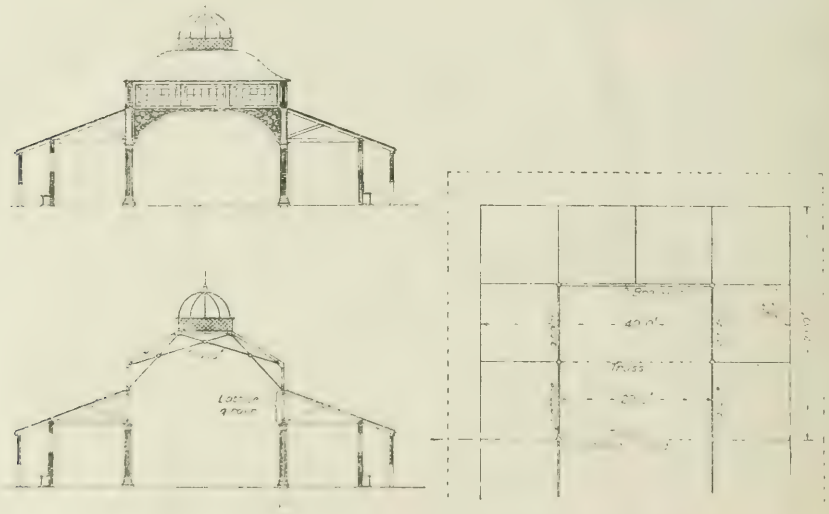
## QUESTIONS.

This week answers are invited to the following questions:

**252. Girder Bridge.**—Design a girder bridge to carry a 24-ft. road over a river and railway (at an angle of 60°) of two spans, 70 ft. and 42 ft. respectively. The mean height of road surface above bed of river is 21 ft. 6 in., and 17 ft. above rails, and the foundation is clay. Please show calculations and give an estimate of the cost. ("Nomad.")

**253. Hospitals.**—Give a typical cross-section of an infectious hospital ward. Specify for finishing the internal surfaces. Give detail sketches of a window. ("M. and C.E.")

**254. Books.**—Would any of your readers kindly recommend any books on bridge construction and tramway construction suitable for the examination of the Institution of Municipal and County Engineers? (F. H. H.)



Design for Pier Pavilion Roof.

**255 Surveying.**—What effect has a steep hill of moderate height on a survey whose accuracy is important. It is obvious that if the reading of the chain line was taken and plotted the resultant plan would be distorted. Describe the means taken to obviate this distortion. (H. S. G., *Ashford.*)

**256. Leak in Drain Pipes.**—What is a reasonable amount of leakage to be expected in newly laid stoneware drain pipes of 6 in. and also 12 in. diameter? State the type of joint, average depth of trench, and class of soil. Is one gallon per mile of pipe per hour a permissible amount? ("Welsh.")

## REPLIES TO QUESTIONS.

**250. Pier Pavilion Roof.** Show by sketches how you would roof a pier concert room 60 ft. by 40 ft. If desired, there may be two columns 20 ft. apart below each truss.

This question is taken from the paper in Building Construction and Materials set at the examination of the Society of Architects in October, 1907. The above drawings are taken from "Examination Work in Building Construction," by Prof. Henry Adams, a book of model answers to questions set at these examinations.

**238. Small Sewage Disposal Installation.**—Sketch and describe an installation consisting of a septic tank and filters for dealing with the soil sewage of about 750 persons, showing all the calculations for size of filters, &c. The filters are to be arranged so as to be capable of being enlarged if required. It is possible to have land treatment afterwards on about ½ acre to ¾ acre of land. The effluent is to discharge into a ditch and must be kept to a high standard. The scheme is not meant to be permanent, and is only required for a period of about six years, until sufficient assessable value is created to apply for a sewer loan to connect to a now existing sewerage system. ("Somerset.")

[In the reply to this question published on June 14th the detritus tank was said to be "rather large." It is in fact unduly large, being about five times as large as recommended by the Royal Commission. Further, the tanks do not empty three times per twenty-four hours, but they always stand full. The total capacity is more nearly that of what are known as "continuous flow settlement tanks," while the question calls for "septic tanks." Again, the calculation of the tanks is incorrect. Taking the dimensions of the tanks given, *viz.*, 20 ft. × 6 ft. × 6 ft., this = 720 cub. ft. for each tank, or 1,440 cub. ft. for the two together, which is equal to 9,000 gallons (not 960 cub. ft. and 6,000 gallons, as mentioned in the reply). For the volume given, the capacity of the filter—*viz.*, "75 yds. of filtrant"—means presumably 75 cub. yds., which is much less than what it should be if based upon the Royal Commission's recommendation. The method of distribution and the thickness of the walls are also open to criticism. The following additional reply to this question is therefore published.—Ed.]

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There are several details required for the purpose of working out an accurate scheme which are not given in the question. Nothing is said as to the amount of fall available and as to whether the drains will be on the separate or combined system. Further, it would have been advisable to have had particulars as to the character of the sewage. In the present reply it has been assumed that there is about 9 ft. or 10 ft. total fall available from the invert of the drain to the surface of the land to be used for irrigation purposes, also that the drains are on the separate system, and that the sewage is of a purely domestic character.

In order to arrive at the daily dry weather volume of sewage the volume per head per day has been taken at 30 gallons. It is quite possible that it may

be considerably less than this figure, but in that case a larger allowance of filtering material must be provided, as the essential feature is the number of persons contributing to the sewage, which would be the same whether it is diluted with a smaller or greater volume of water.

There is no real need for any grit chamber if the drains are laid on the strictly separate system. If, however, the backyards and roofs are connected to the drains, then a small grit chamber of about 300 gallons capacity would be desirable, and this should be so arranged that it can be frequently emptied, so as to prevent the silt from finding its way into the septic tank.

The septic tank should have a capacity of twenty-four hours' dry weather flow, *viz.*, 750 × 30 = 22,500 gallons = 3,600 cub. ft. This means two tanks, each 30 ft. × 10 ft. × 6 ft. average depth, the depth being 7 ft. at the inlet end and 5 ft. at the outlet end. If these tanks are near houses they should be covered in and proper ventilation provided. If, however, they are situated a considerable distance from any house they may be left open or merely covered with loose boards. The details of construction will depend entirely upon whether the tanks are to be arranged above the ground or in the ground, but they should have proper submerged inlets and outlets and provision made for drawing off the sludge when required. A single cross division wall carried up above the top water level, with apertures at about 2 ft. below the water level provided with valves, would obviate the necessity for emptying the whole of the tank on every occasion. This cross wall should be situated about 6 ft. from the inlet end of the tank and should also have a valve at the bottom next to the floor, so that the whole of the tank may be emptied through the sludge outlet if at any time it may be found necessary to do so.

With regard to the filter, this should be a percolating filter with a total cubic capacity of 322 cub. yds., and would therefore be 44 ft. diameter, with an average depth of 6 ft. If it is impossible to obtain sufficient fall to allow for a filter 6 ft. deep, the depth may be reduced to as little as 4 ft. 6 in., but the area must be increased in proportion in order to provide the same total cubic capacity—*viz.*, 322 cub. yds.

This filter should be provided with a proper revolving distributor, which should be supplied from a suitable dosing tank of a capacity of about 300 gallons. The dimensions of this dosing tank will depend upon the fall of the elbow.

The effluent from the percolating filter should receive further treatment in an effluent settling tank of a capacity of about 2,000 gallons. The effluent from this tank could then be distributed over the land for further treatment. If the land is of a stiff nature, it would be better to provide for simple surface irrigation. The final effluent should be picked up by means of a grip along the lower side of the land, which would deliver it to the ditch. If this scheme is properly carried out and carefully managed it should provide an effluent of the highest standard such as is mentioned in the question.

The basis upon which the capacity of the percolating filter has been calculated corresponds very nearly to the recommendations of the Royal Commission, and it is not considered desirable to provide less than this if a uniformly satisfactory effluent is to be obtained. (M. S. E.)

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**Local Authorities and London Drainage.**—Finchley Urban District Council are arranging a conference of representatives of various authorities in Middlesex for the purpose of discussing proposals for connecting local drainage schemes with the London County Council system.

**The Horsfall Destructor Company, Limited.**—Owing to very heavy litigation in connection with furnaces and plant sold to the Southend Borough for the erection of an Electric Light Station, which recently terminated in the company, the company found itself unable to meet its obligations, and a few weeks ago Mr. A. W. Wyon was appointed receiver and manager on behalf of the debenture holders. We are authorised to state that Mr. Wyon is carrying on the business at Atlas Works, Pershore, and that he is making arrangements for the carrying out of any destructor contracts entrusted to the firm, with the assistance of a well-known and very strong firm of contractors. The services of the skilled staff of the company are available, and it is hoped that the latter will be enabled to carry on on a sub-stantial basis.

## LOCAL GOVERNMENT BOARD INQUIRIES.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

### INQUIRIES HELD.

**Birmingham T.C.** (June 18th. Mr. F. O. Stanford).—£33,619 for road improvements and the construction of a bridge over the river Cole at Forman's-road, Sparkhill.—In respect of an application to borrow £3,655 for the widening and improvement of Sandy-lane, the town clerk, Mr. E. V. Hiley, explained that the thoroughfare was used largely for goods traffic to Lawley-street Station. A sum of £6,850 was asked for for the widening of Alum Rock-road, between the London and North-Western Railway and Washwood Heath-road, to 60 ft. It was proposed to widen Trafford-lane, the connecting road between Alum Rock-road and Cotterill's-lane, to 50 ft. In Alum Rock-road it was proposed to form a grass plot 7 ft. wide on each side of the road. This, said Mr. Hiley, was rather a new departure in the way of street works, and one quite in keeping with modern ideas. Mr. Hiley also asked for permission to borrow £2,800 for improvements in Brook Vale-road, Erdington, including the alteration of the Witton Canal Bridge. Another project is the proposed construction of a bridge over the river Cole at Forman's-road, Sparkhill. In applying for permission to borrow £6,250 for the carrying on of the work, the town clerk said it was proposed to construct a two-span brick arch. Regarding the proposed improvement of Hockley Brook, where it adjoins the tramway depot, Mr. Hiley said it was proposed to divert the stream and culvert it. Other applications were for £514 for paving the upper part of Bennett's Hill with oak blocks; £1,020 for putting down wood paving in Great Charles-street; £2,440 for substituting granite blocks for macadam in Landor-street; £5,093 for similar work in Arden-road, and £1,127 for works of sewerage in Woodthorpe-road, King's Heath.

**Ealing T.C.** (June 12th. Mr. M. K. North).—£1,700 for the provision of new bacteria beds at the northern sewage outfall works. Powers for £1,150, £700 and £300 for the widening of Hanger-lane, Northfields-avenue railway bridge, and Warwick-road respectively.—The town clerk, Mr. G. E. Brydges, explained that the borough surveyor, Mr. C. Jones, had reported to the council that, although the northern tanks were sufficient for present use, it would be advisable to construct two additional filter bacteria beds, which would be needed in future in consequence of the continued building operations on the Brentham estate. That work had accordingly partly been carried out during the past winter, in order to provide work for the unemployed. It was the intention of the council that the remainder of the work should be carried out during next winter, with a view to providing further work in the event of necessity arising. The necessity last winter had not been very great; consequently it was not necessary to carry out the whole of the work. One of the beds was, however, nearly completed. The surveyor explained the works in detail. The inspector remarked that any additional cost involved by giving the work to the unemployed must be charged to the revenue account, as the Local Government Board granted loans only for those amounts which represented the cost of works carried out under ordinary labour conditions. The surveyor remarked that he did not think there would be much additional expense. There was no doubt that changing gangs each day was an expensive proceeding, but he did not think that more than 5 per cent of the cost would have to be charged to the revenue account for that reason. In reference to the Hanger-lane widenings, the town clerk explained that the lane was very much used by traffic, especially motor traffic, and it was hoped to place the work in hand.

**East Crinstead R.D.C.** (June 20th. Mr. F. O. Stanford).—£604 for the purpose of sewerage and sewage disposal works for St. John's, Crowborough, in the parish of Withyham.—The surveyor, Mr. C. Turton, in explaining the scheme, said provision had been made at the sewage disposal works for the treatment of sewage from 200 houses, with an estimated population of 1,000. The pipes would be 12 in., 9 in. and 6 in. in diameter, and under the regulations in force in the district rain water would, as far as possible, be excluded from the house sewers; surface water would discharge in the roads or the stream which mostly prevailed at present.

**Mansfield T.C.** (June 12th. Mr. H. R. Hooper).—£300 for the purchase of land to widen Burnt-[illegible]. The town clerk stated that the present width of the road at the point which they considered required widening varied from 20 ft. 5 in. to 12 ft. 6 in. The width of the roadway at the narrowest point was 3 ft. 2 in., which only left 9 ft. 4 in. for carriageway. The council proposed to acquire 690 sq. yds. of land, the whole of which was to be thrown into the roadway. The vendors were the trustees of Brunts' Charity, and the price was 6d. per square yard.

**Mynyddislwyn U.D.C.** (June 20th. Major J. Stewart). —£3,555 for erecting new council offices.—Mr. E. W. Edwards, surveyor, and Mr. W. A. Griffiths, architect, gave evidence as to the need of the new offices.

**Saffron Walden T.C.** (June 4th. Mr. A. A. G. Malet). —£2,205 for the erection of a water tower on land adjoining the town reservoir in Debden-road.—The town clerk, Mr. W. Adams, stated that the proposed high-level water tower was required for the higher portion of the town, which at present was inadequately supplied. That portion of the town was rapidly developing, and it was necessary to provide for that area an efficient supply. The borough surveyor, Mr. A. H. Forbes, gave details of the scheme. The tank upon the tower, he said, would hold 30,000 gallons, and when they left off pumping at night this would be sufficient to supply the high-level with water until the following day. The proposed tower was also required in order to supply the Joint Isolation Hospital of the urban and rural districts with the town water, and for the new isolation hospital which was being built at the Friends' School. The high-water level would be 15 ft. above the top of the tank at the Friends' School.

**Thetford T.C.** (June 20th. Mr. Edward Leonard).—£7,200 for the purpose of erecting fifty workmen's dwellings on the Bury-road. In reply to the inspector, Dr. Oliver said he knew of two definite cases of overcrowding, but as he had only recently been appointed he could not speak at present for more. There were ten houses existing that were absolutely insanitary, and ought to be condemned at once, and there were ten others that were very bad. There was certainly a demand for the class of houses proposed. He knew of eight cases of people wanting houses, but not being able to get them. The wages that prevailed in the town for labourers were from 15s. to 17s. a week. The mechanics, of course, earned more. There were no empty houses of the workmen's type, and private enterprise had not met the demand. There were seventy-three houses in the town with no back entrance, and in all these cases the refuse had to be carried through the house. The borough surveyor, Mr. W. Jones, gave evidence as to the design and construction of the proposed houses.

### APPLICATIONS FOR LOANS.

**Bath T.C.**—£3,500 for the improvement of the institution gardens.

**Brighouse T.C.**—£3,000 for relaying water mains.

**Bristol T.C.**—£669 for a road improvement.

**Cheadle U.D.C.**—£695 for sewerage works.

**Driffield R.D.C.**—£920 for a motor fire engine.

**Harrow U.D.C.**—£5,650 for new municipal offices.

**Hastings T.C.**—£1,180 for a new outfall at the sewage clarification works, Bopcap, and for working Shone [illegible].

**Listowel U.D.C.**—£2,000 for a sewerage scheme.

**Maldens and Coombe U.D.C.**—£1,627 for a 50 h.p. [illegible].

**Merthyr T.C.**—£100 [illegible].

**Northam U.D.C.**—£1,000 [illegible].

**Norwich T.C.**—£1,790 [illegible].

**Prestatyn U.D.C.**—£1,500 for gasworks extensions.

**Saffron Walden T.C.**—£2,470, instead of £2,205 previously [illegible].

**St. Helens (Isle of Wight) U.D.C.**—£1,600 for the [illegible].

**Wellingborough U.D.C.**—£3,500 for [illegible] improvements.

### LOANS SANCTIONED.

**Alderley Edge U.D.C.**—£750 for road improvements.

**Ashton-in-Makerfield U.D.C.**—£5,065 for gas mains extensions, £281 for culverting, and £327 for street lighting purposes.

**Ashwell R.D.C.**—£3,000 for a water supply scheme.

**Bishop's Stortford U.D.C.**—£1,650 for improving the water supply.

**Braintree R.D.C.**—£1,110 for the provision of dwellings.

**Croydon T.C.**—£800 for a site for a fire station.

**East Ashford R.D.C.**—£3,100, to be repaid within thirty years, and of £300 to be repaid in sixty years, for the purposes of sewer and sewerage disposal for the Wye parish.

**Erpingham R.D.C.**—£955 for workmen's dwellings.

**Ilford U.D.C.**—£10,347 for the extension of the South Park schools.

**Middlesbrough T.C.**—£323 for road repairs.

**Portland U.D.C.**—£14,500 for an additional water supply.

**Ripon T.C.**—£250 for museum purposes.

**Scarborough T.C.**—£2,000 for the drainage of Belvedere Grounds.

**Tintwistle R.D.C.**—£2,075 for sewerage and sewage disposal works.

### FORTHCOMING INQUIRIES.

JULY.

| | | £ |
|---|---|---|
| 2. | **Dartford.** For sewage disposal purposes (Mr. A. G. Drury) ... ... ... ... | 7,074 |
| 2.— | **Ilford.** For the purpose of pleasure grounds (Major C. E. Norton) ... ... ... ... | 21,130 |
| 2.— | **Lymington.** For works of sewerage (Mr. P. M. Crosthwaite) ... ... ... ... | 6,420 |
| 2.— | **Salisbury.** For works of street improvement (Mr. F. H. Tulloch) ... ... ... | 1,000 |
| 2.— | **Stalybridge.** For electricity purposes (Mr. T. C. Ekin) ... ... ... ... | 31,850 |
| 3.— | **Bakewell.** For works of water supply (Mr. A. A. G. Malet) ... ... ... ... ... | 1,200 |
| 3.— | **Hornsey.** For the provision of a laundry block and disinfecting chamber (Mr. W. W. E. Fletcher) ... ... ... ... | 4,560 |
| 3.— | **Itchen.** For works of sewerage (Mr. P. M. Crosthwaite) ... ... ... ... | 13,000 |
| 3.— | **Swanage.** For sewerage purposes (Mr. F. H. Tulloch) ... ... ... ... ... | 335 |
| 3.— | **Walsall.** For the purposes of the electricity works (Mr. T. C. Ekin) ... ... ... | 10,000 |
| 3.— | **Waterloo-with-Seaforth.** For road improvement purposes (Major J. Stewart) ... | 10,750 |
| 4.— | **Acton.** For street improvement purposes (Major C. E. Norton) ... ... ... ... | 2,169 |
| 4.— | **Hambledon.** For works of water supply (Mr. P. M. Crosthwaite) ... ... ... | 2,500 |
| 4.— | **Radcliffe.** For the provision of a footbridge and [illegible] (Mr. A. A. G. Malet) ... | 3,400 |
| 4.— | **Royston.** For refuse tip, street, and sewerage purposes (Major J. Stewart) ... ... | 1,075 |
| 4.— | **Southampton.** For street improvement purposes (Mr. F. H. Tulloch) ... | 12,000 |
| 5.— | **Chertsey.** For the provision of a steam watering cart (Mr. F. H. Tulloch) | 700 |
| 5.— | **Chester-le-Street.** For the provision of a pavilion (Mr. R. A. Farrar) ... ... | 2,400 |
| 5.— | **Huddersfield.** For sewage disposal purposes (Mr. A. A. G. Malet) ... ... ... | 15,500 |
| 5.— | **Market Harborough.** For ambulance and fire station purposes (Major J. Stewart)... | 1,150 |
| 5.— | **Swindon.** For electricity and road widening purposes (Mr. T. C. Ekin) | 7,775 |

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**Colwall Sewage Disposal.**—In the recent limited competition for the sewage disposal of Colwall, near Malvern, the scheme submitted by Messrs. Taylor & Wallin, of Newcastle-upon-Tyne and Birmingham (Mr. Harry W. Taylor, Assoc.M.Inst.C.E.), has been premiated and [illegible] for the execution of their scheme. The disposal works will be on modern bacterial lines at the most [illegible]

# Municipal Work in Progress and Projected.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Croydon £5,000, Southport £9,726, Wombwell £6400; housing and town planning Bridlington; roads and materials—Barry £11,900, Bury £2,890, Worcestershire £137,238; sewerage and sewage disposal Bridgnorth, Coatbridge £38,656, Easington £20,500, St. Neots £12,037; water, gas and electricity—Gourock £20,000.—Particulars of other works projected will be found in our "Local Government Board Inquiries" pages.

## ADMINISTRATION.

**Burton T.C.**—The Public Works and Tramways Committee have resolved that an increase of ½d. per hour be granted to all the regular able-bodied men now receiving 5d. per hour or less, and also to the two leading roadmen, and that as regards the paviors, the surveyor, Mr. G. T. Lynam, make further enquiries and report.

## BUILDINGS.

**Blandford T.C.**—The municipal buildings are to be repaired, at an estimated cost of £700.

**Bradford T.C.**—A sum of £7,000 is to be spent upon the improvement of the principal staircase of the town hall.

**Croydon T.C.**—The borough engineer, Mr. G. F. Carter, has been instructed to prepare plans for a new branch library, at a cost not exceeding £5,000.

**Greenock T.C.**—Consideration is being given to a scheme for the erection of five blocks of tenements, at an estimated cost of £5,000.

**Leatherhead U.D.C.**—Plans have been accepted of a pavilion in the recreation ground, to be erected at an estimated cost of £1,600.

**Leicester T.C.**—It has been agreed to erect a general bath-house on the north-east side of the main corridor at the lunatic asylum, with new quarters for the matron and deputy-matron, to extend the laundry at the institution, at a cost of £9,500, and to extend the car-shed accommodation at the tramway depot, at an outlay of £5,790.

**Lincoln T.C.**—The tender of Mr. F. Scarborough, of Lincoln, at £6,675, has been accepted for the erection of a new school at Sincil Bank.

**Llandudno U.D.C.**—The surveyor, Mr. E. P. Stephenson, has prepared a report on a proposed boat jetty for Craigydon, to be constructed of cast-iron columns and [illegible] clock, at [illegible] estimated cost of £521.

**Midleton (Co. Cork) U.D.C.**—A housing scheme is to be carried out, at an estimated cost of £2,700.

**Monaghan U.D.C.**—Fifty-three labourers' cottages are to be provided at a cost of £9,275.

**Northallerton R.D.C.**—The surveyor, Mr. G. Easdale, has prepared the plan and specifications of the proposed bridge at Romanby, and the tender of Messrs. Willoughby & Son has been accepted for building the structure.

**Okehampton T.C.**—A town hall site has been acquired at a cost of £800.

**Radcliffe U.D.C.**—The tender of Messrs. W. Rigby, Limited, at £953, has been accepted for the erection of an electricity sub-station.

**Shrewsbury T.C.**—The tender of Mr. G. Percy Trentham, of Birmingham, at £605, has been accepted for the construction of the Coton Hill river wall.

**Southend T.C.**—The tender of the Alphons Custodis Chimney Construction Company, Limited, of Westminster, at £734, has been accepted for the construction of the Prittlewell refuse destructor chimney shaft.

**Southport T.C.**—A new council school is to be erected at Churchtown at an estimated cost of £9,726.

**Wallsend T.C.**—New public baths, built at a cost of £9,000, have been opened. Messrs. E. W. Liddle & P. L. Browne, of Newcastle-upon-Tyne, were the architects, and Messrs. W. Franklin & Son, of Newcastle-upon-Tyne, contractors.

**Wombwell U.D.C.**—New public baths are to be provided at an estimated cost of £6,000.

## HOUSING AND TOWN PLANNING.

**Bridlington T.C.**—The Sanitary Committee recommend that twenty-five workmen's houses—at rentals from 4s. to 6s. each—be erected in the Old Town Ward.

**Surbiton U.D.C.**—The town planning scheme prepared by the surveyor, Mr. H. T. Mather, has been approved, and the clerk and the surveyor have been instructed to arrange conferences with the larger landowners to ascertain their view with respect to the proposals.

**Wincanton R.D.C.**—Colonel Ridley, of Maperton, raised a discussion as to the exacting nature of the by-laws of the Local Government Board in the erection of new houses in country districts, and said he was not surprised that people hesitated to build under existing conditions. He had recently gone through twelve pages of these by-laws. Colonel Ridley went on to say yet the cry was throughout country districts for more cottages to be built to keep people in the rural districts. The chairman stated that these were Model By-laws which were made by the Local Government Board, and the district council had no alternative but to carry them out. The last thing the council wished to do was to discourage building operations in the district so long as the requirements were carried out.

## PARKS AND OPEN SPACES.

**Finchley U.D.C.**—The council have adopted a report of the Open Spaces Committee recommending negotiations for the purchase of an estate at East Finchley as an open space, at a cost of £2,500. It is also proposed to acquire Brook Farm, Whetstone, for £5,175.

**Renfrew T.C.**—The tender of Mr. Charles McAndrew, at £2,190, has been accepted for laying out the public park.

## REFUSE COLLECTION AND DISPOSAL.

**Watford U.D.C.**—It has been referred to the Sanitary Committee to consider the question of arranging for the collection of refuse from the rear of all houses.

## ROADS AND MATERIALS.

**Barry (Glam.) U.D.C.**—It has been decided to promote a scheme, to be included in a Parliamentary Bill, for a sea-wall and promenade 20 ft. wide, at a cost of £11,901. The plans have been prepared by the surveyor, Mr. J. C. Pardoe.

**Bexhill-on-Sea T.C.**—The borough surveyor, Mr. G. Ball, has submitted plans and estimates, which the council have approved, for making up Ashdown-road, Bedford-avenue, Cantelupe-road (part), Jameson-road (part), Rotherfield-avenue, and Woodville-road, under the Private Street Works Act.

**Blyth U.D.C.**—The tender of Mr. G. E. Simpson, at £5,858, has been accepted for works of street improvement.

**Burnley R.D.C.**—A plan of a proposed new road, 60 ft. wide, from the Burnley boundary to Cliviger has been forwarded by the corporation to the rural district council. It has been referred to a committee.—It has been agreed to carry out street works at an estimated cost of £874.

**Bury T.C.**—Granite paving works are to be carried out, at an estimated cost of £2,890.

**Dalkeith T.C.**—The Road Board have intimated a grant under the Roads Development Act of £300, the maximum amount obtainable by a burgh of the population of Dalkeith.

**Denbigh C.C.**—An agreement has been come to with the contractors for extensive local works to pay to the council, in respect of extraordinary traffic along the Holyhead-road, 3d. per ton per mile during the summer and 4d. during the winter months. This is estimated to produce £812 per annum towards the maintenance of the road.

**Devonport T.C.**—A scheme is under consideration for widening Fore-street, at an estimated cost of £2,900.

**Ealing T.C.**—The borough surveyor, Mr. C. Jones, reports that during the past year 13,900 super. yds. of Ealing stone was manufactured. The cost amounted to £1,175, and issues were charged up amounting to

£1,904. Taking into account stock in hand at the beginning and end of year, there was a profit on the year's working of £627 to be carried to net revenue account. This profit represented roughly the difference in cost between making and issuing. There was, further, a saving to be taken into account—*viz.*, the cost which would be incurred in removing the clinker from the works if it were not utilised in this manner. Since the installation of the clinker crusher a certain market had been created for a portion of the clinker ballast and sand, but undoubtedly the whole of the clinker could not be dealt with in this manner, and a large proportion would have to be removed, at a cost varying from 1s. 3d. to 2s. 6d. per load. Roughly, the saving under this head might be estimated at, say, £500 per annum.

**Esher and the Dittons U.D.C.**—The Works Committee have reported that the clerk to the Twickenham Council, acting as honorary secretary to a sub-committee appointed by a conference of councils in 1911 to interview the Water Board upon its proposed charges for water used in road making, has written expressing the sub-committee's willingness to be satisfied with "an additional payment of the rate specified in sec. 16 of the Water Board's Act of 1907 upon 3 per cent of the total water used in all standposts after deduction of 6d. per 1,000 gallons." The sub-committee recommended the council to agree to this course. This was estimated to result in the council having to pay about £4 or £5 more per annum for road water, but there would be a very large saving in comparison with the Water Board's first proposal to treat road making as a subject for trade rate charges for water. The committee recommended the council to agree to the sub-committee's suggestion, and the recommendation was adopted.

**Haddingtonshire C.C.**—A new road and bridge are to be constructed near Cranshaws, at an estimated cost of £1,500.

**Hove T.C.**—Wood-paving works are to be carried out at a cost of £1,623.

**Lambeth B.C.**—It has been agreed to repave the carriageway of Lingham-street, Stockwell, with Swedish blocks, at a cost of £2,011.

**Lowestoft T.C.**—A sub-committee has been requested to submit plans and estimates of the cost of making up Waveney-drive, and the surveyor, Mr. G. H. Hamby, has estimated at £179 the cost of paving the west side of Whaplode-road with tarred slag and crossings with old lava blocks.

**Maldens and Coombe U.D.C.**—Part of Dickerage-lane is to be made up under the Private Street Works Act, subject to the sanction of a loan for the purpose by the Local Government Board.

**Marylebone B.C.**—Lord Portman has executed a deed of grant for the transfer of a portion of land on the south-east side of Marylebone-road by York-place to the council, for the carrying out of a widening improvement and the formation of a "circus" opposite the Baker-street Station of the Metropolitan Railway.

**Norwich T.C.**—The tender of the Taroads Syndicate, Limited, 9 Victoria-street, London, S.W., for the carrying out of bituminous "Mexphalte" macadam construction, including the supply of all plant, oil, fuel, repair, and materials (except sand and stone), and delivery to the corporation yard, and maintenance for the period of two years, at 10s. 6d. per ton of granite carried, has been accepted.

**St. Asaph (Flint) R.D.C.**—The report of a committee appointed to select tenders for road repairs was accepted at a recent meeting, but Mr. Conwy Bell said he was surprised to find that they had decided to use local stone for the Bodelwyddan-road instead of Penmaenmawr granite. The county council had decided not to take over any more roads at present, but this road would eventually be taken over. It would be a long time before the county council took over a road repaired with limestone. The chairman explained that the cost of road repairing was reduced owing to the heavy rate this year. Mr. Conwy Bell added that one load of Penmaenmawr stone was worth three of the local limestone.

**Wandsworth B.C.**—The borough surveyor, Mr. P. Dodd, has received authority to carry out extensive paving work during the current year.

**Worcestershire C.C.**—A scheme has been prepared at the cost of strengthening and widening with bituminous macadam and generally improving the following portion of first-class roads. County council main roads, 57 miles, estimated cost £122,136; urban main roads, 11 miles, £15,102.

## SEWERAGE AND SEWAGE DISPOSAL.

**Bradford T.C.**—The Sewage Committee have had before them a proposal to try a new system of sewage purification, the invention of the horsekeeper at the works. The engineer (Mr. Garfield), the chairman of the committee (Alderman Johnson), and the deputy chairman (Mr. John Garnett) have devoted some considerable time to the proposals, and have since been instructed by the committee, after due consideration, to go further into the matter. The establishment of an experimental plant will, it is stated, cost £2,000.

**Bridgnorth T.C.**—The experiments at the sewage disposal works have been abandoned, and the council have reverted to a former scheme prepared by the borough engineer, Mr. E. Trevor, which they ask him to reconsider with a view to reducing its cost.

**Cambridge T.C.**—The tender of Messrs. Airds, Limited, at £8,345, has been accepted for the construction of an additional rising main, and the tender of Messrs. A. H. Price & Co., of Nottingham, at £1,907, for the construction of a 24-in. cast-iron outfall and other works.

**Chertsey R.D.C.**—The West Byfleet and Pyrford surface-water drainage scheme was brought up at a recent meeting by the surveyor, Mr. H. Beeney. Reports were also received from the Byfleet and Pyrford Parish Councils recommending that that part of the scheme from Blackdown Hill to Scotland Bridge outfall be immediately proceeded with, the remaining part of the scheme to stand over for the time being. It was also recommended that private owners in several instances be called upon to open ditches. The council resolved to follow out these recommendations, and at the same time to issue tenders for the whole of the scheme as submitted by the surveyor.

**Coatbridge T.C.**—A report was submitted last week by Mr. John D. Watson, of Birmingham, on the relative merits of the competitive designs for sewage treatment, "A" and "D," which had been before him for consideration. The council unanimously agreed that the author of scheme "D," estimated to cost £38,656, be appointed as engineer to carry out the purification of the burgh. The letters were afterwards opened, when it was found that the authors of "D" scheme were Messrs. Kyle, Denison & Laing, Glasgow and Edinburgh.

**Easington R.D.C.**—Plans have been prepared for street sewerage works and water mains, to cost £20,500.

**Falmouth T.C.**—Application is to be made to the Local Government Board for a loan to cover the cost of the extension of the sewers in Western-terrace and Kimberley-road.

**Hemel Hempstead T.C.**—Surface-water sewers are to be laid, at a cost of £1,238.

**Liversedge U.D.C.**—A new screening chamber is to be installed at the sewage disposal works, at an estimated cost of £635.

**Norwich T.C.**—Sewerage works, at an estimated cost of £1,791, are to be carried out, and an air compressor driven by an electric motor, is to be installed at New Mills air-compressing station, at an estimated cost of £590.

**St. Neots (Hunts) U.D.C.**—The council have called in Mr. Reginald Brown, of 21 Old Queen-street, Westminster and Southall, to advise them in connection with a new sewerage and sewage disposal scheme. His report is now before the council. The scheme is estimated to cost £12,037.

**Steyning West R.D.C.**—The council have accepted a scheme of drainage for Lancing prepared by Mr. Reginald Brown, of 21 Old Queen-street, Westminster, and Southall, at an estimated cost of £15,000.

**Tintwistle R.D.C.**—The Local Government Board have given sanction to a loan of £2,075 for purposes of sewerage and sewage disposal works for the township of Tintwistle. Messrs. Brady & Partington, of Chapel-en-le-Frith, are the engineers for the scheme. The construction of the works will be commenced immediately preliminary arrangements are made.

**Woking U.D.C.**—The council have decided to construct by direct labour an experimental percolating filter at the outfall works, the plans of which have been approved by Mr. Midgley Taylor, and which the

surveyor, Mr. G. J. Woodbridge, estimates can be provided at a cost not exceeding £350.

## WATER, GAS, AND ELECTRICITY.

**Gourock T.C.**—A new water supply scheme is to be carried out, at an estimated cost of £20,000, and Mr. Archibald Leitch, of Glasgow, has been appointed engineer. The reservoirs will be constructed at the junction of the Daff and Gimlet burns, and the filters at Larkfield.

**Hastings T.C.**—A scheme has been approved for the erection of a permanent engine-house and duplicating the engine and pumping plant at Crowhurst water-works, at an estimated cost of £980.

**Islington B.C.**—In order to meet the increased demand for electricity, it has been agreed to lay down the following additional plant: One 3,000-kilowatt steam turbine alternator, exciter and condenser, together with an auxiliary plant and other accessories, steam-pipe connections, foundations, &c., cable, cable connections, switch gear and accessories, circulating pipes, valves, &c., £12,600; contingencies, £400; total, £13,000.

**Kingsbridge (Devon) R.D.C.**—It has been agreed to carry out the Stokefleming water scheme at a cost of £400, subject to the consent of the Local Government Board being obtained to a loan chargeable to the parish.

**Lincoln T.C.**—The gas undertaking accounts for the past year show that the profit amounted to £17,936 from which £7,000 had been appropriated for interest and sinking fund charges and £7,000 granted in aid of the rates, leaving a balance of £2,000 to be carried to the next account. The accounts of the electricity and tramways undertakings show that the profit on the former was £3,000. For the first time since its acquisition the accounts for the year of the tramways undertaking closed with a credit balance of £140.

**Navan U.D.C.**—The tender of the Navan Engineering Works, at £395, has been accepted for the erection of gas engine, gas-producer plant, and overhauling existing machinery at the waterworks; and the tender of Mr. James Maguire, Navan, at £450, has been accepted for taking down the old buildings and other necessary works.

**Okehampton R.D.C.**—The tender of Messrs. Blatchford & Dawes, at £679, has been accepted for the work of covering Northtawton reservoir.

**Ruthin R.D.C.**—A water scheme for supplying most of the parishes on the north-western side of the Vale of Clwyd has been formally opened.

**Shrewsbury T.C.** The new engines and pumps which have been installed at the corporation waterworks, at a cost approximating £4,000, were tested last week. This being the completion of the scheme for giving to the town an adequate supply of water for drinking and other household purposes.

## MISCELLANEOUS.

**Bakewell U.D.C.**—In order to enhance the attractions of the town as an inland health resort, the council are being urged to carry out various improvements, including the erection of a pavilion and grand stand in the Rutland Recreation Ground, which is close to the town; the provision of a thoroughly up-to-date band; the laying out and beautifying of all the grounds, and the provision of various games and amusements in them; the construction of an artificial lake at one end of the recreation ground (which in reality is a park); and the utilisation of the fine stretch of water near Bakewell Bridge for boating.

**Dunfermline T.C.**—The council are recommended by the Fire Engine Committee to purchase a motor fire engine at a cost of £850.

**Islington B.C.** — The Works, Parliamentary and General Purposes Committee have recommended that the London County Council should be informed the council will give a conditional consent to the construction of the lines in Balls Pond-road between Southgate-road and Essex-road.

**West Hartlepool T.C.** A recommendation has been passed to purchase that section of the Hartlepool tramway line within the boundaries of West Hartlepool, and also the line to Seaton Carew. Further, it was decided to obtain a lease of that part of the Hartlepool line lying within the borough of Hartlepool—failing the Hartlepool Corporation exercising the month's option which they have of leasing or purchasing that section of the line themselves. The purchase price agreed upon in regard to the Seaton Carew line and the Hartlepool section is between £44,000 and £45,000.

## PERSONAL.

Mr. S. W. Mobbs, assistant surveyor of Lowestoft, has been granted an increase of salary.

Mr. Ronald North has been appointed assistant surveyor of the Worksop Urban District Council.

Mr. R. F. Ward, surveyor to the Alfreton Urban District Council, has had his salary increased by £10 per annum.

Mr. O. A. Bridges, surveyor to the Bognor Urban District Council, has had his salary increased by £30 per annum.

Mr. W. Clifford, manager of the Wolverhampton sewage outfall works, has had his salary increased by £25 per annum.

Mr. A. T. Hobbs, of Luton, has been appointed to a vacancy on the staff of the Maldens and Coombe surveyor's department.

Mr. F. R. Phipps, borough surveyor of Basingstoke, has been voted £50 in recognition of his services in connection with the cemetery scheme.

Mr. G. Rawson, surveyor to the Worksop Urban District Council, has had his salary increased, with subsequent increments of £10, to a maximum of £300.

Mr. E. R. Lloyd, a member of the council, has been appointed surveyor to the Tregaron (Cardigan) Rural District Council. He resigned his membership upon election.

Mr. Wilkinson Ellis has been appointed surveyor, and Mr. Joseph S. Ingham sanitary inspector and sewerage engineer to the Barnoldswick (Yorks) Urban District Council.

Mr. C. H. Hooper, of Brighton, has been appointed surveyor to the Newhaven Urban District Council, at a salary of £130 per annum, rising by annual increments of £5 to a maximum of £150.

Mr. J. F. Jobson, divisional road surveyor of Northumberland, has been appointed inspector of main roads for the Eastern Division of Warwickshire, at a salary of £175, rising to £210 per annum.

Mr. John H. Sharp, assistant surveyor at Rugby, has been promoted to the post of surveyor, at a salary of £300 per annum, in succession to Mr. D. G. Macdonald, who has retired on account of ill-health.

Mr. P. Jones Williams has been appointed temporary surveyor of Prestatyn during the illness of Mr. Fred Wilkinson, the surveyor. Mr. Wilkinson has, we regret to state, been on the sick list for three months.

Mr. Sydney Perks, F.R.I.B.A., F.S.A., surveyor to the Corporation of the City of London, has been elected a member of the council of the Royal Institute of British Architects. He is the first city surveyor since the time of Sir Horace Jones to reach that position. Mr. Perks became an Associate of the institute in 1887, and a Fellow in 1903.

Mr. William Murdoch, the city engineer of St. John, N.B., is another Canadian official who hails from Scotland, where he was born (at Paisley) in 1848, six years later being taken by his parents to the city he now serves as engineer. He became assistant engineer in 1869, in 1906 was made executive head of the department, and in 1909 was elected to his present office.

Mr. Francis Wood, borough engineer of Fulham, has given to the *Evening News* his views as to the utility of subways, and a plan which might possibly induce a general use of them. "The reason why the subways are not used," Mr. Wood says, "is that nobody will take the longest way to get to the other side of the road, although it guarantees safety. In my opinion, where these underground passages have been provided for the public, the edges of the footway should be bounded by fairly short, reasonably designed railings, impassable for pedestrians—especially women and children. This would compel people to walk an equal, if not a further, distance than they would walk if they went by the subways. It is impossible to stop the speed of present-day traffic to any appreciable extent, and we must not look for a remedy in that direction."

## FOR OTHER ADVERTISEMENTS

See End of Paper.

## COUNTY BOROUGH OF NORTHAMPTON.

TO CONTRACTORS.

BRIDGE-STREET IMPROVEMENT, SOUTH BRIDGE WIDENING.

The Corporation invite Tenders for the Masonry and other Works required in the Widening of the South Bridge over the River Nene in three arched spans.

Plans may be seen at the Office of, and Specifications, Bills of Quantities, and Forms of Tender obtained on application to, Mr. Alfred Fidler, M.INST.C.E., Borough Engineer and Surveyor, Guildhall, Northampton, on and after Wednesday, the 3rd July.

Applications to be accompanied by a deposit of £2 2s., which will be returned on receipt of a *bonâ-fide* Tender.

Sealed Tenders, endorsed "South Bridge Widening," to be delivered to the undersigned not later than 12 noon on Monday, the 22nd day of July.

The lowest or any Tender will not necessarily be accepted.

HERBERT HANKINSON,
Town Clerk.

Guildhall,
Northampton.
June 26, 1912.

## METROPOLITAN BOROUGH OF WOOLWICH.

PROPOSED CONVENIENCES AND WAITING-ROOM, TRAMWAY TERMINUS, ABBEY WOOD.

The Council of the Metropolitan Borough of Woolwich invite Tenders for the various Works required in the erection of a Waiting-room and Sanitary Convenience at the Tramway Terminus, Abbey Wood.

Persons or Firms desirous of tendering may, upon depositing the sum of £1 1s., obtain a copy of the Drawing, Specification, and Form of Tender at the Office of Mr. J. Rush Dixon, M.INST.C.E., Borough Engineer, Town Hall, Woolwich. The deposit will be returned upon receipt of a *bonâ-fide* Tender and the return of the copies of Drawing and Specification.

The person or firm whose Tender is accepted will be required to pay Trades Union rates of wages, to observe Trades Union hours of labour, and to enter into a formal Contract.

Sealed Tenders, properly filled in on the official form provided, must be sent to me at the Town Hall Woolwich, not later than 12 noon on Monday, the 15th July, 1912, in envelope endorsed "Tender for Convenience, Abbey Wood."

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
ARTHUR B. BRYCESON,
Town Clerk.

Town Hall, Woolwich.
June 26, 1912.

## NEWPORT PAGNELL RURAL DISTRICT COUNCIL.

INSPECTOR OF NUISANCES AND SURVEYOR, &c.

The above Council invite applications for the appointment of Inspector of Nuisances, Surveyor under the Public Health Acts, &c., for their Bradwell District, which contains 22 Parishes, an acreage of 27 437, and a population of 9 995. The annual salary of Inspector and Surveyor will be £158, with special payments for the additional duties, estimated at £42 per annum. The salary to include the provision and maintenance of a motor cycle. The salary will be increased by annual increments of £5, until a maximum of £240 per annum, inclusive, is reached.

The Officer will be required to reside at Bradwell, where an office is provided by the Council.

Forms of application and full particulars as to duties, &c., can be obtained from the undersigned by forwarding a stamped addressed foolscap envelope, and the application must be returned to me by Saturday, 13th July.

The Officer will be required to commence his duties on 1st September, 1912.

(By order)
CHARLES W. POWELL.
Clerk to the Rural District Council.

Council Offices,
Newport Pagnell.
June 26, 1912.

## TENDERS FOR ROADMAKING.

The Beckenham Urban District Council invite Tenders from experienced Road Contractors for the Reconstruction of, or the Supply of "Binding" Materials for, the following Roads situate in the District of Beckenham:—

Wickham-road (area 8,400 sq. yds.), Hayes-road (area 2,200 sq. yds.), and Thesiger-road (area 2,050 sq. yds).

Contractors may Tender either for:—

(1) The supply and laying complete on the roads of "metal," with bituminous or other approved matrix;

(2) The supply only of road "metal" already treated with some bituminous or other approved matrix; or

(3) The supply only of "binding" matrix.

Particulars and Forms of Tender may be obtained, and Plans and Sections seen, on application to Mr. John A. Angell, Surveyor, Council Offices, Beckenham, on and after July 4th, 1912, on the production of a receipt from the Collector (who attends his office daily from 9 to 10 a.m. only, except on Tuesday, when his hours are from 9 a.m. to 1 p.m.), for a deposit of £2, which will be returned on the receipt of a *bonâ-fide* Tender.

A clause will be inserted in the Contract providing that the Contractor shall (1) pay to the employees the wages generally accepted as current for workmen engaged on similar work in the town where the work is executed, and (2) to the extent of 75 per cent at least of the staff required in the execution of such works in Beckenham, give preference to, and engage such competent workmen of the class required as may be *bonâ-fide* residents in the Parish of Beckenham and may offer themselves for employment.

Tenders, duly sealed, and endorsed "Tenders for Road Works," to reach undersigned not later than 4 p.m. Monday, July 22, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
F. STEVENS,
Clerk to the Council.

## URBAN DISTRICT OF FINCHLEY.

UNDERGROUND CONVENIENCE.

The above-named Council invite Tenders for the Construction of an Underground Convenience at Tally Ho! Corner, in the Great North Road, Finchley.

Plans may be seen, and Specification, Schedules and Form of Tender obtained, on application to the Council's Engineer, Mr. C. J. Jenkin, M.I.C.E., M.I.M.E., on payment of the sum of £2 2s., which will be returned on receipt of a *bonâ-fide* Tender for the whole of the works, together with the fully priced Schedules, and the return of all papers supplied.

Sealed Tenders, endorsed "Tender for Convenience," to be forwarded to the undersigned not later than 12 o'clock noon on Monday, the 15th July, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

E. H. LISTER,
Clerk of the Council.

Council Offices, Finchley, N.
June 26, 1912.

## URBAN DISTRICT OF FINCHLEY.

SEWAGE FILTERS.

The Council of the above-named District invite Tenders for the Construction of Four Clinker Sewage Filters, &c., at their Sewage Farm, Summers-lane, Finchley.

Plans may be seen, and Specification, Schedules and Form of Tender obtained, on application to the Council's Engineer, Mr. C. J. Jenkin, M.I.C.E., M.I.M.E., on payment of the sum of £2 2s., which will be returned on receipt of a *bonâ-fide* Tender for the whole of the works, together with the fully priced schedules and the return of all papers supplied.

Sealed Tenders, endorsed "Tender for Filters," to be forwarded to the undersigned not later than 12 o'clock noon on Monday, the 15th July, 1912.

The Council do not bind themselves to accept the lowest or any Tender.

E. H. LISTER,
Clerk of the Council.

Council Offices,
Finchley, N.
June 27, 1912.

# Institution of Municipal Engineers.

## WESTERN DISTRICT MEETING.

A meeting of the Western District of the above institution was held on Thursday of last week in the Forest of Dean, the members dining at the "Speech House," and proceeding afterwards on visits to works of interest in the Forest. The attendance at dinner included Messrs. H. Weaver, M.INST.C.E.I., M.I.MECH.E., F.G.S. (Gloucester), R. E. Westaway (vice-chairman, East Dean Rural District Council), F. J. Hurley (Crickhowell), James Joiner (Soudley), G. J. Elliott (Lydney), W. Whitehouse (Cinderford), A. E. Tingle (Cinderford), P. Phipps (Yorkley), W. T. Horbrough (Gloucester), D. Walkley (Cinderford Bridge), H. Woolford (Cinderford), J. J. Joynes (Coleford), F. G. Church (Gloucester), A. Matterface (Cinderford), B. Wyand (secretary of the institution) and John Brook (hon. district secretary).

Mr. HENRY WEAVER, M.INST.C.E.I., M.I.MECH.E., F.G.S. (Gloucester), was voted to the chair in the absence of Mr. H. Hulse, the district chairman, who expressed his regret at being unavoidably kept away.

At the outset Mr. R. E. WESTAWAY, vice-chairman of the East Ham Rural District Council, apologised for the absence of Mr. G. H. Rowlinson, the chairman of that body.

After the reading and confirmation of the minutes, the following paper was submitted for consideration:—

### SOME NOTES ON THE USE, MISUSE, AND WASTE OF PUBLIC WATER SUPPLIES: CAN MISUSE AND WASTE BE REMEDIED?

By WM. WHITEHOUSE, M.S.E.

The quantity and purity of water supplies have always been subjects of importance, and every year receive more and more attention. In urban centres and rural districts the desirability of a public supply of greater purity and larger quantity is generally found to be one of the most pressing questions. In the rural districts outbreaks of disease have now so frequently been traced directly to polluted wells that it can safely be said that at the present time the question of universal pure drinking water is one of primary importance to all classes of the community. The preservation of the quality as well as the quantity is, therefore, a serious responsibility upon the guardians of public water supplies.

#### USE.

In speaking of pure water, I hope we shall consider the question from a common-sense point of view, for when we speak of "pure water" we mean "wholesome water." Sir Wm. Crookes has stated: "There is a great deal said about microbes, and a good deal of nonsense talked. When we hear that every glass of water we drink contains microbes by the thousand it is rather a shock. If we had too pure water, too much sterilised, we should all starve. A friend of his tried to bring his children up on hygienic principles, and had everything sterilised. The poor children were nearly starved, and at last they were given good, wholesome water with plenty of microbes in it, and they got as fat as possible."

Clark's tables give the average quantity of water required by an adult as follows:—

| | |
|---|---|
| 2 | pints for drinking, in addition to about 2 pints retained in his food. |
| 3 | quarts for preparing and cooking his food. |
| 1 | gallon for cleansing dishes and food utensils. |
| 2 | gallons for house cleansing. |
| 3 | gallons for washing clothes. |
| 5 | gallons for cleansing the body. |
| 5 | gallons as a proportion, assuming a plunge bath is taken once a week. |
| 6 | gallons for w.c. use. |
| Total 23 | gallons, being the average amount of water required daily for each individual. |

#### MISUSE AND WASTE.

I consider the theoretical quantity given above is too lavish, although it is much less than the Romans used in ancient times. Prof. Rideal informs us that "ancient Rome, with its nine aqueducts, served its people with 300 gallons a day per head, including the supply for the public fountains, baths, circus, and amphitheatre, and for sanitary and trade purposes. A special State department administered the supply, and, as a result of these efforts, classic Rome was far more healthy than the modern city."

I think all will agree that this example could not be followed in these days, as there are very few waterworks that could stand that sort of thing.

It seems to me that a warning to the public is necessary to prevent waste or misuse of such an increasingly valuable commodity as pure water. The tendency of everyone who designs or manufactures water fittings and sanitary appliances is to rely upon an excessive supply of water, but they should be designed in such a way that the utmost efficiency and economy is obtained from moderate quantities rather than by the waste of large quantities. An ordinary plunge bath holds from 30 to 70 gallons of water, and if everybody had a bath every morning, using, say, an average of 50 gallons each, there would be very few waterworks in the country that would be able to stand it. What is wanted is a greater use of the portable hip bath, with about 3 gallons of water, or some development of the shower bath by which a person could have a complete bath with a small expenditure of water, and so fulfil the ideal of the sanitarian, that every healthy person should have a head-to-foot bath once a day.

A very general idea prevails among water consumers that waste, although bad for the waterworks, is good for the drains and sewers, but that is not true, because if the waste is due to defective fittings, it goes on in the daytime, plus the consumption, which in itself is, or ought to be, enough for all purposes. During the night, when the leakage is going on as before, and the consumption is small, the water is so distributed over a large area that it is of no use whatever as a flush to the drains and sewers, but is simply a waste of water which could be more effectively used in a legitimate manner.

There are various causes of the waste of public water. One is a misapprehension—as noted above—that a continual small stream of water along house drains improves the sanitary condition of the house. This is a mistake. A short sudden rush at intervals has a beneficial effect in flushing drains, but a continual dribble has none. There is no use, therefore, in allowing small streams of water to flow continually down water-closets, or other sanitary appliances. By improvements in the form of water-closets and of flushing apparatus, the former have been made quite self-cleansing with a flush of 2 gallons, or even of less, appliances being insisted upon that make it impossible to give a greater flush.

However, it must be admitted that by far the greater part of the waste that takes place is due to carelessness on the part of the consumers of water, often carelessness that can only be considered as culpable, if it be borne in mind that wilful waste of water supplied by waterworks is simply stealing. The water is actually public property if the works belong to a corporation or council, as the case may be; and even if they belong to a company the water is public property in the sense that the price which each individual has to pay to the company must in great part depend on the consumption of the whole, including waste.

Although not generally the case, many householders are indifferent to the waste of water; it is therefore a matter of indifference to them whether, for example, a tap is running the whole night or not. Where the cost of leathering a tap is charged to the consumer, there are some who consider that it is to their advantage to allow the leakage to continue. In the works under my control—although the average consumption is low—we lose every night, between the hours of 12 p.m. and 6 a.m., from 15,000 to 20,000 gallons of water. The major portion of this quantity must be waste.

Apart, however, from this, a great deal of leakage takes place, simply because it is difficult to appreciate how large a quantity of water is lost on account of an apparently very small leakage continuing through the whole twenty-four hours. It would astonish most people who see water merely dripping from a tap, or from a leaky pipe, to be told that the loss is likely to be 3 or 4 cub. ft. in twenty-four hours, or fully the average consumption of water of one individual. Yet if a measuring glass be taken it will be found that from 2 oz. to 3 oz. per minute of water may fall merely in the form of drops, and this corresponds to a large consumption in twenty-four hours for one person. It needs but a very small dribble to discharge 20 cub. ft.

of water in twenty-four hours, or, say, the quantity that ought to be consumed by an average household.

This matter of the great quantity of water that may be lost by a continual leakage is well illustrated by Mr. W. Hope, C.E. The diagram below is taken from

Results of experiments on the flow of water through circular holes in ½in. lead pipe under a pressure of 45 lb. per square inch, showing number of persons who might be supplied by the discharge through flaws of various sizes.

a paper of his on the subject of the waste of water, and is described in his own words.

The diagram shows a lead pipe drilled with various sized holes, the burr on the inside not being removed. The actual number of gallons per day which passed through each hole under a pressure of 45 lb. per square inch, is noted on the drawing, together with the corresponding number of persons that quantity would supply at the rate of 15 gallons a head per day.

PREVENTION OF MISUSE AND WASTE.

The question of waste prevention has always been a source of trouble, and one of anxious consideration for the engineer. Burton, in his treatise on water supplies, writes as follows:—

"Of late years large reductions in the consumption of water per head have been made by careful arrangements for saving waste. Waste has been saved in several ways; for example: (1) by the use of district meters; (2) by the use of house meters; and (3) by insistence on the use of house fittings of good quality only, and on their frequent inspection. I may say concerning the third item, that the difficulty in preventing waste in waterworks has seldom been felt to any great extent in connection with the street mains, or the larger appliances belonging directly to the proprietors of the waterworks. These are fixed under the charge of skilled engineers, and are under their supervision afterwards. It thus occurs that leakage is not very likely to occur in them, and that if it does it is soon stopped. In the case of house fittings it is quite different. These are put in by the builder or the householder, who employs whomsoever he likes; it is not in the least to the advantage of the former of these to be sure that no water waste takes place, and it is to the reverse of the interest of the latter to prevent leakage, because he has nothing to pay for leakage, while he has to pay for preventing it. Very stringent regulations have been introduced in most English and many Continental towns for the prevention of waste in houses, and these have been put efficiently in force in a considerable number of cases."

Notwithstanding the severe climatic changes in England, few precautions are taken against the grave inconvenience of waste occasioned by frost. House pipes are often left unprotected, and so placed that a burst will cause considerable damage. Cisterns are frequently situated outside, and when they freeze solid are the cause of serious annoyance. The pipes and fittings in the ground should always be laid a good depth, and all exposed pipes and fittings should be protected with some non-conducting material.

I expect the Deacon waste-water meter is familiar to all of you: there is no doubt about its excellency in the discovery of waste, as one meter will control a large part of a district, but there are many authorities who would hesitate to instal this system in consequence of its cost and manipulation. It has even been suggested that every house should be supplied by meter just in the same way that it is supplied by gas. That is an exceedingly expensive way of controlling the supply on a large scale, and leads to the other extreme of undesirable parsimony in the use of water. To instal the meter system in my own district would cost £5,000, the cost of maintenance and inspection would necessarily be higher, which would mean raising the price of the water *pro rata*, as consumption was large or small, to cover the extra cost of maintenance.

There is one matter I should like to refer to, with which I have no patience, and that is the parsimonious spirit of some public water authorities who begrudge the engineer in charge the assistance of inspectors and fitters for the proper, economical and expeditious control of the works which he has to administer.

Quite recently a surveyor informed me that the waste of water in his district was so large as to be quite absurd. It has never been the custom of his authority to leather taps, but some time ago he made an inspection of his district, and with some assistance leathered, or saw to the leathering of, the taps himself. In one month he tells me, he saved by these means no less than 400,000 gallons. Assuming it cost 6d. per 1,000 gallons to pump and distribute the water, the saving is quite equal to paying the wages of two men permanently employed, apart from the saving to the consumer's fittings, and also the saving of this precious and absolutely necessary fluid.

Speaking of the works under my own control, I am pleased to say that it has always been our custom to leather and repair consumers' service taps, &c., and to fix new taps free of charge (excepting the cost of the tap). The result has been highly economical and satisfactory, the average consumption, excepting periods of continued drought, does not exceed 12 gallons a head per day, including that used for trade purposes, and we supply a population of 10,000.

Previous to obtaining an additional supply, I am quite sure our system, comparatively speaking, was saved from absolute failure by our methods of checking waste.

Our methods have enabled us to keep in touch with, and to gain the confidence of, the consumers; the reporting of leakages is encouraged; and it has had the effect of making each and all of them an inspector, as it were. We are promptly apprised of leakages, and if they are not promptly attended to, of course there is a row.

Notwithstanding the result, there are some, I am sorry to say, who disagree with our methods, but I sincerely hope that wise and experienced counsels will prevail. Under any circumstances, no one can dispute that our system means convenience, advantage, and even privilege to consumers, and it is undoubtedly a joint means of preventing waste.

It is only fair to state that plunge baths and water-closets are not in general use, but probably 40 per cent of the consumers have one or the other, or both, so that our rate of consumption is certainly 40 per cent below the theoretical quantity required per adult per diem.

Before concluding, I should like to summarise a few things which would certainly have the result of checking waste.

(1) *Night Inspection.*—This need only be periodical, but it would be the means of discovering underground leakages, as well as other causes of waste. The method to adopt would be for the inspector to proceed round the district during the night with a sounding rod, and to hand over the result of his discoveries to the fitters for further enquiry into the matter the next morning. This would have the effect of finding out wilful waste, as well as that due to defective fittings.

(2) First-class fittings of approved construction should be rigidly insisted upon, as well as the laying and fixing of pipes for protection against frost.

(3) The enforcement of 2-gallon closet flushing cisterns, and automatic flushing cisterns of stated capacity for urinals. Great economy in the use of water could be effected if it were possible to provide a satisfactory and water-saving substitute for the plunge bath.

(4) Outside closets could be an approved make of the waste-water type.

(5) Public inspection and repair of draw-off apparatus, such as leathering, &c., free of charge.

(6) Covered reservoirs for spring water to obviate the waste caused by the necessity of cleansing of

algæ, or water weed, which rapidly forms in hot weather. (This advice may be somewhat superfluous, as spring water reservoirs are very rarely left uncovered nowadays.)

(7) Plenty of air valves and sluice valves to prevent the emptying of long lengths of main when repairing or tapping.

(8) Apparatus for tapping mains under pressure, and so save emptying them when doing this work.

(9) Pressure reducing valves in very hilly districts, wherever possible to fix them.

I should like to say, in conclusion, that one of the objects of this paper is to give food for thought among those who may be personally interested in this subject, whether publicly or privately—especially with regard to its importance. The question of preventing waste as far as possible, without curtailing the legitimate requirements, or causing inconvenience, annoyance, or undue expense to the consumer, would then, I think, be soon effected. Furthermore, as waterworks engineers, I am sure we all agree that the legitimate prevention of waste in our public water supplies is a serious duty, whether from a national or economical point of view.

## DISCUSSION OF MR. WHITEHOUSE'S PAPER

The CHAIRMAN opened the discussion. At the outset he said it gave him very great pleasure indeed to propose a vote of thanks to Mr. Whitehouse for his very able paper, which, as he rightly stated, gave food for reflection. In the first place he should like to point out to them the bearing this subject had upon sewerage and sewage disposal. For instance, he would take a town which had a water supply and was about to embark upon a scheme of sewage and sewage purification. The engineer prepared the scheme in which it would be necessary to provide tanks and filters, and so on, that would meet the requirements of the Local Government Board. If the population of the town was 10,000 persons, then one would calculate that a fair proportion of sewage to be dealt with from a town of that size would be 30 gallons per head per day. The purification works having been laid down on that basis, let it be supposed that in course of time there was a gross waste of water. They would find then that they were working their filters at a greater speed than they were designed for. Consequently they would have trouble at the sewage works, as there would be a greater quantity of sewage passing through the beds than they were able to take, and this would mean such a condition of things that generally the whole purification works would be in a state of chaos. The result would be that they would have either to prevent the waste or to enlarge the purification works, and the latter would be done without any corresponding benefit. As Mr. Whitehouse had said, there was absolutely no advantage in a constant dribble or waste of water so far as flushing sewers was concerned. In order that flushing could be of any use at all, the water must be held up until it attained a certain quantity, and then released quickly in order that there should be a big volume of water rushing down, thereby removing any obstacle that might be in the way. They would therefore see that this was a very important reason why the waste of water should be prevented. Then, again, Mr. Whitehouse said "It seems to me that a warning to the public is necessary to prevent waste or misuse of such an increasingly valuable commodity as pure water." No doubt many of them knew that he (Mr. Weaver) had had something like twenty years' experience of the management of waterworks, and having had that experience he could assure them that this kind of warning was of very little use, and that the only thing which could be was to prosecute people who wilfully wasted water. He was quite aware that it was very difficult for a council to order a prosecution when the members of that body were acquainted with the individual who, perhaps, was responsible for what his servants did. The only way, in his opinion, in which they could get over that difficulty was that a prosecution should be ordered by the council without the name having first of all been revealed to them. If the council made a general order to the effect that where the clerk of the council was satisfied that wilful waste had taken place a prosecution should be instituted, and examples were made of two or three people, then, he thought, the people would begin to realise the value of water. Mr. Whitehouse told them that in the works under his control he calculated the daily loss at something between 15,000 and 20,000 gallons of water, through either waste or leakage. It would be interesting to know the population supplied by that water supply, and then he thought that they might be able to arrive at some interesting figures. Mr. Whitehouse remarked that in one district the surveyor went round the district himself and leathered some of the taps. It seemed to him (the chairman) that that was a duty which ought not to be thrown upon a surveyor. A surveyor, he contended, ought not to be expected to put washers on taps. It was quite out of the province or the duty of the surveyor to do this. Referring to the Deacon waste-water meter, the chairman said that on one occasion he was called in to report upon a new water scheme for a town in Northumberland. He obtained various statistics as to the population of the town and the consumption of water per head per day. The latter, they would be surprised to hear, came to 60 gallons per head per day, which to all of them would appear altogether out of reason. He knew that something must be wrong, and he advised the council, against his own interest, to put down a system of waste-water detecting meters. They did so at a cost of £2,000, and the result was that the supply was immediately reduced to 30 gallons per head per day. To this day this town had got an ample supply of water, and unless the population grew very considerably he did not anticipate that they would require a new water scheme for the next twenty or twenty-five years. The chairman said that in Mr. Whitehouse's district, where there was a waste of 15,000 to 20,000 gallons every eight hours, there might be some means of ascertaining the leakages without putting down a system of waste-water detecting meters. One way, of course, was to go round at midnight with a sounding rod and sound the stop taps at the houses, and also the valves and hydrants. If there was a leakage one could ascertain whether it was a large one or not, and about where it was. It was, however, much better to have a proper system of waste-water detecting meters. In conclusion, the chairman said the paper which had been presented to them was a very excellent one, and it was one he was sure with which all of them generally agreed. Their heartiest thanks were due to Mr. Whitehouse for the manner in which he had prepared his paper, which was solely to the point, and of a very interesting character.

Mr. G. J. ELLIOTT (Lydney) seconded the vote of thanks. The paper, from beginning to end, was one which was calculated to help all those who were acquainted with and who were at work upon water schemes. He did not think he could quite agree with Mr. Whitehouse in believing that 23 gallons was an excessive average amount of water required for each individual daily, especially when they took into account the fact that it was used for trade purposes. The waste of water, as Mr. Whitehouse had truly said, could be attributed to so many varying causes. One very bad cause, which he had discovered during the last winter, was due to frost. In the fortnight's frost that they had he found that their water consumption went up something like 348,000 gallons more than it did in the driest part of the year before —July and August. That was entirely due to wastage in the taps in the houses. Generally, he agreed with the paper. They used the Siemens meter in Lydney. To put meters to every house would mean a very great cost, and would add considerably to the expense of the work. He had very much pleasure in seconding the vote of thanks.

The CHAIRMAN, referring to the 23 gallons of water required daily by each individual, which Mr. Whitehouse thought was rather lavish, said he agreed with Mr. Elliott. He did not think it was beyond reason. He noticed that in Mr. Clark's table nothing had been allowed for trade purposes. That was a very serious omission—an exceedingly serious omission. To the 23 gallons he should add another 7 gallons for trade purposes, which would then bring it up to 30 gallons, which, in his opinion, was not too much in a manufacturing town.

Mr. F. J. HURLEY (Crickhowell) said the few remarks he would have to make had relation to the waste-water detecting meters. He now had control over a works at which at one time there was a very serious waste. He had only had it under his charge for a few years, prior to which it was under the supervision of a water rent collector, who was a very good collector of water rents, but who did not know very much about hydraulics. Consequently, in the course of years, there was a considerable waste of water, and it resulted at last in an indignation meeting,

which put the waterworks in its proper sphere—under the surveyor's control. It was a works laid down in 1887, and it superseded an old private concern which was put down as far back as 1857. One difficulty he had to contend with when he took over the management was in locating the leakages. They had a very porous, gravelly subsoil, and unless the waste was above ground it could never be discovered. No matter what quantity of water was leaking away, it was always going underground, and it was not located by merely looking at it. Then another difficulty he had to contend with was old house fittings. When the newer scheme was put down the authority very wrongly allowed householders to connect old fittings to new mains; consequently by the time he took over the control some of these were getting fifty years old. Besides, there was a large proportion of obsolete flushing tanks and other means of causing waste. The conditions were so bad that he had no difficulty in inducing the council to go to the cost of a waste-water meter. Fortunately the district was such that it could be put under one zone, which was easily controlled from the one meter. The first thing he discovered was that, although there was enough water in an ordinary summer to give 45 gallons per head, there was a waste of 32 gallons per head per day. That, as they would see, did not leave much for consumption, and the result was that directly the summer came on there was always this shutting off of water at night. He went through the usual process of night inspection and tracing the leakages, and he found a most prolific cause of leakage to be ball hydrants. The scheme, they would remember, was put down in 1887; consequently by this time the water was leaking away at a terrible rate, and getting into the porous subsoil, where it could not be located. By the re-leathering and re-washering of hydrants the waste was considerably reduced. Then he did away with the old and obsolete flushing tanks, and obtained modern 2-gallon flushing cisterns with warning pipes. Although last summer was a very dry one, he was glad to say that the town was put under no inconvenience whatever through the lack of water. He considered the ball hydrants ought to be substituted by sluice-valve hydrants. In his district, however, they had simply gone to the expedient of re-leathering the present hydrants, and this he was glad to say had had its effect. Before concluding, Mr. Hurley said he should like to tell the meeting that on one occasion he was talking to a surveyor of a neighbouring urban district, and felt much amused about what he told him of one of their regulations. While it was very effective in preventing waste, it was not very convenient to the consumer. The regulation—whether the council could enforce it by law he really did not know—was that they would not allow any owner of property to put a sink under the tap. He thought they would agree that that was very absurd, but it was certainly a very effective method in preventing waste of water.

Mr. John Brook (the hon. secretary of the Western District) said it afforded him much pleasure to support the vote of thanks to Mr. Whitehouse for his very excellent paper. It had been most interesting. The waste of water, Mr. Brook proceeded, they all admitted was a very serious matter. In the district over which he had control he had considerable trouble last year over the waste of water, which was used very freely on the gardens, which they would agree was an improper use of it. This was a thing they could not very well stop without resorting to prosecution. He knew of one place where the people fetched the water for their gardens at 3 o'clock in the morning. The result was that by 10 o'clock in the day the whole supply had gone. Speaking of ball hydrants Mr. Brook said they were a source of great trouble. He congratulated Mr. Whitehouse upon the very small consumption of water in his district. He thought it was extraordinarily small. He should like to ask Mr. Whitehouse what system of disposal they had—whether they had many water-closets or baths? He should also like to ask him whether he had much trouble with the mains, and also the make of the meter he favoured generally? With regard to the waste of water in Mr. Whitehouse's district, it seemed to him to be very excessive. He did not know what the population of his area was, but certainly the waste of water seemed very serious. It would form a supply for a moderately large place. Mr. Brook then proceeded to read the following notes written by Mr H. Hulse district chairman:

Mr. H. Hulse said I desire personally to thank Mr. Whitehouse for the paper he has prepared for the Cinderford meeting, also for the trouble he has taken in making the local arrangements for the meeting, and it is with extreme regret that I have been compelled, owing to reasons Mr. Brook will explain, to be absent and forego the pleasure of taking part in the meeting. The paper submitted is an instructive one, and I am in practical agreement with Mr. Whitehouse throughout. A few hurried notes I have made, and upon which I had hoped to have spoken, are given herewith. In view of the numerous schemes now in hand, and future developments of such, for labourers' or working-class cottages, there is a need for a suitable bath somewhat on the lines of the hip bath mentioned by the author, as the ordinary pattern plunge bath is inconveniently large for fixing in the sculleries of such cottages, as recommended by the Local Government Board, and a smaller bath would be equally as efficient for bathing purposes for the use such tenants would make of it. As the author states, the difference in size would be a means of reducing the consumption of water, and this on property which, as a rule, does under the twopence per week contribution pay sufficient to cover the consumption. As to the mistaken idea of many occupiers that water trickling away cleanses the drains, I would like to have inquired from Mr. Whitehouse if in his district he has any waste pipes from water-closet cisterns made to discharge into the closet pans. In this district this arrangement was allowed at one time, doubtless under the above mistaken assumption of cleansing the pan, and frequently such waste was allowed to continue without the occupier troubling to notify the authorities, as would have been the case if the discharge had been in the court or some other open place. We now insist upon all waste pipes being so fixed as to discharge in the open. As to the loss by waste at night, perhaps Mr. Whitehouse can state what proportion this bears to the average gross daily consumption, and also give the figures of population and gross daily consumption. Regarding prevention of waste, Mr. Whitehouse is right in placing first night inspection, with which I should include house-to-house day inspection for the discovery of and re-washering or re-leathering of leaking house taps. For the second check for waste I would place the waste detecting meters, such as the Deacon, and any water authority not having such meters in use would be well advised to at once take the matter into consideration. With such a meter, or meters, the numbering varying according to the size of the locality, the inspector can check the water passing through it to any locality in his district, and by a systematic arrangement of the valves of the mains can discover very readily if an abnormal quantity of water is being consumed in any street or district, and with this information can then go on and make a house-to-house inspection in such street until the leakage or cause of the abnormal consumption is discovered. All the other eight means of checking waste named by the author are essential, and to them, wherever local circumstances permit, and where there is a high day pressure, I would add the reduction of pressure at night.

Mr. R. E. Westaway (vice-chairman, East Dean Rural District Council) said the question before them that day was: How could misuse and waste of water be remedied? In his few remarks he would leave all the technical and scientific problems to the very able experts present, and would take up the position of a representative of the ratepayers, whose sole aim was the best possible service at the least possible cost. Mr. Whitehouse in his paper led them up to a point, and, unfortunately, left them there. He said "that a warning to the public is necessary to prevent waste," that "the greater part of the waste that takes place is due to carelessness," that "wilful waste is simply stealing," and that "many householders are indifferent to waste." Then Mr. Whitehouse went on to say that, by means of free repairs, the confidence of the consumer was obtained, while the practice had the effect of making each and all of them an inspector. To expect to get good results by turning the habitual waster of water into an inspector was a fallacy. To have a proper system of inspection was at once an essential, but—and this was the point—there was only one cure for wilful waste, and that was prosecution. On the question of free repairs, opinions might largely be divided, but, after watching it closely for several years, he was of opinion that—especially in rural districts—it was the most satisfactory course to adopt. Mr. Whitehouse advocated a hip bath with 3 gallons of water, by which a person could have a complete bath. A few more details on

that point, accompanied by a practical lesson on how to do it by the author of the paper, would be interesting. (Laughter.)

The resolution of thanks was then heartily carried.

Mr. WHITEHOUSE, in replying to the discussion, said that he must thank them all very sincerely for the kind and considerate manner in which they had received the paper. The criticism had not, he confessed, been very keen. He was glad that the suggestions he had made had so met with their approval. With regard to Mr. Weaver's remarks about the bearing of the waste of water on drainage matter, this was really most important. If they could supply a town with 15 gallons per head per day instead of 30 gallons, then they would see they would have only half the quantity to deal with; consequently the filters and everything connected with the outfall works would be in better order. Referring to prosecution, Mr. Whitehouse said he personally had always thought there should be some kind of Parliamentary legislation, if possible, upon this matter, so that offenders could be dealt with more drastically. It was most difficult now, as Mr. Weaver had told them, to deal with it through the council. If they could get some Parliamentary legislation whereby the waste of water could be made a criminal offence, then he thought that would help to check the waste a great deal. It was certainly a crime to waste water. Speaking of the 15,000 to 20,000 gallons of water wasted in his district, the speaker said this was over a period of six hours from the middle of the night on into the morning. The quantity was equal to about two gallons per head per day. This could be dealt with, he thought, by a system of night inspection. He quite agreed with Mr. Weaver's remarks about the leathering of taps. With reference to the remarks of Mr. Elliott that 23 gallons of water per day for an individual was not excessive, he could hardly agree with that statement. He was reading in a paper recently Mr. Pickering's presidential address to the Institution of Water Engineers, in which that gentleman said that at the Consett and Weardale waterworks, where there was a supply of 360,000 gallons, the average consumption was 9½ gallons per head per day. That was certainly extraordinary. Mr. Pickering also said that they had an arrangement there by which each householder should pay the water authority 1s. per house per year, and in consideration for that the council undertook the whole of the repairs of the fittings. That was an argument in favour of what he had suggested. Their consumption at normal times was about 10 gallons per head per day. As to the Deacon waste-water meter, he had no doubt about its excellency. It was a very fine meter, and besides being a means of controlling waste, it also assisted them in locating the spot where the waste was taking place. Mr. Weaver said the cost of installing water in a town he referred to was £2,000. £2,000 in his district would be absolutely out of the question. With regard to supplying every house with a meter, he could not agree with that, because he thought the cost of maintenance, of keeping in repair and one thing and another would raise the expenditure to an enormous extent. In his district he felt sure it would be more than doubled. Mr. Whitehouse proceeded to express the opinion, in answer to Mr. Weaver, that 15 gallons of water per head per day was almost enough for all purposes. Mr. Hurley in his speech dealt with the proper management and effectual control of waterworks. There was no doubt unless they had skilled men in control of waterworks they could not expect to get a good result. The ball hydrants in Mr. Hurley's district must have been very bad, and it must have been very difficult to find out when they were leaking in consequence of the porous nature of the ground. But the condition would not apply in many districts; it did not apply in his own. With reference to warning pipes, they had been in force in his district for many years. Mr. Brook referred to the question of prosecution. His idea was that this would only follow night inspection. The process would be that they would send a man round at night to sound the taps and the pipes, and if he discovered a leakage he would report it to the surveyor the next day. The surveyor would hand the report on to the fitter, who would go to the place the next day, and if he found out the leakage was due to carelessness, then he would report it again to the surveyor, who would issue a notice to the offender threatening prosecution. They would continue to send the man to this place, and if the leakage occurred again through the same cause then they could prosecute, and could without much trouble obtain a conviction. In answer to Mr. Brook, he should say that 40 or 50 per cent of the persons in his district had either water-closets or baths, or both. The meters he used were Geo. Kent's, Limited, of High Holborn. They were the best he had yet found, and would guarantee to register 97 per cent of the consumption. Mr. Westaway wanted to know how the warning was to be brought to bear. One way, he thought, was by letting the public know what they might expect.

Mr. WESTAWAY: I shall be pleased to back you up.

Mr. WHITEHOUSE said that with regard to hip baths he thought Mr. Westaway had misunderstood him. The complete bath would be given by some such arrangement as a shower bath.

Mr. WESTAWAY: You don't mean to sit down in it?

Mr. WHITEHOUSE: Oh, no. A hip bath means that you would have a good wash——

Mr. WESTAWAY: Without getting too wet.

Mr. WHITEHOUSE: It would be practically like a shower bath. You would have to stand up in the bath. There would be a consumption of 3 or 4 gallons of water. Concluding, Mr. Whitehouse said he wished to thank them again for the kind way in which they had received his paper. If he felt he had done any good by it, then he should be amply repaid for any trouble he had gone to in the matter.

The CHAIRMAN said there was one point which he did not think was quite clear, and that was in regard to the calculated average of waste per head per day. He understood from the paper that Mr. Whitehouse estimated that from 15,000 to 20,000 gallons of water was wasted during a night of six hours. If they calculated it at 17,000 gallons for six hours, and multiplied it by four, they got 68,000 gallons. At 2 gallons per head per day of a given population that would mean a supply of water to 34,000.

Mr. WHITEHOUSE said that it was not all waste at night. There were at work flushing systems, urinals, and other things at night which were not at work in the daytime. But the greater part of it was waste, no doubt. He anticipated that a great deal of waste at night was due to carelessness of the people in forgetting to shut off the taps. In the daytime the people were about all the time and able to see what was going on.

The CHAIRMAN said he was afraid Mr. Whitehouse misunderstood. It was not the cause, but the effect of waste he was inquiring about. If Mr. Whitehouse had a leakage of 68,000 gallons, this, at 2 gallons per head, would give a population of 34,000. Instead of 2 gallons per head he wanted something more per head.

Mr. HURLEY: At a 10,000 population it would be 6·8.

Mr. WHITEHOUSE said the conclusion he had arrived at was that the waste did not go on in the same proportion in the daytime as it did during the night. For instance, persons would not allow a tap to run "full tear" all day long if they were around it. He repeated he was perfectly sure it did not go on in the day in the same proportion as it did at night. Their average consumption was 12 gallons per head per day. If they wasted the same proportion in the daytime as they did at night it would mean that they would only have about 52,000 gallons to supply 10,000. That would, of course, be absurd. Their total consumption on an average was about 120,000 gallons a day.

Mr. HURLEY asked how Mr. Whitehouse measured the night flow of water.

Mr. WHITEHOUSE replied that he simply measured it in the reservoir. They knew exactly the size of the reservoir.

Mr. HURLEY said that Mr. Whitehouse had, therefore, no really reliable data from hour to hour. The waste-detecting meter he used was also the Kent meter, which he had found to be very effective. He expected there was little to choose between the Kent and the Deacon.

Mr. WHITEHOUSE said his one object in trying to start a system of night inspection was to prevent such a terrible waste of water.

On the motion of Mr. WYAND, seconded by Mr. WHITEHOUSE, a hearty vote of thanks was accorded Mr. Weaver for his services in the chair.

Mr. WEAVER, in reply, said he was one of quite a small number who attended a meeting in London and formed the institution. That it had justified its existence was proved by the fact that they now had 850 members.

Messrs. H. Hulse and John Brook were unanimously

re-elected district chairman and hon. district secretary respectively.

At the conclusion of the meeting the party drove in brakes to the stone cutting and sawing works of the Dean Forest Stone Firms, where they were obligingly shown over and had explained to them details in connection with the industry by Mr. W. Davidson. They next journeyed to Cannop Colliery, where they were received by the manager, and, after inspecting the workings, they proceeded to the cement making works of the South Wales Portland Cement Company at Mitcheldean, where they were met by Mr. Terry, the managing director.

Tea at Mitcheldean concluded the day's proceedings.

## SEWAGE DISPOSAL AT WAKEFIELD.

### EXTENSION AND REMODELLING OF CALDER VALE WORKS.*

By J. P. Wakeford, Assoc.M.Inst.C.E.,
City Surveyor of Wakefield.

The dry-weather flow of sewage per day at Wakefield is 2,000,000 gallons. The works are at present in process of remodelling, and when the various alterations and additions are complete the system of disposal will be chemical precipitation followed by filtration on percolating filters, and final settlement in humus tanks. The precipitants to be adopted are lime and ferric sulphate, the latter being produced by dissolving ferric hydrate in vitriol, the character of the sewage being such as to require heavy precipitants. This method of treatment is rendered necessary by the presence of sundry trade effluents in the sewage, notably wool scouring refuse.

At the termination of the 6-ft. barrel sewer the sewage enters the detritus tanks, which are in duplicate, each with a settlement capacity of 32,700 gallons, and a storage capacity of 26,300 gallons, making a total capacity of 59,000 gallons. The sewage passes from the detritus tanks to the pump wells, and is lifted a height of 19 ft. to the inlet channel, along which it passes to the precipitation tanks. The pumps up to the present in use have been of the centrifugal type, steam driven, four in number, but two of these are now being abandoned and replaced by two electrically driven high-efficiency pumps, running at 690 revolutions per minute. The pumping capacity on completion will be: No. 1, electrically driven, 4,000 gallons per minute; No. 2, electrically driven, 2,000 gallons per minute; No. 3, steam driven, 1,400 gallons per minute; No. 4, steam driven, 3,860 gallons per minute; the object being to instal sufficient pumping power to enable any three of the pumps to deal with five volumes of sewage (6,950 gallons per minute) in case of a breakdown of one of the pumps.

It is well known that the Local Government Board's usual requirements as to the quantity of sewage to be dealt with are six volumes of the dry-weather flow, but in the present instance representations were made to the board that, as half the flow at Calder Vale is trades waste (which does not increase in wet weather), that the discharge is into a main stream, and that it is proposed to deal fully with more than the quantity ordinarily stipulated by the board in places where a considerable portion of the flow is trades waste, the corporation suggested that anything over five volumes should be permitted to go direct to the river, and after some correspondence the board assented to this proposal.

In its passage along the inlet channel the precipitants are added to the sewage, baffle stones being provided for the more effective mixing of the lime and ferric sulphate before entering the precipitation tanks.

The lime mixers, which are in duplicate, are known as Gaudette's patent, supplied by Messrs. Young & Co., Nine Elms Ironworks, London. They are electrically driven, and are quite satisfactory in their working. A portion of the filtered effluent from the humus tanks will be conveyed to a water well in the liming house, whence it will be lifted to a steel tank in the roof of the building and used for lime mixing purposes.

At the termination of the inlet channel a weir will be placed opposite to its junction with the carriers supplying the precipitation tanks. This weir will be set to discharge at three volumes, so as to permit the flow up to this amount to pass through the tanks, plates being placed across the carriers going right and left to the tanks, so that their under edges will be at the level of the sewage when three volumes (the amount to be fully treated) are passing. The flow between three and five volumes, will pass along the culvert between the tanks and through the newly constructed storm-water carrier to two of the disused land filtration areas. Portions of these areas are walled off to arrest solids, and adjustable weirs opening downwards are inserted to permit of the effluent being drawn off to the filtration areas to a depth of 18 in. The effluent after being so drawn off will be discharged into the existing underdrains through outlet chambers fitted with adjustable weirs.

The three volumes passed through the precipitation tanks, which have a capacity equal to 16·6 hours' dry-weather flow, will pass to the tank effluent channel, and thence through the feed culvert to the supply channel by means of four adjustable telescopic feed pipes. This method will permit of the supply channel being used in eight separate sections, so that portions of the filters may be thrown out of use as required. In this channel there have been fixed thirty-two syphons, which will discharge automatically into chambers, from which the sewage passes through delivery pipes laid upon the floor of the filters, and communicating by means of vertical pipes with 15-in. half-pipe distributors, cement jointed, laid upon the surface of the filters. From the half-pipe distributors open-jointed whole pipes, 3 in. diameter, will be laid at intervals of 3 ft. The main delivery pipe and the vertical pipes, together with a few inches in depth of the main half-pipe distributors on the surface of the bed, remain constantly full of water. On the syphons coming into action an equable distribution results through the subsidiary open pipes. The distribution over the bed will be effected by a layer of moderately fine material on the surface of the bed, grading down to the larger sizes beneath.

When an efficient state of affairs has been set up, this upper fine layer retains the liquid to an extent necessary to produce an equable flow throughout the body of the filter. This method of distribution has been adopted owing to the limited fall and the size of the filtering medium, and is virtually a compromise between the two methods, type 3 and type 4, referred to on p. 92 of the Fifth Report of the Royal Commission on Sewage Disposal. The sizes of the medium, the careful grading of which is an essential point, are:—

| | Depth. ft. in. | Grade. in. in. | |
|---|---|---|---|
| Bottom layer | 1 0 | 4 3 | gravel. |
| | 2 8 | 3 1½ | ,, |
| | 1 0 | 1½ ½ | ,, |
| | 10 | ½ ¼ | clinker. |
| Top distributing layer | 6 | ¼ ⅛ | ,, (free from dust) |
| | 6 0 | | |

A 6-in. concrete floor covered with Naylor's tiles has been laid underneath the gravel media, the floor having a fall towards the filter effluent culvert.

The filtered effluent passes from the bottom of the filters to this culvert, which is situated beneath the supply channel and the feed culvert, and thence to the humus tanks, which have a capacity of 2½ hours' dry-weather flow, after which it passes over a weir into the effluent channel, and will be conveyed by a 27-in. pipe and a short length of 30-in. brick culvert to the existing outlet into the river Calder. The humus tanks are provided with sludge outlets at the deep end communicating with the existing sludge tank, top water draw-off arms being fixed for cleansing purposes, the drawn-off effluent being carried to the detritus tank, and with the crude sewage relifted by the pumps to the inlet channel. A Tangye's horizontal double-acting sludge pump has been installed in each of the sludge pits, and each pump is capable of lifting a week's supply of sludge in twelve hours. This sludge is forced by means of a 6-in. cast-iron main on to portions of the land to be trenched in and finally disposed of. The top water from the sludge tanks is run off into detritus tanks, and by this means the moisture is reduced from 94·50 per cent to 92·75 per cent (approximately).

A manager's office, messroom for workmen, and store has been erected near the electricity buildings, and a lime store and shed for the storage of precipitant.

#### ESTIMATED EXPENDITURE.

The estimate presented to the Local Government Board for the remodelling of the works was £33,550, and it is not anticipated that this amount will be exceeded.

#### ANALYSIS OF TANK EFFLUENTS.

The following table shows comparative results of

* Paper read at a meeting of the Association of Managers of Sewage Disposal Works held at Wakefield on the 15th inst.

analyses of tank effluents, in parts per 100,000, taken in proportion to the flow during dry weather. It will

| | Crude Sewage. | Tank Effluent (Settlement only). | Crude Sewage. | Tank Effluent (Lime Precipitant). | Crude Sewage. | Tank Effluent (Lime & Ferric Sulphate Precipitant). |
|---|---|---|---|---|---|---|
| Oxygen absorbed in 4 hrs. at laboratory, temp from $\frac{N}{80}$ | | | | | | |
| $KMnO_4$ | 11·84 | 7·60 | 11·40 | 5·46 | 11·36 | 4·36 |
| Chlorides as Cl | 17·0 | 16·7 | 22·0 | 21·6 | 16·1 | 16·5 |
| Alkalinity (as CaO) ... | Very slight | Very slight | Very slight | 1·40 | Very slight | Neutral |
| Suspended solids (total) | 51·0 | 22·0 | 45·00 | 5·00 | 33·6 | 3·30 |
| Loss on ignition ... ... | 23·8 | 12·6 | 32·20 | 2·90 | 22·2 | 1·30 |
| Ash ... ... ... | 27·2 | 9·4 | 12·80 | 2·10 | 11·4 | 2·00 |
| Percentage purification on oxygen absorption. | 35·8 | | 52·1 | | 61·6 | |

readily be seen that settlement alone is insufficient; that lime alone gives good results, but not so good as when used together with ferric sulphate. The addition of ferric sulphate fully justifies the extra cost.

## CORRESPONDENCE.

*"Men are never so likely to settle a question rightly as when they discuss it freely."*—MACAULAY'S *"Critical and Historical Essays."*

### SUPERANNUATION: SECURITY OF TENURE: MUTUAL AID AND PROTECTION.

*To the Editor of* THE SURVEYOR.

SIR,—It is comforting to learn that the Institution of Municipal Engineers and the Institution of Municipal and County Engineers have awakened to the necessity for taking active measures towards securing for their members the benefits of superannuation and security of tenure, and are alive to the pressing need of mutual aid and protection.

It is to the credit of the former institution that it was first in the field in the discussion of these important subjects, which, it is asserted, are included in its "objects." It is equally praiseworthy that the elder body is now proposing to concentrate its energies in the same direction.

From correspondence which has recently appeared in the columns of the service journals, it is evident the erroneous impression prevails in some quarters that it is only necessary to ask for the benefits in question, and they will forthwith be obtainable. It may, therefore, be well to invite attention to the methods to be adopted in the endeavour to secure such benefits. The first, presumably, is what may be termed the constitutional method—*i.e.*, by means of legislation, either by a private member's bill or by a Government measure.

The difficulties surrounding a private member's Bill are so well known to everyone possessing even an elementary knowledge of Parliamentary procedure as to need no further comment, while in the present congested state of affairs in Parliament it is practically hopeless to expect the Government to render any assistance, notwithstanding the fact that it has recently dealt with the question of superannuation for teachers. Either of these courses would, doubtless, be strenuously opposed by the Association of Municipal Corporations and kindred associations as the representatives of the ratepayers, although these associations have approved the principle of a national superannuation scheme in preference to the continuance of piecemeal legislation. Neither can it be hoped that superannuation and security of tenure can be obtained solely for municipal engineers, and isolated action on the part of the two institutions is sure to prove abortive.

There yet remains an alternative—*viz.*, the co-operation of every member of the local government service. Parliament, municipal authorities, and the public must be educated. The active interest and assistance of the Press must be sought and obtained. A powerful and influential organisation, with adequate funds and representative of every grade of local government officer, must be actively supported. Municipal officers must dispense with that apathy which, for many years, has been their stumbling-block, and a ceaseless campaign must be waged throughout the country.

If security of tenure cannot be obtained through the usual channels, then it must be secured through the medium of an organisation so powerful as to command respect, so that it would be necessary to think twice before an injustice was done to one of its members. This is the mutual aid and protection that is so absolutely essential. If the two municipal engineering institutions cannot agree on other points, it is incumbent upon them to combine for the protection of their members.

It must not, however, be thought that the interests of local government officers have been neglected in the past. There exists at the present moment an association which for years has been striving to obtain for the service superannuation and security of tenure, and in numerous instances has given legal advice and assistance to those requiring the same. To this association the National Association of Local Government Officers, the two municipal engineering institutions are affiliated, and their affiliation costs them, approximately, 1d. per member per annum, the only contribution, so far as can be ascertained, made by these institutions towards the attainment of the important benefits under review.

After having been in existence for about six years the membership of the National Association is well over 30,000, or nearly one-third of the total of local government officers in the country. Here, then, would appear to be the nucleus of the powerful and influential organisation to which reference has been made, and before embarking upon individual enterprises, it might be worth the while of the two institutions to consider the advisability of furthering the work of the National Association by supporting it financially and by increasing its membership, either directly or by forming local associations where at present no such association exists, for it must be borne in mind that whatever benefits are gained by the minority will be shared by the whole.

Superannuation and security of tenure must be worked for, must be fought for, and must be paid for.—Yours, &c.,

"UNION IS STRENGTH."

June 21, 1912.

### WATER PURIFICATION IN SINGAPORE.

*To the Editor of* THE SURVEYOR.

SIR,—In your issue of May 3rd you were good enough to publish an account of the Singapore waterworks recently opened, and in the analysis of filtration it was stated that the percentage removal of bacteria from the unfiltered water by filtration was, on an average, 60 per cent.

In the pamphlet describing these works, by an oversight during my absence in England, the percentage reduction of bacteria taken some time ago from some old filter-beds was inserted as the result of the new filter-beds, whereas the analysis quoted below shows the results obtained from the new beds, as made recently by the Government bacteriologist, indicating a reduction of 99 per cent bacteria, which is most satisfactory.

ANALYSES DELIVERED TO.

Sepoy Lines,
Singapore.
April 13, 1912.

Woodleigh filtered water.

A.—Supply pipe from reservoir unfiltered. { 4,272 colonies per c.c. on agar (24 hours). 1,684 " " gelatine (3 days). Very large proportion of liquefiers. B. coli present in 0·1 c.c. (24 hours.)

B. Filtered water from Bed No. 7. { 86 colonies per c.c. on agar (48 hours). 46 " " gelatine (3 days). B. coli doubtful in 1 c.c. (no gas formation).

C.—Filtered water from Bed No. 8. { 84 per c.c. on agar (48 hours). 40 " " gelatine (3 days). B. coli present in 5 c.c.

The filters seem to be acting admirably, there being 99 per cent removal practically.

(Signed) W. M. SCORR,
Government Bacteriologist.

—Yours, &c.,

R. PEIRCE, M.INST.C.E.,
Municipal Engineer.

Singapore.
May 29, 1912.

**Pier for Westcliff-on-Sea.**—Southend Town Council have been granted a Provisional Order by the Board of Trade for the construction of a new pier at Westcliff-on-Sea, at an estimated cost of £17,000.

## INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

*President*—Mr. Albert D. Greatorex, M.Inst.C.E., Borough Engineer and Surveyor of West Bromwich.

### NORTH-EASTERN DISTRICT MEETING AT BRIDLINGTON.

A North-Eastern District meeting will be held at Bridlington to-morrow (Saturday).

PROGRAMME.

10.30 a.m.—Assemble at the town hall, Garrison-street, where members will be received by his Worship the Mayor (Alderman L. Mainprize, J.P.). District business, minutes, &c., papers by the borough surveyor, Mr. E. R. Matthews, Assoc.M.Inst.C.E., "Bridlington and Some of its Municipal Works and Undertakings," and Mr. Councillor Charlesworth, "Bridlington Waterworks."

11 a.m.—Discussion on papers (which will be taken as read).

12.15 p.m.—Visit Royal Prince's Parade, Victoria sea defences, Beaconsfield lavatories, and foreshore.

1.15 p.m.—Lunch at the Britannia Hotel, kindly provided by Mr. Frank Massie, M.Inst.C.E., district chairman.

2.30 p.m. (sharp).—Drive to the Marine Drive lavatories and shelter, Pembroke Gardens, fish stand, depot, nurseries, electricity works, and waterworks.

Tea will be provided at the waterworks by his Worship the Mayor.

5 p.m.—Arrive Bridlington.

The Property Committee of the Bridlington Corporation have kindly granted complimentary tickets for admission to the Royal Prince's Parade and Grand Pavilion during the week-end to those attending the meeting.

J. P. Wakeford, Assoc.M.Inst.C.E.,
*Hon. District Secretary.*

City Surveyor,
Wakefield.

### WEST MIDLAND DISTRICT MEETING AT STOURBRIDGE.

A West Midland District meeting is to be held at the Town Hall, Stourbridge, on Saturday, July 6th.

PROGRAMME.

10.30 a.m.—Assemble at the council chamber, town hall, where members will be received by the chairman of the urban district council.

District business, minutes, &c.

The following papers (which will be taken as read) will be discussed: "Some Municipal Works at Stourbridge," by Mr. F. Woodward, surveyor to the urban district council. "New Boring Operations" for the Stourbridge and District Water Board, by Mr. W. Fiddian, consulting engineer to the board. "Description of Stourbridge Gasworks and Tar Plant," by Mr. C. H. Webb, engineer and manager, Stourbridge gasworks.

12 noon.—Inspect the engineering works of Messrs. Jones & Attwood, and oil gas plant, and tar dehydration plant at Stourbridge gasworks.

1.30 p.m.—Lunch at the Talbot Hotel, by kind invitation of the urban district council.

2.30 p.m (prompt).—A trip on the Kinver light railway, by kind invitation from the Dudley and District Tramway Company (destructor works and sewage pumping station can be seen *en route*).

3.15 p.m.—Start from Stewpony Hotel (by brake) and drive through the sewage farms belonging to the Stourbridge and Upper Stour Valley Boards.

4.30 p.m.—Inspect as many of the following as time will permit: Public baths, Roemac road, free library, and secondary school buildings, and tar-macadam plant.

5.30 p.m.—Tea at the town hall, by invitation of Mr. Woodward.

H. Richardson, Assoc.M.Inst.C.E.,
*Hon. District Secretary.*

Council House,
Handsworth,
Birmingham.

### THIRTY-NINTH ANNUAL GENERAL MEETING.

The annual meeting of the institution will be held in the Council Chamber, Caxton Hall, Westminster, on Thursday and Friday, July 11th and 12th, and at the County Hall, Aylesbury, on Saturday, July 13th.

PROGRAMME.

*Thursday, July 11th.*

9.30 a.m.—Meeting of the subscribers to the Orphan Fund.

10 a.m.—Council meeting.

10.30 a.m.—Annual general meeting.
Annual report of council.
Presentation of premiums.
Presidential address.

1 p.m.—Adjournment for lunch.

2 p.m. Discussion on the following papers (to be taken as read):—
(1) "Masonry Dams," by F. C. Uren.
(2) "Bacteria," by W. Ransom.
(3) "Town Planning in Sheffield," by C. F. Wike.
(4) "Town Planning," by W. H. Price (Student).
(5) "Standardisation," by E. J. Elford.
Adjournment.

6.30 p.m. for 7 p.m. Reception in the Oak Room of the Hotel Cecil, by the president. Annual dinner in the Victoria Hall. Ladies are especially invited to be present.

9.30 p.m.—Concert.

*Friday, July 12th.*

10 a.m. Discussion on the following papers (to be taken as read):—
(6) "Maintenance of Sewers in Hampstead," by O. E. Winter.
(7) "Bituminous-bound Carriageways," by J. S. Brodie.
(8) "Road Maintenance in County Armagh," by R. H. Dorman.
(9) "Scottish Roads," by Allan Stevenson.
(10) "How the New District Committees may Promote the Progress of the Institution," by A. H. Campbell.

1 p.m.—Adjournment for lunch.

Programme of Visits.

*Friday, July 12th.*

Party "A"—Norwood.

2.30 p.m.—The party will assemble at Victoria Station (London, Brighton and South Coast Railway). Members will book independently.

2.43 p.m.—Depart for Crystal Palace (change).

3.20 p.m.—Arrive Norwood Junction.
Proceed to inspect reinforced concrete subway, 9 ft. 6 in. diameter, by invitation of Mr. G. F. Carter, who will kindly conduct the party over the work.

Party "B"—Sidcup.

2.40 p.m.—The party will assemble at Charing Cross Station (South-Eastern and Chatham Railways). Members will book independently to New Eltham.

2.50 p.m. Train leaves for New Eltham, where members will alight on the outward journey.

3.32 p.m.—Inspection of sections of road, of various materials, laid for testing by the Kent County Council, for the Road Board, *en route* to Sidcup.

Party "C"—Hampstead.

2.45 p.m.—The party will assemble at Golder's Green Station. Guides will meet the party to conduct them through the Hampstead Garden City. Members will travel independently.

Party "D"—Westminster.

2.45 p.m. The party will assemble at Westminster Bridge (south side) at the London County Council County Hall, in course of erection by Mr. Ralph Knott and Mr. W. E. Riley, and proceed to inspect the works, by kind invitation.

*Saturday, July 13th.*

Visit to Aylesbury, Tring, &c.

9.15 a.m.—The members will assemble at Marylebone (Great Central Railway).

9.25 a.m. Depart for Aylesbury.

10.45 a.m.—Arrive Aylesbury. Proceed to the County Hall. The members will be received by Mr. Tomman Mosley, C.B., chairman of the Buckinghamshire County Council, and Mr. H. L. Nippin, J.P., chairman of the Aylesbury Urban District Council.

Discussion on the following paper (to be taken as read):—

(11) "Municipality Work in Aylesbury," by W. H. Taylor.

Proceed by conveyances along roads bituminously bound, tar-painted, &c., to the Chiltern Hills Spring Water Company's works, near St. Leonards (by kind permission of the chairman and directors), where members will be received by Mr. H. A. Callon, assistant manager.

1.45 p.m.—Leave for Tring.
2 p.m.—Luncheon at the "Rose and Crown" Hotel.
3 p.m.—The Honourable Walter Rothschild will receive the members at his museum, over which he has kindly consented to conduct the party.

It is hoped that arrangements can be made for affording members an opportunity of seeing the grounds of Tring Park.

4 p.m.—Leave for Aylesbury.
4.45 p.m.—Arrive at Aylesbury, where tea will be provided at "The Chantry" by the president.

Ladies are invited to attend the annual meeting and the visits. The permission of the president may in their case be assumed, but due notice must be given on the reply form.

CHAS. JONES, M.INST.C.E., *Hon. Secretary.* THOMAS COLE, *Secretary.*

## INSTITUTION OF MUNICIPAL ENGINEERS.

*President*—Mr. E. A. STICKLAND, ASSOC.M.INST.C.E., Borough Surveyor, Windsor.

### MEETING AT PETERBOROUGH.

A North-Eastern and Eastern Districts joint meeting will be held at Peterborough on Wednesday, July 3rd.

PROGRAMME.

12.15 p.m.—Meet at Peterborough Station (G.N.R.).
12.56 p.m.—Leave Peterborough Station for Yaxley.
1.3 p.m.—Arrive at Yaxley Station and proceed to the Fletton Brick-making Works of Messrs. Eastwood & Co., Limited. An inspection will here be made of all the processes of brick manufacture, including grinding and screening of the raw material, moulding, pressing, drying and burning.
3 p.m. A short business meeting will be held, at which the officers for the year 1912-13 will be elected.
4.13 p.m.—Leave Yaxley Station.
4.20 p.m.—Arrive at Peterborough, where visits will be paid to places of interest in the town, to a programme now being arranged.

Members intending to be present are requested to notify their district secretary or me as early as possible.

B. WYAND, *Secretary.*
39 Victoria-street, S.W.

## ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

*President*—MR. JOHN D. WATSON, M.INST.C.E.

### ANNUAL GENERAL SUMMER MEETING.

The annual general summer meeting of the Association of Managers of Sewage Disposal Works will be held at Wolverhampton on Saturday, July 6th.

PROGRAMME.

11 a.m.—Reception by the Mayor (Councillor T. W. Dickinson, J.P.), to be followed by papers:—(1) "Notes on Methods of Differentiating Soils for Sewage Purification." Dr. G. J. Fowler, F.I.C., and Mr. Wm. Clifford, ASSOC.M.INST.C.E.

(2) "Deodorisation Methods in Use at Stratford-on-Avon for the Prevention of Aerial Nuisance from Sewage Containing Brewery Waste." Mr. Herbert D. Bell, manager, Stratford-on-Avon.

1 p.m.—Lunch, Star and Garter Hotel.
2 p.m.—Assemble for conveyance by brakes to sewage works and farm.
2.30 p.m.—Arrive at works. Description by manager (Mr. Wm. Clifford).
3.30 p.m.—Visit farm.
4.30 p.m.—Tea, by invitation of the Sewage Works Committee. Votes of thanks.

## APPOINTMENTS VACANT.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1369 Holborn), subject to later confirmation by letter.*

ASSISTANT TO COUNTY SURVEYOR.—June 29th. East Sussex County Council. £180 per annum.—Mr. F. J. Wood, county surveyor, Lewes.

STEAM ROLLER DRIVER.—June 29th.—Chipping Sodbury Rural District Council. 28s. per week.—Mr. R. Wilson, clerk, Council Office.

HIGHWAYS FOREMAN.—July 1st.—Deptford Borough Council. £2 2s. per week.—Mr. V. Orchard, town clerk.

SURVEYING ASSISTANT.—July 1st.—Corporation of Manchester. £2 10s. per week.—Mr. Thomas Hudson, town clerk.

ASSISTANT SANITARY INSPECTOR.—July 1st.—Aberdare Urban District Council. £90 per annum.—Mr. Thos. Phillips, clerk.

STEAM ROLLER DRIVER.—July 1st.—Rugby Rural District Council. 24s. per week.—Mr. T. W. Willard, surveyor.

BOROUGH SURVEYOR'S CLERK.—July 3rd.—Corporation of Chepping Wycombe. £78 per annum.—Mr. T. J. Rushbrooke, borough surveyor.

BUILDING INSPECTOR.—July 4th.—Corporation of Warrington. £125 per annum.—Borough Engineer and Surveyor.

BOROUGH SURVEYOR AND INSPECTOR OF NUISANCES.—July 8th.—Borough of Southwold. £130 per annum.—Mr. Ernest R. Cooper, town clerk.

INSPECTOR OF NUISANCES.—July 9th.—Corporation of Exeter. £200—£250.—Mr. H. Lloyd Parry, town clerk.

SURVEYOR OF HIGHWAYS.—July 13th.—Whittington and Newbold Urban District Council.—Mr. H. J. Watson, clerk, 32 Gluman-gate, Chesterfield.

ASSISTANT ENGINEERS.—Public Works Department of the Government of the Gold Coast. £300—£350.—Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W.

## MUNICIPAL COMPETITIONS OPEN.

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REIGATE.—June 29th.—Plans and schemes for laying out and developing part of the Reigate Lodge estate, belonging to the town council. Premiums of 30 and 10 guineas.—Mr. Alfred Smith, town clerk.

PADIHAM.—June 30th.—Designs for town hall and baths. Premiums £40 and £20.—Mr. J. Gregson, surveyor.

DUSSELDORF.—July 1st.—Plan for the extension of the city. Premiums of £1,000 and £375 are offered.—The Chief Burgomaster.

CARDIFF.—August 6th.—Designs and estimates for fire station.—The Town Clerk.

GOOLE.—September 1st.—Competitive designs and estimates for municipal offices, for the urban district council. Two premiums (£30 and £15).—Mr. R. Tyson, clerk.

## MUNICIPAL CONTRACTS OPEN.

**Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue,** *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (No. 1369 Holborn), subject to later confirmation by letter.*

### Buildings.

NEWBURN.—June 28th—July 1st.—For the erection of fifty-eight houses at Walbottle, for the urban district council.—Mr. T. Gregory, surveyor.

STRATFORD-UPON-AVON.—July 1st.—For the erection of workmen's cottages, for the corporation.—Mr. R. Lunn, town clerk.

WORKINGTON.—July 1st.—For the execution of alterations to Carnegie Hall, for the corporation.—Mr. H. B. Williams, borough engineer and surveyor.

HENDON.—July 1st.—For the erection of a public mortuary and other buildings, for the urban district council.—Mr. S. S. Grimley, engineer and surveyor.

HALIFAX.—July 1st.—For repairing roof of market, for the corporation.—Mr. J. Lord, borough engineer.

PEMBROKE.—July 1st.—For the erection of office accommodation at constabulary headquarters, for the county council.—Mr. A. H. Thomas, county surveyor.

STOCKTON-ON-TEES.—July 1st.—For alterations to secondary schools, for the Education Committee.—Mr. M. H. Sykes, borough engineer.

DUNDEE.—July 1st.—For laying 1,550 super. yds. of patent jointless flooring, for the corporation.—Mr. J. Thomson, city engineer.

HATFIELD.—July 1st.—For alterations and additions to buildings, for the rural district council.—Mr. Ernest J. Dunham, clerk.

NORTH RIDING.—July 2nd.—For alterations at a public school, for the Education Committee.—Mr. J. C. Wrigley, secretary, Education Offices, Northallerton.

WALSALL.—July 2nd.—For the construction of a concrete foundation for cooling tower, for the corporation.—Mr. J. R. Cooper, town clerk.

MOUNTAIN ASH.—July 2nd.—For alterations at a public school, for the Education Committee.—Mr. A. Morgan, director of Education.

LEEK.—July 2nd.—For the erection of new offices and extension of coal store, for the urban district council.—Mr. W. E. Beecham, surveyor.

TOTTENHAM.—July 2nd.—For the erection of heating apparatus, pitch-pine block flooring, tar paving, and stoves and ranges, for the Education Committee.—Mr. G. E. T. Laurence, architect, 22 Buckingham-street, Adelphi.

SUNDERLAND.—July 2nd.—For the erection of a pavilion and shelter, for the corporation.—Mr. F. M. Bowey, town clerk.

LUTON.—July 2nd.—For extensions at a public school, for the corporation.—Mr. B. Penny, town clerk.

EALING.—July 2nd.—Rebuilding footbridge over the Brent at Perivale, for the corporation.—Mr. Geo. E. Brydges, town clerk.

SADDLEWORTH.—July 3rd.—For the erection of thirty-five workmen's dwellings, for the urban district council.—Mr. E. Rowbotham, clerk.

STEPNEY.—July 3rd.—For the erection of a bacteriological laboratory, for the borough council.—Mr. Geo. W. Clarke, town clerk.

MACCLESFIELD.—July 3rd.—For the erection of public conveniences, for the corporation.—Borough Surveyor.

PENGE.—July 4th.—For alterations to and redecoration of school, for the urban district council.—Mr. H. W. Longdin, surveyor.

CARMARTHEN.—July 4th.—For building a school, for the county council.—Mr. W. V. Morgan, county architect, County Education Offices, Carmarthen.

EAST RIDING.—July 5th.—For the removal of existing bridge across the river Hull, near Beverley, and the construction of a new bridge, for the county council.—Mr. John Bickersteth, clerk.

THORNEY.—July 5th.—For the erection of cottages, for the rural district council.—Mr. W. Bell, surveyor.

WEST RIDING.—July 5th.—For the erection of two new schools and additions to existing school, for the county council.—Mr. Francis Alvey Darwin, clerk, County Hall, Wakefield.

ELLESMERE.—July 6th.—For the erection of cemetery chapel and convenience, and laying pipe sewer, for the urban district council.—Mr. T. W. Francis, clerk, Ellesmere Park.

BRIGHOUSE.—July 6th.—For the erection of public baths, for the corporation.—Mr. Jas. H. Rothwell, town clerk.

HUDDERSFIELD.—July 6th.—For taking down and rebuilding boundary wall, for the corporation.—Town Clerk.

EAST SUFFOLK.—July 8th.—For the erection of schools at Stowmarket and Pakefield, for the county council.—Mr. W. E. Watkins, secretary, County Hall, Ipswich.

FAILSWORTH.—July 8th.—For alterations to council offices, for the urban district council.—Mr. W. M. Shimmin, surveyor.

GUILDFORD.—July 8th.—For alterations and repairs to schools, for the corporation.—Mr. C. G. Mason, borough surveyor.

ALTRINCHAM.—July 8th.—For the erection of conveniences, for the urban district council.—Mr. H. E. Brown, surveyor.

HASTINGS.—July 9th.—For the construction of an engine-house, for the corporation.—Mr. P. H. Palmer, borough engineer.

WALTHAMSTOW.—July 9th.—For repairs and painting at various schools, for the Education Committee.—Mr. T. W. Liddiard, secretary, Education Offices, High-street.

WILTS.—July 9th.—For alterations at police stations and cottages, for the Standing Joint Committee of the county council.—Mr. J. G. Powell, county surveyor, Trowbridge.

LANCASHIRE.—July 9th.—For the construction of a bridge and approaches, for the county council.—Mr. W. Compton Hall, county bridgemaster, Preston.

BARKING.—July 9th.—For the erection of twenty-six workmen's houses, for the urban district council.—Mr. H. Hargreaves, clerk.

LEYTON.—July 9th—23rd.—For the erection of a school for girls and infants, for the urban district council.—Mr. W. Jacques, architect, 2 Fen-court, Fenchurch-street, E.C.

HOLBORN.—July 10th.—For the erection of a public mortuary, for the borough council.—Mr. E. F. Spurrell borough surveyor.

HAILSHAM.—July 10th.—For the erection of a three-span bridge, for the rural district council.—Mr. Edmund Catt, clerk.

HACKNEY.—July 11th.—For the erection of a branch library, for the borough council.—Mr. W. A. Williams, town clerk.

ASHWELL.—July 12th.—For the construction of waterworks, including the laying of 2¼ miles of 4-in. and 3-in. cast-iron pipes with all appurtenances, the construction of brick service reservoir, and the erection of pumping station, for the rural district council.—Mr. Arthur Sharpe, clerk.

## Iron and Steel.

STEPNEY.—July 1st.—For the supply of ampere-hour meters, demand indicators, time switches, and arc lamp carbons, for the borough council.—Mr. W. C. P. Tapper, borough electrical engineer, 27 Osborne-street, Whitechapel.

MALDON.—July 2nd.—For sinking and steining a further depth of 65 ft. the well at the Wantz-road pumping station, for the corporation.—Mr. F. H. Bright, town clerk.

MALDON.—July 2nd.—For providing and fixing set of 7-in. treble stand-pipe pumps, for the corporation.—Mr. F. H. Bright, town clerk.

DEWSBURY.—July 4th.—For the supply of one 1,000-kw. turbine, two 500-kw. direct-current generators, and jet-condensing plant, for the corporation. Mr. H. Ellis, town clerk.

MANCHESTER.—July 4th.—For the supply of cast-iron main pipes, for the Gas Committee.—Gas Office, Town Hall.

ASHTON-UPON-MERSEY.—July 9th.—For the supply of 900 yds. of unclimbable iron fencing, for the urban district council.—Mr. F. Hutton, surveyor.

SWINDON.—July 13th.—For the supply of unclimbable wrought-iron fencing, gate and posts, for the corporation.—Mr. H. J. Hamp, borough surveyor.

BOURNE.—July 15th.—For the supply of cast-iron pipes and valves, for the rural district council.—Mr. T. Lake, district surveyor.

ISLINGTON.—July 24th.—For the supply of 3,000-kw. steam turbine alternator, exciter, condensing plant, switch gear, and circulating and steam piping, for the borough council.—Mr. W. F. Dewey, town clerk.

## Roads.

HARROW.—June 29th.—For the supply of broken granite, granite chippings and gravel, for the urban district council.—Mr. P. Bennetts, surveyor.

LURGAN.—June 29th.—For the supply of concrete flags, for the town council.—Mr. F. W. Pollock, clerk.

DEVONPORT.—June 29th.—For making up a road, for the corporation.—Mr. John F. Burns, borough surveyor.

SANTOS (Brazil).—June 30th.—For asphalt paving, for the municipal council.—The British Vice-Consul.

HENDON.—July 1st.—For making up certain streets, for the urban district council.—Mr. S. S. Grimley, engineer.

HIPPERHOLME.—July 1st.—For the supply of macadam, for the urban district council.—Mr. G. W. Thompson, engineer and surveyor.

EAST PRESTON (Sussex).—July 1st.—For the supply of granite, binding gravel, and coarse flints, for the rural district council.—Mr. A. Shelley, clerk, Littlehampton.

WOLVERHAMPTON.—July 1st.—For making up work, for the corporation.—Mr. G. Green, borough engineer.

WHITCHURCH. — July 1st. — For steam rolling work, for the rural district council.—Mr. John T. P. Clarke, clerk.

ROMFORD.—July 1st.—For road improvements and laying sewers, for the urban district council.—Mr. C. T. King, clerk.

TENDRING.—July 1st.—For the supply of flints, for the rural district council.—Mr. A. J. H. Ward, clerk, 42 Church-street, Harwich.

EAST BARNET.—July 2nd.—For making up and sewering several streets, for the urban district council.—Mr. T. A. Buckley, clerk.

BUSHEY.—July 2nd.—For making up a street, for the urban district council.—Mr. John Wilson, clerk.

MIDDLETON.—July 2nd.—For street works and wood fencing, for the corporation.—Mr. W. Welburn, borough surveyor.

WINSFORD.—July 2nd.—For the supply of granite-macadam and granite chippings, for the urban district council.—Mr. J. H. Cooke, clerk.

SWANSEA.—July 2nd.—For private street works, for the corporation.—Mr. H. L. Coath, town clerk.

LLANDAFF.—July 2nd.—For street improvement works, for the rural district council.—Mr. J. Holden, surveyor.

GOOLE.—July 3rd.—For making up Humber-street, for the urban district council.—Mr. Robert Tyson, clerk.

KINGSTON-UPON-THAMES.—July 3rd.—For the supply of granite kerb, channelling, setts, and cubes and quadrants, for the corporation.—Mr. Harold A. Winser, town clerk.

LONDON.—July 3rd.—For paving repairs at a fever hospital and school, for the Asylums Board.—Mr. T. Duncombe Mann, clerk.

NORTH DARLEY.—July 4th.—For the supply of granite, for the urban district council.—Mr. E. F. Lowe, surveyor, Darley Dale, Matlock.

HEATON NORRIS.—July 4th.—For sewering, levelling, and paving with Limmer rock-granited asphalt, kerbing and flagging footpaths of Egerton-road North, and Lynton-road, for the urban district council.—Mr. F. W. Brooke, clerk.

HEREFORD.—July 5th.—For raising and stacking road material, for the rural district council.—Mr. H. Bishop, surveyor, Moreton-on-Lugg.

ASHTON-IN-MAKERFIELD. — July 6th. — For making up thirty-one streets, for the urban district council.—Mr. T. Burgess, surveyor.

DEWSBURY.—July 6th.—For paving and flagging, for the corporation.—Borough Surveyor.

WILLINGTON.—July 6th.—For making up side streets, for the urban district council.—Mr. J. H. Gardner, surveyor.

ROMSEY.—July 6th.—For removing old bridge and building new concrete bridge, for the rural district council.—Mr. A. J. Harrington, clerk.

WANDSWORTH.—July 8th.—For the making up and paving of Gatwick-road, Southfield, and part of Seeley-road, Tooting, for the borough council.—Mr. D. A. Nicholl, town clerk.

FAREHAM.—July 8th.—For steam rolling and scarifying, for the rural district council.—Mr. A. Laker, clerk.

WANDSWORTH.—July 8th.—For making up and paving part of Beechcroft-road, Balham, for the borough council.—Mr. D. A. Nicholl, town clerk.

CASTLEFORD.—July 8th.—For street widening and laying rock asphalt road surface, for the urban district council.—Mr. W. Green, surveyor.

MOUNTAIN ASH.—July 9th.—For private street works, for the urban district council.—Mr. W. G. Thomas, surveyor.

PENGE.—July 12th.—For soft wood paving and concrete foundation, for the urban district council.—Mr. H. W. Longdin, surveyor.

GOOLE.—July 15th.—Making up a street, for the urban district council.—Mr. Robert Tyson, clerk.

SAN SALVADOR (Central America). — November 15th.—For asphalt paving works and the provision of a complete system of drainage, for the Board of Works.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

## Sanitary.

PETERBOROUGH. — June 29th—July 20th.—For the construction of sewerage works and pumping machinery, for the rural district council.—Mr. J. W. Buckle, clerk.

SOUTH MOLTON.—June 29th.—For laying 3,560 yds. of service mains, connection of house services, provision of valves and hydrants, and laying gas mains, for the corporation.—Mr. R. Louis Riccard, town clerk.

ALDERLEY EDGE.—July 1st.—For the construction of earthenware-pipe drain, for the urban district council.—Mr. H. Sheldon, surveyor.

BLEAN.—July 2nd.—For the construction of about 12,689 yds. of stoneware and cast-iron pipe sewers, cast-iron rising and air mains, manholes and ejector chambers, for the rural district council.—Mr. J. E. Burch, clerk.

WILTON.—July 2nd.—For constructing cast-iron sewers, manholes and flushing chamber, for the corporation.—Town Clerk.

WOODFORD.—July 2nd.—For sewage works extension, for the urban district council.—Mr. W. Farrington, engineer and surveyor.

HOVE.—July 3rd.—For constructing new sewer, for the corporation.—Mr. H. Endacott, town clerk.

BINGLEY.—July 4th.—For work of converting closets into water-closets, for the Education Committee.—Mr. B. Leah, Education Office, Bingley.

LYMM.—July 4th.—For the construction of outfall works and laying three miles of stoneware pipe sewers and manholes, for the urban district council.—Mr. W. Mullard, clerk.

WINDERMERE.—July 5th.—For the construction of stoneware-pipe sewers, cast-iron sewers, and manholes, for the urban district council.—Mr. J. T. Bownass, clerk.

DENTON.—July 6th.—For the erection of a gas engine, suction-gas plant, air compressor, ejectors, lime and sludge mixers, sludge presses, pipes and valves, for the urban district council.—Mr. W. Richards, clerk.

NEWPORT PAGNELL.—July 6th.—For the construction of sewage disposal works, for the rural district council.—Mr. C. W. Powell, clerk.

CHERTSEY.—July 8th.—For laying 3¼ miles of stoneware pipes, concrete tubes, concrete manholes, catchpits and stoneware gullies, and incidental works, for the rural district council.—The Surveyor, High-street, Chobham, near Woking.

WALSINGHAM.—July 9th.—For the construction of sewerage and sewage disposal works, for the rural district council.—Mr. R. S. Butcher, clerk.

BLAYDON-ON-TYNE.—July 9th.—For the removal of the contents of ashpits, for the urban district council.—Mr. H. Dalton, clerk.

SOUTH MIMMS.—July 10th.—For the construction of a sewage tank, percolating filters, sand filters, and detritus chambers, for the rural district council.—Mr. G. D. Byfield, clerk.

LONDON.—July 9th.—For the construction of egg-shaped sewer and cast-iron pipe sewer, for the county council.—Sir Maurice Fitzmaurice, chief engineer.

SEISDON.—July 10th.—For the construction of sedimentation tanks, filters, and other works at the sewage outfall site, for the rural district council.—Mr. H. Taylor, clerk.

BRIERLEY HILL.—July 12th.—For the construction of 2,576 yds. of stoneware-pipe sewers, and 6,425 yds. of branch drains in house connections, manholes, and lampholes, for the urban district council.—Mr. William Waldron, clerk.

LUTON.—July 13th.—For the removal of household refuse, for the rural district council.—Mr. W. Austin, clerk.

CHURCH.—July 15th.—For the construction of a main sewer, for the urban district council.—Mr. W. E. Wood, surveyor.

NOTTINGHAM.—July 29th.—For the supply of sanitary fittings at schools, for the corporation.—Mr. F. B. Lewis, city architect, Guildhall.

### Stores.

ROTHERHAM.—July 8th.—For the supply of materials for the tramway department. — Tramways Manager.

WARRINGTON.—July 8th.—For the supply of necessaries, for the Gas Committee.—Mr. W. S. Haddock, gas engineer.

KING'S LYNN.—July 15th.—For the supply of 500 tons of coal (hand-picked hards), for the corporation.—Borough Surveyor and Waterworks Engineer.

## TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

*The Editor invites the co-operation of* SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

ASHTON-UNDER-LYNE.—For the supply of cast-iron pipes and specials, for the Ashton-under-Lyne, Stalybridge, and Dukinfield District Waterworks, for the ensuing twelve months.—Mr. F. J. Dixon, water engineer:—

Stanton Ironworks Company, Limited, Nottingham.

AUCKLAND.—For the construction of sewage disposal works, for the rural district council:—

| | |
|---|---|
| H. J. Wood, Durham | £6,302 |
| S. Simpson, Newcastle | 6,100 |
| J. Carrick, Durham | 5,598 |
| M. France, Limited, Redcar | 5,100 |
| Walton Brothers, Crook | 5,080 |
| G. Hetherington, Bishop Auckland | 5,030 |
| R. Wilson, Barnard Castle | 4,592 |
| J. Robson, Newcastle* | 4,802 |

CHESHAM.—For construction of outfall works and laying out additional land for sewage disposal purposes, for the urban district council.—Mr. P. C. Dormer, engineer:—

Contract No. 1.—Tenders for Sewage Disposal Works.

| | |
|---|---|
| W. Y. Green & Co., Aylesbury | £6,897 |
| S. Wood, Reading | 6,598 |
| G. Henson & Son, Wellingborough | 6,473 |
| Rust & Ratcliffe, Chesham | 6,349 |
| A. T. Catley, Lloyd-square | 6,300 |
| A. Mead & Son, Chesham | 5,950 |
| W. Wright, Chesham* | 5,893 |

Contract No. 2.—Tenders for Reconstruction of Sewers.

| | |
|---|---|
| S. Wood, Reading | £1,350 |
| A. T. Catley, Lloyd-square | 1,312 |
| W. Y. Green & Co., Aylesbury | 1,296 |
| W. Wright, Chesham | 1,287 |
| G. Henson & Son, Wellingborough | 1,280 |
| Rust & Ratcliffe, Chesham | 1,249 |
| Free & Co., Maidenhead | 1,226 |
| A. Mead & Son, Chesham* | 1,090 |

Street Improvement Works, Waterside, Chesham.

| | |
|---|---|
| Rust & Ratcliffe, Chesham | £106 |
| S. Fassnidge, Chesham | 105 |
| W. Wright, Chesham | 88 |
| A. Mead & Son, Chesham* | 81 |

CHURCH.—Accepted for the erection of public conveniences, for the urban district council.—Mr. W. Wood, surveyor:—

Mason's work.—R. Stewart, Accrington.
Joiner's work.—G. Walsh & Sons, Oswaldtwistle.
Plumber's work.—J. Haworth, Church.
Slater's work.—E. Welsh, Accrington.

DOVER.—For the supply of Guernsey or Welsh granite and granite chippings, for the corporation:—

Guernsey Granite.

| | s. d. | |
|---|---|---|
| A. & F. Marsden, London | 10 10 | per ton. |
| J. Mowlem & Co., London* | 10 5 | ,, |
| Brookes, Limited, London | 10 9 | ,, |
| W. Griffiths & Co., Greenwich | 11 4 | ,, |
| Fry Brothers, Greenwich | 10 6 | ,, |

Welsh Granite.

| | s. d. | |
|---|---|---|
| Brookes, Limited, London | 10 4 | per ton. |
| Enderby and Stanton Stanton Granite Co., Leicester | 11 0 | ,, |

EASINGWOLD.—For laying stoneware sewer and manholes, for the rural district council:—

T. Wood & Son, Easingwold, £116.

EPSOM.—For making up roads for the rural district council.—Mr. T. E. Ware, surveyor:—

| | Grove-rd. | Hadfield-rd. | Copse-rd. |
|---|---|---|---|
| Kavanagh & Co., Surbiton | £307 | £87 | £697 |
| Streeter & Co., Godalming | 294 | 81 | 620* |
| May & Son, Ashtead | 292* | 73* | 685 |
| Ripley & Co. | 288 | 61 | 650 |
| Buller | — | — | 923 |
| J. Mowlem & Co. | — | — | 923 |
| Surveyor's estimate | 256 | 67 | 686 |

GRANTOWN-ON-SPEY.—For extension of sewer and water pipe, for the corporation:—

W. Laing, Grantown-on-Spey.—Sewer, £48 15s.; pipe, £39 10s.

HOVE.—For executing paving and laying wood paving upon present concrete foundation, for the corporation.—Mr. H. H. Scott, borough surveyor:—

Improved Wood Pavement Company, London, £760.

HOVE.—For new street works, and the supply of flints, for the corporation.—Mr. H. H. Scott, borough surveyor:—

Glebe Villas, New Street Works.—J. Parsons & Sons, Hove, £863.

1,500 Cubic Yards of Coombe Rock Flints.—W. Hillman, Portslade.

| | Price per cubic yard. Broken. s. d. | Unbroken. s. d. |
|---|---|---|
| Delivered at Farm-road Depot, or on the roads in any part of the borough east of Sackville-road | 5 2 | 4 6 |
| Delivered at Sackville-road Depot or on the roads in any part of the borough west of Sackville-road | 4 10 | 4 2 |
| Delivered at Erroll-road Depot | 4 0 | 3 4 |

NORWICH.—The corporation have accepted the following tenders:—

Cochrane & Co. (Woodside), Limited, Dudley, for the immediate supply of 350 yards of cast-iron pipes for the purpose of the water supply to the proposed new cottages, &c., at Whitlingham Farm for £30.

Whipps & Bourne, Manchester, to supply four feeder panels at £185.

A. Stimpson, to provide haulage at 8s. per day for each man, horse and cart supplied beyond his contract number of 41.

Butler & Hacon and T. M. Read, each for 100 coombs of old English oats at 13s. 6d per coomb of 12 stones.

RAUNDS.—Accepted for the supply of broken granite and slag, for the urban district council:—

Forest Rock Granite Company, Leicester.—175 tons 2½ in. granite, 8s. 10d.; 60 tons 1½ in. granite, 8s. 1d.

Enderby and Stoney Stanton Granite Company, Leicester.—635 tons 2½ in. seconds granite, 8s. 3d.

Groby Granite Company, Leicester.—110 tons ¾ in. granite chippings, 5s. 7d.

Islip Iron Company, Limited, Thrapston.—358 tons 2½ in. broken slag, 5s. 6d.; 45 tons 1½ in. broken slag, 5s. 6d.; 75 tons ¾ in. slag chippings, 4s. 6d.; 20 tons slag dust, 3s. 9d.

RUGBY.—For additions to public baths, for the urban district council.—Mr. D. G. Macdonald, engineer and surveyor:—

| | |
|---|---|
| Winn & Son, Rugby | £852 |
| Walton & Son, Rugby | 755 |
| C. Cockerell, Rugby* | 748 |

Surveyor's estimate, £750.

STAINES.—For the supply of galvanised round sanitary pans, for the rural district council.—Mr. G. W. Manning, surveyor:—

| | | |
|---|---|---|
| Ash & Lacy, Birmingham | 7 0 | each. |
| J. Gibbs, Bedfont | 10 0 | ,, |
| Herring & Son, Chertsey* | 7 0 | ,, |
| Johnson & Clark, Staines | 8 8 | ,, |
| Smith & Haynes, Yiewsley | 7 3 | ,, |
| Hugh Brothers, London | 9 6 | ,, |
| Bird & Co., Oxford-circus | 8 0 | ,, |

STOCKPORT.—For work of sewering, for the corporation.—Mr. J. Atkinson, borough surveyor:—

E. J. Lomas, Stockport, £38.

WANDSWORTH.—The committee recommend the acceptance of the Improved Wood Pavement Company, Limited, for laying wood paving and other works, for the borough council.—Mr. P. Dodd, borough engineer:—

Mitcham-lane (between St. Leonard's Church and Eardley-road, and between Blegborough-road and the county boundary at Roe Bridge), £6,659.

Southcroft-road (between No. 45 and Rectory-lane) and parts of Rectory-lane and Mitcham-road at Amen Corner, £1,930.

Wimbledon-road, £1,633.

Clapham Park-road (between High-street, Clapham, and entrance to tramway depot), £780.

## MEETINGS.

*Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.*

JUNE.

29.—Institution of Municipal and County Engineers: Meeting at Bridlington.

JULY.

3.—Institution of Municipal Engineers: North Eastern and Eastern Districts Joint Meeting at Peterborough.

6.—Institution of Municipal and County Engineers: Meeting at Stourbridge.

6. Association of Managers of Sewage Disposal Works: Annual General Summer Meeting at Wolverhampton.

11-13.—Institution of Municipal and County Engineers: Annual Meeting, London.

13.—Institution of Municipal Engineers: North Western District Meeting at Clitheroe.

25-28.—Royal Institution of Public Health: Congress in Berlin.

29.—Royal Sanitary Institute: Congress at York opens.


## FOR SALE.

SECOND-HAND Copy of Aitken's "Road Making," published at 21s. What offers?—Box 1,167, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

"The Surveyor" Supplement.

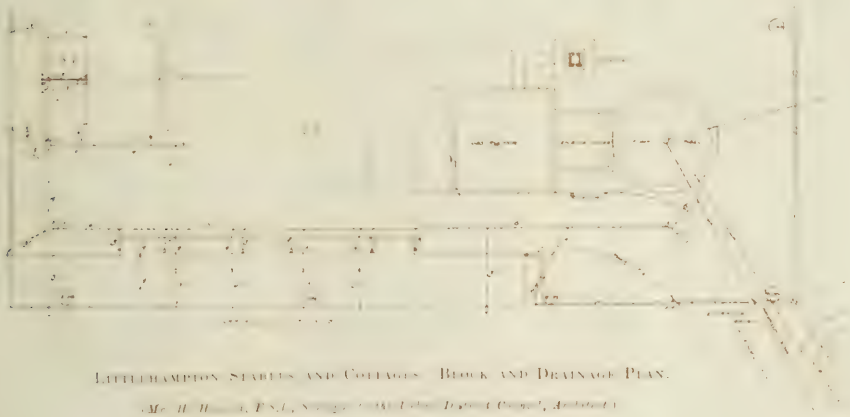
FOR ARCHITECTS, QUANTITY SURVEYORS, CONTRACTORS, AND ALL USERS OF REINFORCED CONCRETE.

# Littlehampton Stable Buildings and Workmen's Cottages.

[illegible] Littlehampton having [illegible] years ago decided to employ [illegible] and staff for the various highway, electrical, scavenging, watering and other departmental works, have now found it necessary to [illegible] their property in a depot. Experience has shown, too, that this depot control in place of contractors has easily engaged has produced more efficient and satisfactory results, although in some cases there has no doubt been additional expense.

Associated with other important undertakings of new sewerage works for part of the town, and the village of Wick, together with a refuse destructor, the urban district council are carrying out stable buildings and workmen's cottages. Attached to the scheme [illegible] box and [illegible] box at the other. In the [illegible] two ladder bays are arranged.

The main wall and the roof covering will be of the [illegible] as for the cottages, except that the principals will be [illegible] and the purlins, with stout boarding employed in place of ordinary rafters. The internal faces of walls will be hard trowelled cement plaster, and the floors of stables of blue chequered Staffordshire bricks. The stables will be in two parts, each having five stalls, the latter with strong divisions and mangers. The remainder of the floors will be of hard concrete, and all angles at walls hollowed out so as to be easily cleansed. The windows will be cast-iron sashes, one section in each to be pivot-hung for ventilation. Foul-air extractors



Littlehampton Stables and Cottages. Block and Drainage Plan.

Mr. H. H[illegible], F.S.I., Surveyor and Engineer to the Urban District Council, Architect.

[illegible] have been given by the Local Government Board, and a contract has been let to Messrs. Linfield & Sons, builders, of Littlehampton, for the erection of the works, at £2,360.

The boundary walling [illegible] ft. high, and encloses an area of about 1 acre, on which will be placed the destructor and chimney, compressed-air engine-house, as well as the cottages and block of stables, cart-houses, &c. In the case of the last-named three buildings may be [illegible] The pair of semi-detached cottages are intended for the engineer and the general foreman. These buildings are five-roomed, with out-buildings, wash-houses, coals and water-closets, and the external walls are 11 in. thick, cavity, covered with rough-cast plaster. The floors [illegible] and the roofs boarded and covered with sand-faced tiles. The stables block comprises two spacious cart sheds at each end, with harness-room in centre, corn store and tool store at one end of the stables and a will be placed in roof over each stable block. The best local stock bricks and red kiln bricks will be used in [illegible].

The new sewerage works will be extended to this site, and the town's gas and water supplies will also be laid on to the whole of the premises.

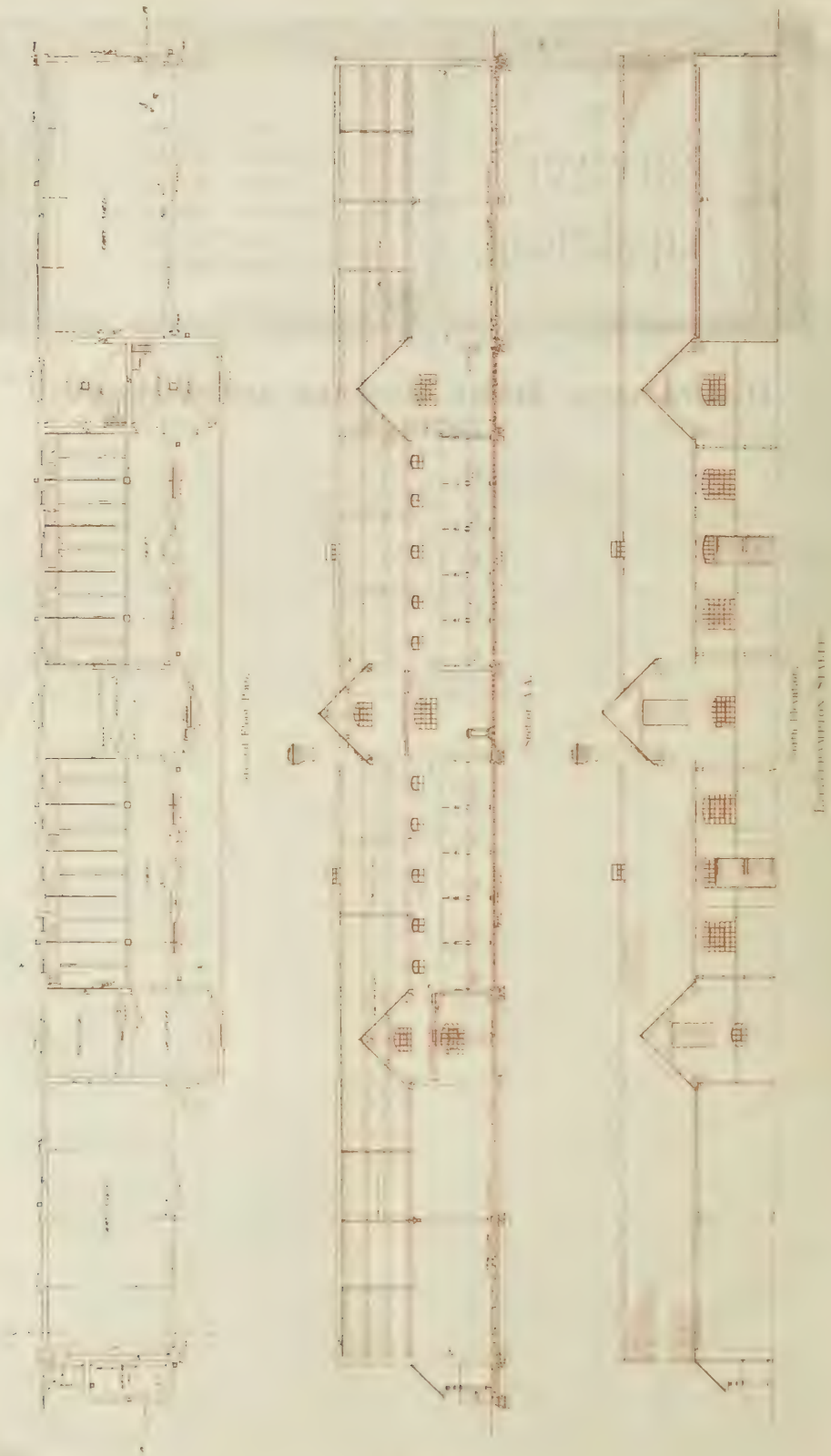
The [illegible] are given of the different parts of buildings, [illegible], &c.

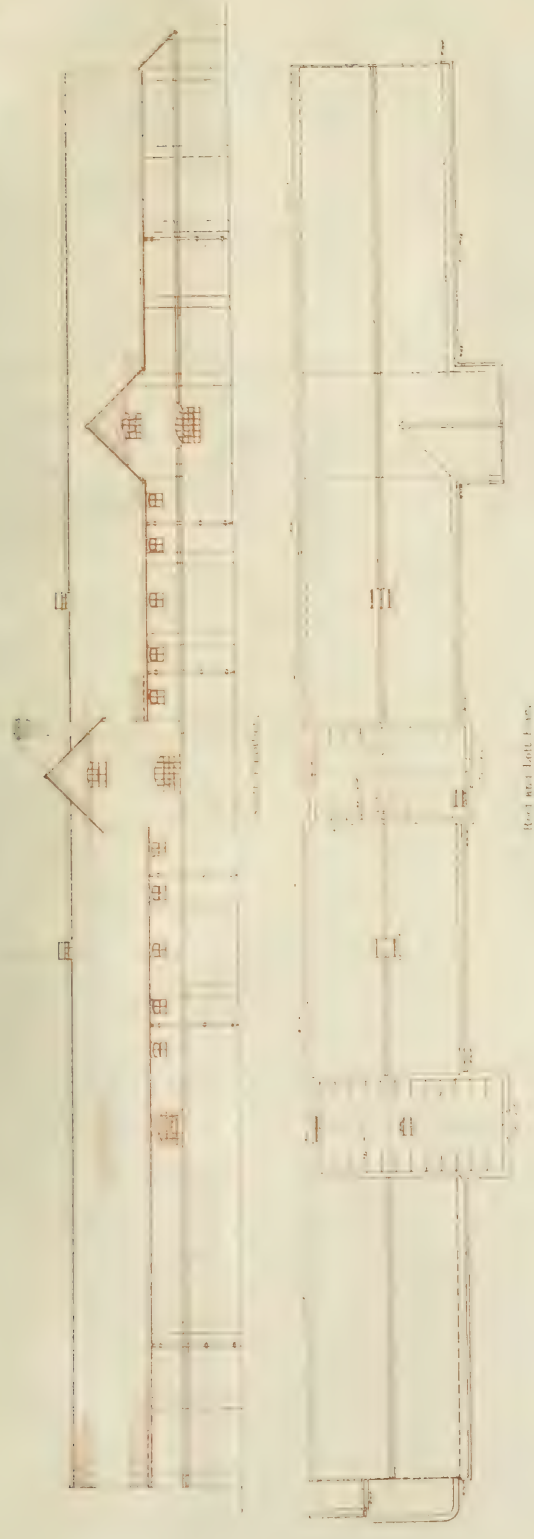
## COTTAGES.

Front entrance and staircase, 5 ft. 3 in.; sitting-room, 14 ft. by 12 ft.; kitchen and living-room, 14 ft. by 12 ft., [illegible], 6 ft. 3 in. by 4 ft. 7 in., back entrance lobby, 3 ft.; wash-house, 10 ft. by 10 ft.; coals 7 ft. by 6 ft.; water-closet, 6 ft. by 3 ft.; and three bedrooms, 14 ft. by 12 ft., 12 ft. by 10 ft. 3 in. and 10 ft. by 8 ft. respectively.

## STABLES.

Two cart sheds, each 40 ft. by 18 ft. 7 in., two blocks of five stalls, each 33 ft. 3 in. by 18 ft., stick box and





Section at B B.

Section at C C.

East End Elevation.

L[illegible]HAMPTON STABLES.

[illegible] 12 ft. [illegible] 20 ft. [illegible] 12 ft. [illegible] 10 ft. [illegible]

[illegible] There [illegible] 20 ft. [illegible] 24 [illegible] 12 ft. respectively. [illegible] to be completed in six months. [illegible] Mr. H. [illegible]

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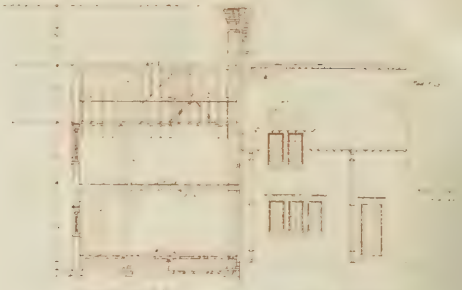
**Cottage Building at Bexhill.**—The [illegible] Council at Bexhill have decided that cottages as proposed by Lord [illegible] may be built on the [illegible] sufficient air-space is provided. The re- [illegible]

**The Purchase of Coventry Tramways.**—[illegible] £202,152 [illegible] amounting to £6,819, and stamp duty on [illegible] £2,021 and an additional [illegible] capital.

**Proposed New Richmond Bridge.**—Owing to the heavy [illegible] traffic over Richmond Bridge, the steep- [illegible] ness of the bridge, the Richmond and Twickenham Councils are jointly peti- tioning the county authorities to improve [illegible] Two pro- posals will be considered—the widening of the old bridge and the erection of a new bridge lower down the river [illegible] with the main road from London.



Section at E F. Back Elevation.

East Elevation.

**Smells from Vent Shafts.**

the ventilating column."

**The Incorporated Municipal Electrical Association's Convention.**

of advantage, as estimated by the *Accountant*, is about 1½ per cent per annum on the capital, and Mr. Pearce accepted this as a fair contribution to the relief of rates. Recent Parliamentary decisions were cited by Mr. Pearce in opposition to the prevailing practice. the rate relief to 1 per cent on the outstanding mortgage debt, and later, in the case of a Bill promoted by the Glasgow Corporation, the House of Commons Committee prohibited the use of profits for this purpose. The Potteries Federation Act also forbade the The writer of the paper pointed out that the practice was a form of indirect taxation of a section of the community for the benefit of the whole, and that, as was well known, in some instances even the existing increased, as they should have been.

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The Surveyor and municipal engineer

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